Request for Tender # T-1160-2021
for
Construction of New Seaton Paramedic Station and Training Facility in the City of Pickering

Appendix D, D-1

The Deliverables and Material Disclosures

Project Manual - Volume 1 of 2

Electronic submission required

The Regional Municipality of Durham
Works Department
605 Rossland Road East, Whitby ON, L1N 6A3

New Seaton Paramedic Station and Training Facility
1890 Fifth Concession Rd, Pickering, Ontario

AECOM Canada Ltd.
50 Sportsworld Crossing Road, Suite 290, West Entrance, Kitchener, Ontario, N2P 0A4, Canada
Project No. 60611569

These specifications (Divisions 00-33) were prepared under the supervision of the following registered coordinating professionals:

Written by: **Jared Cardiff** **Date:** **September 22, 2021**

Checked by: **Jason Chang** **Date:** **September 22, 2021**
(Consultant Project Manager)

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Geothermal		
LICENSED PROFESSIONAL ENGINEER S.M.R. ALMEIDA 100161229 Sept 22/21 PROVINCE OF ONTARIO		

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1 General

1.1 Definitions

.1 Available Project Information: Means only information of any type and in any form, related to Project and identified in this Section as such, and only as specifically referenced in this section.

.2 Contract Documents: All documents and information of any type and in any form, specifically prepared for use of Contract by Consultant and as defined in Contractor's Agreement Form.

1.2 Status of available project information

.1 Available Project Information identified in this section, or any part thereof, are not part of Contract unless specifically incorporated into Contract Documents by means of copying, transcribing or referencing.

1.3 Use of and reliance upon available project information

.1 Available Project Information is made available to Bidder for the purpose of providing Bidder with access to information available to Owner, and Consultant.

.2 Available Project Information shall not be considered a representation or warranty that information contained therein is accurate, complete, or appropriate.

.3 Bidder shall interpret and draw conclusions about Available Project Information and are encouraged to obtain specialist advice with to this information.

.4 Owner and Consultant assume no responsibility for such interpretations and conclusions.

.5 Information contained in Available Project Information may be time sensitive and dates shall be considered when interpreting Available Project Information.

.6 Bidder may rely upon data contained in Available Project Information, or parts thereof, which are specifically incorporated into Contract Documents by means of copying, transcribing or referencing, but shall draw his own

conclusions from such data and shall not rely on opinions or interpretations contained therein.

1.4 Geotechnical investigation data

.1 A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer.

.2 The report does not cover all subsurface conditions of the site or other localized conditions. Be satisfied with regard to all matters relating to sub-soil and subsurface conditions which may affect methods or cost of construction before commencing work.

.3 Neither the Owner nor the Consultant guarantee the accuracy or completeness of this data, and will not be responsible for interpretations or conclusions drawn from this data.

.4 A copy of the geotechnical investigation report titled Preliminary Geotechnical Investigation, Proposed Pickering Emergency Medical Services (EMS) Facility, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario prepared by EXP Services Inc., and dated November 26, 2018 and consisting of 83 pages, is appended to this Section.

1.5 Environmental site investigation data

.1 A environmental site assessment (ESA) report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of engineer and represent interpretations of conditions, tests, and results of analyses conducted by environmental engineer.

.2 The report does not cover all subsurface conditions of the site or other localized conditions. Be satisfied with regard to all matters relating to sub-soil and subsurface conditions which may affect methods or cost of construction before commencing work.

.3 Neither the Owner nor the Consultant guarantee the accuracy or completeness of this data, and will not be responsible for interpretations or conclusions drawn from this data.

.4 A copy of the environmental site assessment report titled Phase One Environmental Site Assessment Update Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario, BRM-00604892-B0 prepared by EXP Services Inc., and dated April 7, 2021 and consisting of 63 pages, is appended to this Section.

1.6 Soil Management Plan

.1 A soil management plan has been prepared for this Project and is available for information only. The opinions expressed in this report are those of engineer and represent interpretations of conditions, tests, and results of analyses conducted by environmental engineer.

.2 The report does not cover all subsurface conditions of the site or other localized conditions. Be satisfied with regard to all matters relating to sub-soil and subsurface conditions which may affect methods or cost of construction before commencing work.

.3 Neither the Owner nor the Consultant guarantee the accuracy or completeness of this data, and will not be responsible for interpretations or conclusions drawn from this data.

.4 A copy of the Soils Management Plan titled Soil Management Plan, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario, DRAFT prepared by EXP Services Inc., and dated August 18, 2021 and consisting of 48 pages, is appended to this Section.

1.7 Appendices to Division 27 and 28

.1 The following appendices are attached to this Section, in reference to Division 27 and 28 for information:

.1 Appendix A – Regional Municipality of Durham Network Standards

.2 Appendix B – Regional Municipality of Durham Security Services Installation and Security System Standards

.3 Appendix C – Regional Municipality of Durham Physical Protection System Installation Guidelines Checklist

2 Products – not used

3 Execution – not used

End of section

Regional Municipality of Durham

Preliminary Geotechnical Investigation
Proposed Pickering Emergency Medical Services (EMS) Facility
Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Project Number
BRM-00604892-A0

Prepared By:

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Date Submitted
November 26, 2018 (Final)

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1. Introduction

This report presents the results of a preliminary geotechnical investigation carried out for the proposed Pickering Emergency Medical Services (EMS) Facility located at the northwest corner of Concession Road 5 and Sideline 16 in Pickering, Ontario. The work was authorized by Mr. Sameh George of the Regional Municipality of Durham.

The site is currently undeveloped and under agricultural use. It is proposed to develop the site with a new EMS facility consisting of a low-rise structure that will either be of slab-on-grade construction or with up to one (1) level of basement. However, the size, location and configuration of the building have not yet been finalized at the time of the investigation. As such, the report will address general development of the site.

The purpose of this preliminary geotechnical investigation was to determine the subsurface soil and groundwater conditions at the above captioned site and, based on an assessment of the factual borehole data, to provide general geotechnical engineering recommendations for site development planning.

Our Terms of Reference also include a letter detailing the Geotechnical Investigation Chemical Analysis Summary and a Phase One Environmental Site Assessment (ESA) which was performed. The results of the Geotechnical Investigation Chemical Analysis Summary and Phase One ESA will be reported under separate cover.

The comments and recommendations given in this report are based on the assumption that the above described design concept will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Site Description

The site is located on the northwest corner of Concession Road 5 and Sideline 16, approximately 500 m east of Brock Road and about 1500 m south of Highway 407 East in Pickering, Ontario. The municipal address of the site is unknown, and the property covers an approximate area of about 4.1 acres.

The site is currently undeveloped and under agricultural use. The majority of the site is covered with rows of various tree types, leased and maintained by Dutchmaster Nurseries Limited.

The ground surface elevation at the borehole locations ranged from 149.6 to 153.0 m.

3. Fieldwork

The fieldwork was carried out between August 30 to 31, 2018 and September 4 to 6, 2018. A total of eighteen (18) sampled boreholes (Boreholes 1 to 15, and 101 to 103) were put down at the approximate locations shown on the attached Borehole Location Plan (Drawing No. 1). The boreholes were advanced to depths of about 5.2 to 11.1 m below existing grade.

The boreholes were advanced using continuous flight solid stem auger equipment owned and operated by a specialist drilling contractor. In each borehole, samples were recovered using conventional split spoon equipment and standard penetration test method.

The fieldwork was supervised throughout by a geotechnical engineer from **EXP Services Inc. (EXP)** who directed the drilling and sampling operations, prepared borehole logs, made groundwater observations during and upon completion of drilling, and processed the recovered samples. In the laboratory, the samples were classified as to their olfactory, visual and textural characteristics.

Monitoring wells were installed in eight (8) of the boreholes. Two (2) of the monitoring wells (Boreholes 3 and 13) were installed to a depth of about 3.0 m below existing grade for in-situ percolation testing. In addition, monitoring wells were installed in six (6) boreholes (Boreholes 1, 9, 15, 101, 102, and 103) to establish the short-term stabilized groundwater levels at the site. Water levels were observed in the open boreholes during the course of the fieldwork. The monitoring wells were installed in accordance with the Ontario Water Resources Act, R.R.O. 1990, Ontario Regulation (O. Reg.) 903 – Amended to O. Reg. 128/03.

The location and ground surface elevation of the boreholes were established in the field by **EXP.** Ground surface elevations at the borehole locations were derived from Can-Net Elevations with the use of a Trimble TSC3 Controller.

4. Laboratory Testing

The laboratory testing program comprised the following:

- Moisture content determinations on all recovered samples, with results presented on the Log of Borehole sheets (Drawing Nos. 2 to 119).
- Grain size analyses conducted on six (6) selected soil samples, with results presented in Appendix A.
- One (1) select soil sample was tested for pH and sulphate, with the results presented in Appendix B.

5. Subsurface Conditions

5.1 Subsoils

The detailed subsoil profiles encountered in each borehole and the results of laboratory moisture content are indicated on the attached borehole logs (Drawing Nos. 2 to 19). It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones, for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The "Notes on Sample Description" preceding the borehole logs are an integral part of and should be read in conjunction with this report.

In general, the subsurface profile encountered at the site, as revealed in the boreholes, comprised surficial topsoil underlain by fill and native deposits of sandy silt till, silt till, clayey silt and clayey silt till.

A brief description of the soil profiles, in order of depth, follows:

Topsoil

Surficially, a topsoil layer was encountered in Boreholes 1, 4, 5, 6, 7, 8, 9, 13, 14, 15, 101, and 102. The topsoil thickness ranged from about 150 to 300 mm thick. The topsoil comprised dark brown sandy silt with rootlets.

Topsoil measurements were carried out at the borehole locations only. A much more detailed analysis (i.e. test pits) is required to accurately quantify the amount of topsoil to be removed for construction purposes. Consequently, topsoil quantities should not be established from the information provided at the borehole locations.

Fill

A fill unit was encountered surficially in Boreholes 2, 3, 10, 11, 12, and 103, extending to depths of about 0.8 to 3.4 m below existing grade. Fill was also encountered below the topsoil in Boreholes 1, 4, 5, 6, 7, 8, 9, 13, 14, 15, 101, and 102, extending to depths of about 1.4 to 2.7 m below existing grade. The fill consisted of silty sand to clayey silt material containing trace gravel and topsoil inclusions. Moisture contents varied from 3 to 32 %, indicating moist to very moist conditions.

Sandy Silt

A deposit of sandy silt was encountered below the fill in Boreholes 9 and 15, extending to a depth of about 2.9 m below existing grade. The sandy silt contained trace clay and gravel and was found to be in a compact to dense state of compactness. Moisture contents varied from 7 to 10 %, indicating moist conditions.

Sandy Silt Till

A deposit of sandy silt till was encountered below the fill in Boreholes 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, and 14, and the sandy silt layer in Boreholes 9 and 15. The sandy silt till extended to depths of about 4.1 to 8.4 m below existing grade in Boreholes 1 to 13 and 15, and to the termination depth of boreholes at about 11.1 m below existing grade in Borehole 14. The sandy silt till contained trace to some clay and trace gravel. Occasional wet sand seam/layers and cobbles and boulders were noted within the sandy silt till deposit. The sandy silt till was found to be in a compact to very dense state of compactness. Moisture contents varied from 4 to 17 %, indicating moist to very moist conditions and the presence of wet sand seams/layers.

A lower sandy silt till layer was encountered in Borehole 1 at a depth of about 9.9 m below existing grade and extended to the termination depth of borehole at about 10.7 m below existing grade.

Silt Till

A deposit of silt till was encountered below the sandy silt till in Boreholes 1 to 4 and 7 to 13, extending to depths of about 6.1 to 9.9 m below existing grade in Boreholes 1 and 8 and to the termination depth of boreholes at about 11.1 m below existing grade in Boreholes 2 to 4, 7 and 10 to 13. Silt till was also found beneath the silt layer in Boreholes 5, 6, and 8 and beneath the clayey silt till in Borehole 101 to the termination depths of boreholes at about 5.2 to 11.1 m below existing grade. The silt till contained trace clay, sand and gravel. Occasional cobbles were noted within the silt till deposit. The silt till was found to be in a compact to very dense, but typically dense to very dense, state of compactness. Moisture contents varied from 5 to 13 %, indicating moist to very moist conditions.

Silt

A deposit of silt was encountered below the sandy silt till in Boreholes 5 and 6, and beneath the silt till in Borehole 8, extending to depths of about 7.1 m to 9.1 m below existing grade. The silt contained trace to some clay. The silt was found to be in a compact to very dense state of compactness. Moisture contents varied from 9 to 12 %, indicating moist to very moist conditions.

Sand and Gravel

A deposit of sand and gravel was encountered below the sandy silt till in Borehole 15, extending to the termination depth of borehole at about 11.0 m below existing grade. The sand and gravel layer was found to be in a very dense state of compactness. Moisture contents varied from 7 to 10 %, indicating a wet condition.

Clayey Silt Till

A deposit of clayey silt till was encountered below the fill in Boreholes 101, 102, and 103, extending to depths of about 3.0 to 4.3 m below existing grade. The clayey silt till contained trace to some sand and trace gravel. The clayey silt till was found to be in a stiff to very stiff state of consistency. Moisture contents varied from 9 to 14 %, indicating moist to very moist conditions.

Clayey Silt

A deposit of clayey silt was encountered below the clayey silt till in Boreholes 102 and 103, extending to the termination depth of about 5.2 m below existing grade. The clayey silt contained trace sand. The clayey silt was found to be in a very soft to very stiff state of consistency. Moisture contents varied from 7 to 23%, indicating moist to wet conditions.

5.2 Groundwater

Groundwater conditions were assessed in the open boreholes during the course of the fieldwork and in eight (8) groundwater monitoring wells installed in Boreholes 1, 3, 9, 13, 15, 101, 102, and 103 for subsequent readings. Short-term groundwater measurements are recorded in the attached borehole logs.

Upon completion of drilling, free groundwater was observed in Boreholes 1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 14, 15, 101, 102, and 103 at about 0.9 to 10.4 m below existing grade. Boreholes 3, 5, and 13 remained dry on completion of drilling.

After a period of approximately 14 to 15 days, the groundwater levels in the monitoring wells installed in Boreholes 1, 3, 9, 13, 15, 101, 102, and 103 were measured at depths of about 0.93 to 3.84 m below existing grade.

The observed groundwater levels are listed in Table 1. The groundwater elevations reflect the conditions at the time of the investigation. Seasonal fluctuations of the groundwater level at the site should be anticipated.

Table 1: Groundwater Levels at Borehole Locations

Borehole No.	Ground Water Level below Existing Grade/Elevation upon Completion (m)	Ground Water Level below Existing Grade/Elevation in Groundwater Monitoring Well on September 11, 2018 (m)	Ground Water Level below Existing Grade/Elevation in Groundwater Monitoring Well on September 12, 2018 (m)	Ground Water Level below Existing Grade/Elevation in Groundwater Monitoring Well on September 20, 2018 (m)
BH/MW-1	3.81 (147.1)	3.81 (147.1)	3.80 (147.1)	3.84 (147.0)
BH-2	10.36 (141.5)	-	-	-
BH/MW-3	Dry	2.93 (148.4)	2.54 (148.8)	2.92 (148.4)
BH-4	4.57 (147.0)	-	-	-
BH-5	Dry	-	-	-
BH-6	8.38 (143.6)	-	-	-
BH-7	4.57 (145.9)	-	-	-
BH-8	2.27 (149.5)	-	-	-
BH/MW-9	3.62 (148.9)	3.16 (149.4)	2.73 (149.8)	2.87 (149.7)
BH-10	4.82 (146.3)	-	-	-
BH-11	4.57 (147.7)	-	-	-
BH-12	3.36 (149.4)	-	-	-
BH/MW-13	Dry	2.39 (148.4)	2.40 (148.4)	2.54 (148.3)
BH-14	5.36 (146.9)	-	-	-
BH/MW-15	2.68 (150.4)	2.37 (150.7)	2.39 (150.7)	2.52 (150.5)
BH/MW-101	1.29 (148.3)	1.08 (148.5)	1.03 (148.5)	1.38 (148.2)
BH/MW-102	0.90 (148.9)	0.33 (149.4)	0.48 (149.3)	0.93 (148.8)
BH/MW-103	1.56 (149.5)	1.80 (149.3)	1.90 (149.2)	1.91 (149.2)

6. Soil Permeability

6.1 Grain Size Analyses

Six (6) grain size analyses were conducted on selected soil samples recovered from the boreholes using sieve and hydrometer method. The grain size distribution curves are included in Appendix A. The following Table 2 presents the estimated soil permeability based on the respective grain size analyses results in accordance with Tables 2 and 3 provided in the Ministry of Municipal Affairs and Housing Supplementary Standard SB-6.

Table 2: Estimated Soil Permeability

Location	Depth (Elevation)	Soil Type	Estimated Coefficient of Permeability (cm/sec)	Estimated Percolation Time, T (mins/cm)
BH-5 SS9	9.1 – 9.6 m	Silt Till	10^{-5} – 10^{-6}	20-50
BH-5 SS10	10.7 – 11.1 m	Silt Till	10^{-5} – 10^{-6}	20-50
BH-12 SS8	7.6 – 8.1 m	Silt Till	10^{-5} – 10^{-6}	20-50
BH-12 SS9	9.1 – 9.6 m	Silt Till	10^{-5} – 10^{-6}	20-50
BH-14 SS5	3.0 – 3.5 m	Sandy Silt Till	10^{-5} – 10^{-6}	20-50
BH-14 SS6	4.6 – 5.0 m	Sandy Silt Till	10^{-5} – 10^{-6}	20-50

6.2 In-Situ Percolation Test

An in-situ infiltration test was carried out at Boreholes BH/MW-3 and BH/MW-13. A 50 mm diameter PVC well pipe was installed in each borehole. The monitoring well pipes were perforated from 1.5 to 3.0 m depth. The perforated section was packed with #3 filter sand and the top portion of the wells was backfilled with bentonite. The diameter of the borehole is 0.15 m.

The monitoring well pipe and sand pack area as well as the surrounding soils were filled/saturated with water. Infiltration testing data were collected and calculated using Hvorslev's formula:

$$k = \frac{r^2 \cdot \ln (L/R)}{2 \cdot L \cdot T} \qquad \text{for } L/R > 8$$

where k = hydraulic conductivity, cm/sec.

R = radius of the borehole

r = radius of wall of open borehole

L = length of water column, cm

T = time it takes for water level to fall to 37% of initial level

Based on the above, the results of the permeability testing of the soils are presented in the following Table 3 below. The estimated infiltration rates presented in Table 3 were determined from Table C1: Approximate relationship between hydraulic conductivity, percolation time and infiltration rate provided in Appendix C of the "Low Impact Development Stormwater Management Planning and Design Guide" developed by the Credit Valley Conservation Authority and the Toronto and Region Conservation Authority.

Table 3: In-situ Infiltration Test Results

Borehole	Hydraulic Conductivity, k (cm/s)	Infiltration Rate (mm/hour)
BH/MW-3	6.23×10^{-6}	22
BH/MW-13	7.31×10^{-5}	42

7. Engineering Discussion and Recommendations

7.1 General

It is proposed that Dutchmaster Nurseries Ltd. will harvest and remove all trees from the site, prior to the construction of a new EMS facility consisting of a low-rise structure with or without a basement. However, the size, location and configuration of the building have not yet been finalized at the time of the investigation.

The following subsections provide preliminary geotechnical engineering guidelines pertinent to the design and construction of the proposed development. When more detailed conceptual design information is available, a more detailed investigation, including additional boreholes, should be carried out to provide geotechnical parameters for final design and construction of the proposed development.

7.2 Site Grading

Final site grades had not been established at the time of this investigation. However, it is anticipated that some regrading (cut and fill operations) will be carried out at the site.

The following procedures are recommended for the construction of standard fill for roads and building areas at the site, where required:

1. All vegetation, topsoil, topsoil-stained and weak native soils should be removed. Within the building area, the existing fill should also be removed.

2. The exposed subgrade surface should be proofrolled with a heavy roller and inspected by geotechnical personnel. Any soft or loose spots encountered during the process should be subexcavated and replaced with approved on-site or imported materials, compacted to 100 % standard Proctor maximum dry density.

3. The area can then be brought up to the final subgrade level with approved on-site or imported material. The material should be placed in lifts not exceeding 300 mm and compacted to at least 98% standard Proctor maximum dry density in the pavement areas. Compaction to 100% standard Proctor maximum dry density is recommended within the proposed building areas.

4. Engineered fill slopes should not be steeper than two horizontal to one vertical and should be protected from surface erosion with sodding.

5. All fill and compaction operations must be supervised on a full-time basis by geotechnical personnel to approve material and ensure the specified degree of compaction has been obtained.

7.3 Building Construction

7.3.1 Foundation

Based on the results of the limited boreholes drilled at the site, it is considered the site will be suitable for the construction of the proposed structure. It is understood the proposed building will be a low-rise structure with or without a basement. Since regrading will be carried out at the site, two foundation schemes are being presented for consideration; namely footings on native soils and footings on engineered fill.

Footings on Native Soils

The proposed structure may be supported on conventional spread and strip footings founded on the native dense to very dense sandy silt till below the topsoil and loose soils. For preliminary design purposes, the recommended factored geotechnical resistances at Ultimate Limit State (U.L.S.) and the geotechnical reaction at Serviceability Limit State (S.L.S.) with the highest founding elevations at each borehole location are provided in Table 4 below.

Table 4: Recommended Allowable Geotechnical Resistances at U.L.S. and S.L.S. and the Highest Founding Elevations at Each Borehole Location

BH No.	Borehole Surface Elevation (m)	Recommended Highest Founding Depth/Elevation (m)	Factored Geotechnical Resistance at ULS (kPa)	Geotechnical Resistance at SLS (kPa)
BH/MW-1	150.88	1.8 / 149.1	300	200
BH-2	151.90	1.8 / 150.1	300	200
BH/MW-3	151.33	1.8 / 149.5	300	200
BH-4	151.54	1.8 / 149.7	300	200
BH-5	152.38	2.2 / 150.2	300	200
BH-6	151.94	1.8 / 150.1	300	200
BH-7	150.49	1.8 / 148.7	300	200
BH-8	151.74	3.0 / 148.7	300	200
BH/MW-9	152.56	2.0 / 150.6	300	200
BH-10	151.07	2.2 / 148.9	300	200
BH-11	152.26	1.2 / 151.1	300	200
BH-12	152.73	1.2 / 151.5	300	200
BH/MW-13	150.80	1.8 / 150.2	300	200

BH No.	Borehole Surface Elevation (m)	Recommended Highest Founding Depth/Elevation (m)	Factored Geotechnical Resistance at ULS (kPa)	Geotechnical Resistance at SLS (kPa)
BH-14	152.21	2.0 / 151.2	300	200
BH/MW-15	153.05	1.8 / 147.8	300	200
BH/MW-101	149.57	1.8 / 148.2	300	200
*BH/MW-102	149.76	1.5 / 148.3	75	50
BH/MW-103	151.09	3.5 / 147.6	300	200

Note *: It is recommended the building be excavated away from this area.

Footings on Engineered Fill

In areas where filling is present, the proposed structure may be supported on footings founded on engineered fill placed over the competent native compact to very dense sandy silt till and designed for a geotechnical resistance of 150 kPa (S.L.S.) and 225 kPa (U.L.S.). The engineered fill should be constructed, following the guidelines set out in the 'Site Grading' section, with approved on-site or imported material compacted to 100% standard Proctor maximum dry density, under full-time monitoring by EXP. The engineered fill should be constructed to design floor subgrade level prior to installation of footings. This will ensure the engineered fill placed will be suitable for foundations and slab-on-grade construction.

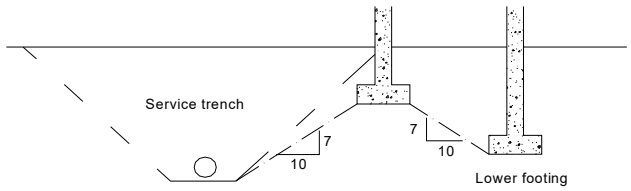
The engineered fill should extent at least 3 m beyond the outside edge of exterior footings. The required extent of the engineered fill should be determined based on a known fixed location for the structures and adherence of the conditions outlined above. In general, after the engineered fill has been placed, the location of the structure cannot be changed. Accordingly, accurate survey control is essential to the success of engineered fill construction. In this regard, the boundaries of the 'engineered fill' must be laid out by a surveyor in consultation with engineering staff.

The engineered fill should not be constructed during the winter months when freezing ambient temperatures occur either persistently or intermittently. This is to ensure the fill material is free of frozen soil and snow.

It is recommended reinforcing steel be installed in the footings and foundation walls to minimize cracking from differential settlement due to the variable thickness of engineered fill or if footings are partially on native soil and partially on engineered fill. The reinforcing steel should be designed by a structural engineer.

7.3.1.1 Foundation General

Footings which are to be placed at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footings, as indicated on the following sketch:



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

Footings constructed adjacent to underground services should be founded below a line drawn up at 10 horizontal to 7 vertical from the near edge of the trench invert. All footings exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m of soil cover or equivalent thermal insulation, depending on the final design requirements.

The total and differential settlements of footings designed to the above recommended geotechnical resistances are expected to be less than 25 mm and 20 mm, respectively.

It should be noted that the recommended bearing capacities have been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated that modifications to bearing levels may be required if unforeseen subsoil conditions are revealed after the excavation is exposed to full view or if final design decisions differ from those assumed in this report. For this reason, this office should be retained to review final foundation drawings and to examine footing conditions.

7.3.2 Excavation and Groundwater Control

If the proposed development should have one (1) level of basement, the excavation will extend up to about 4 m below existing grade. Based on the results of the investigation, the excavation will generally be carried out within the native sandy silt till.

Excavation within the overburden materials should be relatively straightforward and must conform to the current Occupational Health and Safety Act (OHSA) and local regulations. Based on the subsurface conditions, it will be feasible to cut back the excavation slopes at 1 vertical to 1 horizontal. Locally, within the variable surficial deposits where loose/soft materials are encountered, or within zones of persistent seepage at depth, it may be necessary to flatten the side slopes.

Groundwater seepage into the excavation should be anticipated during construction. The quantity of water from the fill and wet sand seams and layers in the sandy silt till deposit will vary depending upon the extent and thickness of individual wet seams and layers. It should be recognized that groundwater levels are also influenced by the effects of precipitation as well as seamed fluctuations. It is our opinion that the seepage produced by these services or surface runoff can be handled using conventional construction dewatering techniques, i.e. pumping from sumps with oversize excavation.

7.3.3 Backfill Considerations

It is considered that the portion of the fill material and native sandy silt till which are not contaminated with topsoil and other obviously unsuitable material, is generally suitable for reuse as backfill, provided the moisture content is within 2 percent of its optimum values. Based on the results of the moisture contents from the recovered soil samples, some moisture content adjustment may be required for proper compaction.

Any organic or otherwise deleterious material should not be used for backfill purposes. Any shortfall of suitable on-site excavated material can be made up with imported clean approved fill or granular material, OPSS select subgrade material or Granular 'B' Type I.

In general, the native sandy silt till is not free draining and therefore should not be used where this characteristic is required, or in confined areas. Imported granular material conforming to OPSS Granular 'B' Type I would also be suitable for these purposes.

All backfilling and compaction operations must be closely examined by geotechnical personnel to ensure uniform compaction to specification requirements. All backfilling should be placed in maximum 300 mm horizontal lifts and uniformly compacted to 98 % standard Proctor maximum dry density. Smaller lifts may be required depending on the size of compaction equipment used by the contractor and the moisture content of fill at the time of construction.

7.3.4 Floor Slab Construction and Permanent Drainage

Slab-on-grade construction is feasible at the site and may be carried out in accordance with the following recommendations.

Prior to slab-on-grade construction, all vegetation, topsoil, fill and unsuitable material should be removed from the underfloor area. Following rough grading, the exposed subgrade surface should be proofrolled with a heavy roller and inspected by a geotechnical technician. Any soft areas identified during the proofrolling operation should be subexcavated and replaced with approved material compacted to 100% SPMDD.

A moisture barrier consisting of 200 mm of 19 mm clear crushed stone placed directly under the floor slab should be adequate. Within unheated areas, Styrofoam insulation of minimum 50 mm thick should be provided below the floor slab and below any concrete slabs surrounding the building to protect against frost heave.

Around the perimeter of the building, the ground surface should be sloped on a positive grade away from the structure to promote surface water run-off and to reduce groundwater infiltration adjacent to the foundations.

If the proposed building has one (1) level of basement, installation of perimeter drainage is required to remove any water that may be accumulated at the exterior foundation walls. To prevent occasional build-up of water adjacent to the basement walls, it would be prudent to incorporate an exterior vertical drainage sheet attached to the backside of the basement wall connected to frost free outlets inside the building. The exterior drainage should consist of SITEDRAIN HQ 240 or equivalent covering the entire basement wall in order to reduce the risk of water penetration. The wall drain panels should be outletted through the basement wall into the basement.

An under-floor drain system is also recommended below the basement floor slab. The underfloor drains should consist of 100 mm diameter perforated drain pipes installed at the base of the drainage stone, at no greater than 3 m intervals. The pipes must be wrapped in a non-woven geotextile having a filtering opening size (FOS) of 60 microns. These drain pipes should be connected to the interior sumps. Adequate clean-out ports should be installed for each line of drainage pipes to facilitate future cleaning of the pipes.

The perimeter drainage systems should be independent of any stormwater piping, such as rainwater leaders. Backflow prevention should be provided between the sumps and the drain headers.

7.3.5 Earthquake Considerations

It is assumed that the building will be designed to the requirements of the OBC 2012. This requires that the site be classified according to Table 4.1.8.4.A of the same code.

For the proposed structure, compact to very dense sandy silt till is present in this area. As such, a Site Class ‘C’ is considered appropriate for design.

7.3.6 Earth Pressure on Subsurface Walls

The lateral earth pressure acting on subsurface walls may be calculated from the following equation:

$$p = k(\gamma h + q)$$

where:

- p = the pressure in kPa acting against any subsurface wall at depth, h, below the ground surface;
- k = the earth pressure coefficient considered to be appropriate for the subsurface walls, for this case, 0.4;
- γ = the bulk unit weight of the retained free draining granular backfill; use 21 KN/m^3
- h = the depth in m below the ground surface at which the pressure, p, is to be computed; and
- q = the value of any adjacent surcharge in kPa which may be acting close to the wall.

The above expression assumes an effective perimeter tile drain system will be incorporated to prevent the build-up of hydrostatic pressure behind the subsurface wall. All subsurface walls should be backfilled with free draining granular material. To minimize infiltration of surface water, the upper 600 mm of backfill should comprise compacted relatively impervious material sloped away from the building.

7.3.7 Subsurface Concrete

One (1) soil sample from Borehole 8 was analyzed for pH and sulphate. The test results are included in Appendix B.

The test results of the soil sample collected from Borehole 8 indicated that the pH values were 7.71 with a soluble sulphate content less than 20 ppm as SO_4, respectively.

The soluble sulphate concentration indicates "negligible" degrees of sulphate attack on subsurface concrete structures. For information regarding selection of cement type for subsurface concrete structures, reference is made to C.S.A. Standard CAN3-A23.

7.4 Pavement Construction

The recommended pavement structures provided in Table 5 are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. Other thickness combinations can be used provided the Granular Base Equivalency (GBE) is maintained and any minimum component thickness specified by the Town of Clarington.

Table 5: Recommended Pavement Structure Thickness

Pavement Layer	Compaction Requirements	Light Duty Asphalt (Car Parking)	Heavy Duty Asphalt (Access Road / Fire Route)
Asphaltic Concrete	Minimum 92 % Relative Density	40 mm HL3 50 mm HL8	40 mm HL3 80 mm HL8
19 mm Crusher-Run Limestone or Sand and Gravel Material meeting OPSS Granular 'A' Base requirements	100% SPMDD*	150 mm	150 mm
50 mm Crusher-Run Limestone or Sand and Gravel Material meeting OPSS Granular 'B' Type 1 Base requirements	100% SPMDD *	200 mm	450 mm

* Denotes standard Proctor maximum dry density, ASTM-D698

The subgrade must be compacted to 98 % SPMDD for at least the upper 300 mm.

The foregoing design assumes that construction is carried out during dry periods and that the subgrade

is stable under the load of construction equipment. If construction is carried out during wet weather, and heaving or rolling of the subgrade is experienced, additional thickness of sub-base course material may be required.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped to provide effective surface drainage toward catchbasins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. In view of the silty native of the subgrade soils, it is recommended subdrains be installed on both sides of the access road at least 300 mm below the granular subbase. In addition, to minimize problems of differential movement between the pavement and catchbasins/sewer maintance holes due to frost action, backfill around these structures should consist of free-draining granular material. The granular material should be compacted for 98% SPMDD with a small tamper to avoid damaging the structures. Catchbasins should be perforated just above the drain and the hole screened with filter cloth.

8. General Comments

EXP Services Inc. should be retained for a general review of the final design and specifications to verify this report has been properly interpreted and implemented. If not accorded the privilege of making this review, EXP Services Inc. will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations as well as their own interpretations of the factual borehole results so that they may draw their own conclusions as to how the subsurface conditions may affect them.

More specific information with respect to the conditions between samples or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent; should this occur, EXP Services Inc. should be contacted to assess the situation and additional testing and reporting may be required. EXP Services Inc. has qualified personnel to provide assistance in regard to future geotechnical issues related to this property.

Yours truly,

EXP Services Inc.

LICENSED PROFESSIONAL ENGINEER
P. T.-L. CHAN
7408750
14/26/2018
PROVINCE OF ONTARIO

Peter Cosentino, B. Sc. (Eng.)
Geotechnical Division

Peter Chan, P. Eng.
Senior Manager, Geotechnical Division

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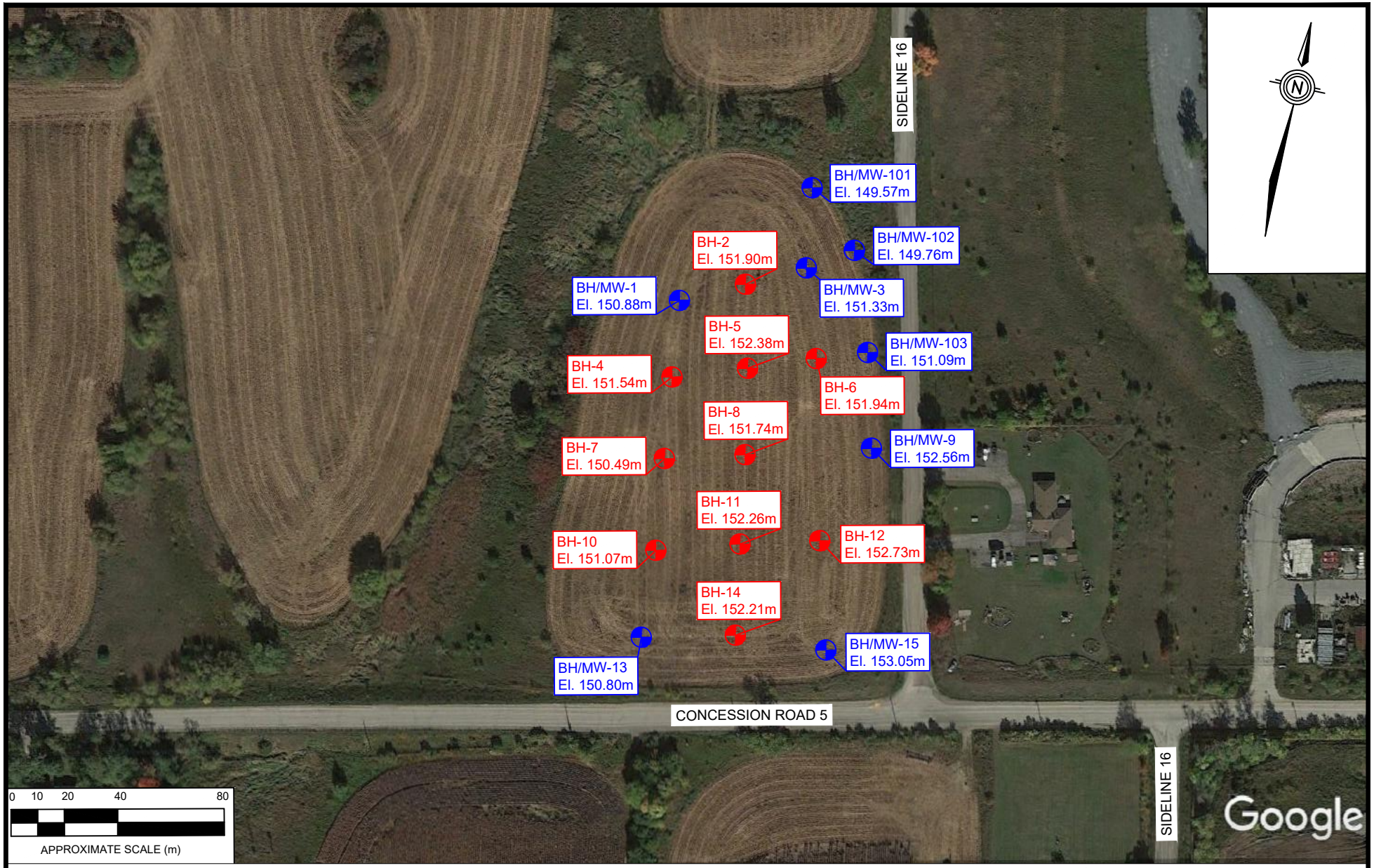
Drawings

Borehole Location Plan

Borehole Logs



NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 3 MONTHS AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. THIS DRAWING WAS REPRODUCED FROM A 2016 AERIAL PHOTOGRAPH TAKEN FROM GOOGLE EARTH.

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE/MONITORING WELL LOCATION

exp Services Inc.
t: +1.905.695.3217 | f: +1.905.695.0169
220 COMMERCE VALLEY DR., SUITE 500
MARKHAM, ON L3T 0A8
Canada
www.exp.com

PROJECT TITLE AND LOCATION:
GEOTECHNICAL INVESTIGATION
PROPOSED PICKERING EMERGENCY MEDICAL SERVICES (EMS) FACILITY
NW CORNER OF CONCESSION ROAD 5/SIDELINE 16
PICKERING, ONTARIO

DRAWING TITLE:
BOREHOLE LOCATION PLAN

PROJECT#: BRM-00604892-A0	DWN.: PJC
SCALE: AS SHOWN	CHKD.: PC
DATE: OCTOBER 2018	DWG. No.: 1

Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by exp also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

EQUIVALENT GRAIN DIAMETER IN MILLIMETERS

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Log of Borehole BH/MW-1

Project No. BRM-00604892-A0 | Drawing No. 2

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 5, 2018

Drill Type: CME 750 Track Mount

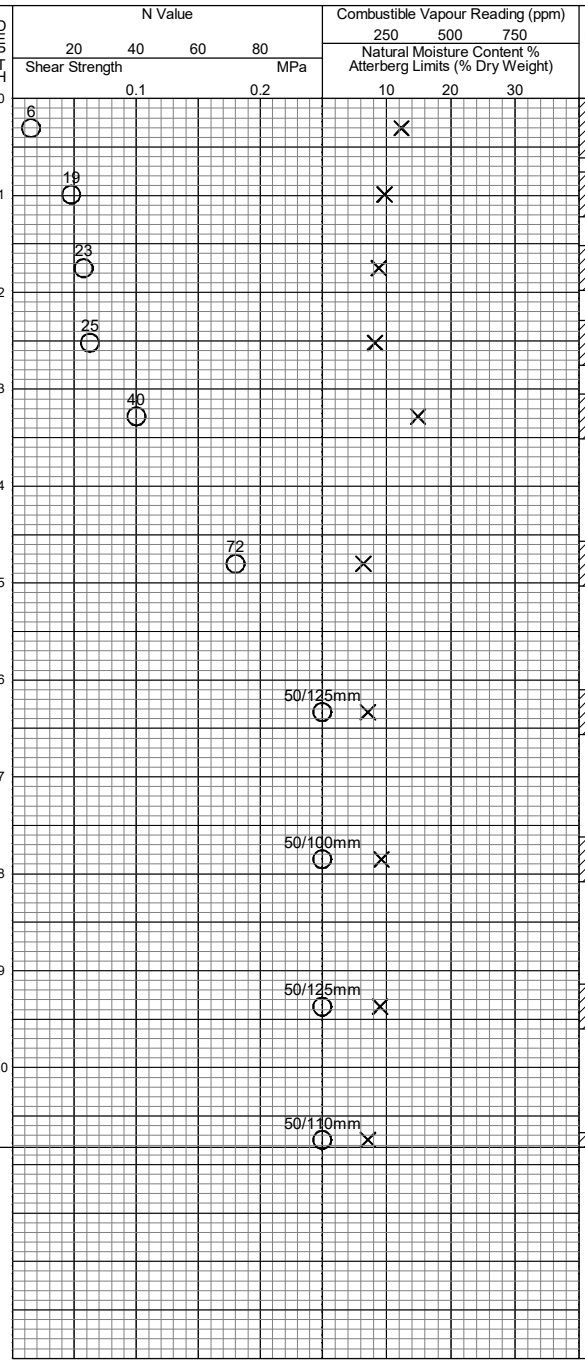
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m
	150.88
TOPSOIL - about 150mm thick	150.7
FILL - sandy silt, trace clay, trace gravel; brown, moist	149.4
SANDY SILT TILL - trace clay, trace gravel and cobbles; brown, moist, compact	
- wet sand layer, becoming dense	147.04
- becoming very dense	
- some cobbles and boulders	144.0
SILT TILL - trace clay, trace sand, trace gravel; grey, moist, very dense	141.0
SANDY SILT TILL - grey, wet, very dense	140.1
END OF BOREHOLE	

NOTES
1. Goundwater monitoring well installed to 4.57 m depth.



SAMPLES

Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	3.79	Well
September 6, 2018	3.81	
September 11, 2018	3.81	
September 12, 2018	3.80	
September 20, 2018	3.84	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-2

Project No. BRM-00604892-A0

Drawing No. 3

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: August 31, 2018

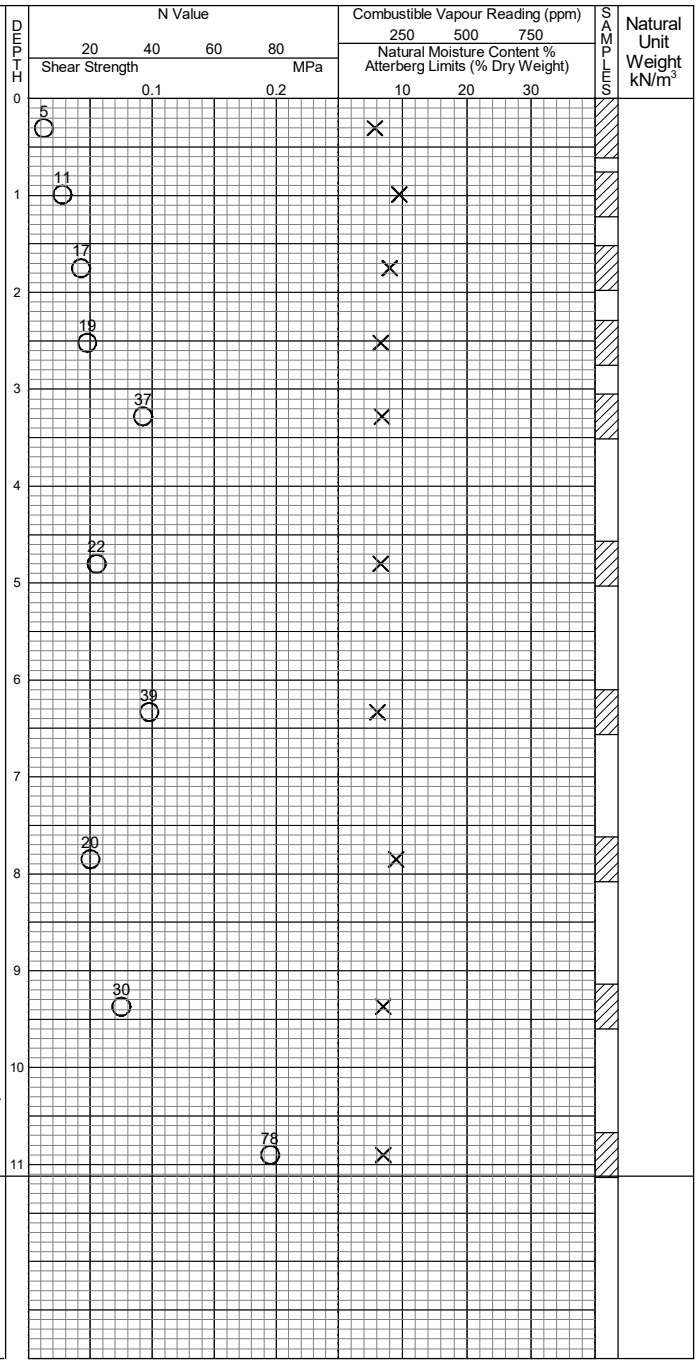
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
		FILL - sandy silt to clayey silt, trace gravel, topsoil inclusions; brown, moist	151.90
		SANDY SILT TILL - trace clay, trace gravel; brown, moist, compact to dense	150.4
		- some cobbles and boulders	
		- wet sand layer	146.6
		SILT TILL - trace clay, trace gravel; grey, moist, compact to dense	
▼			141.54
		- becoming very dense	140.8
		END OF BOREHOLE	



LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Time	Water Level (m)	Depth to Cave (m)
On completion	10.36	Open

Log of Borehole BH/MW-3

Project No. BRM-00604892-A0 | Drawing No. 4

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 4, 2018

Drill Type: CME 750 Track Mount

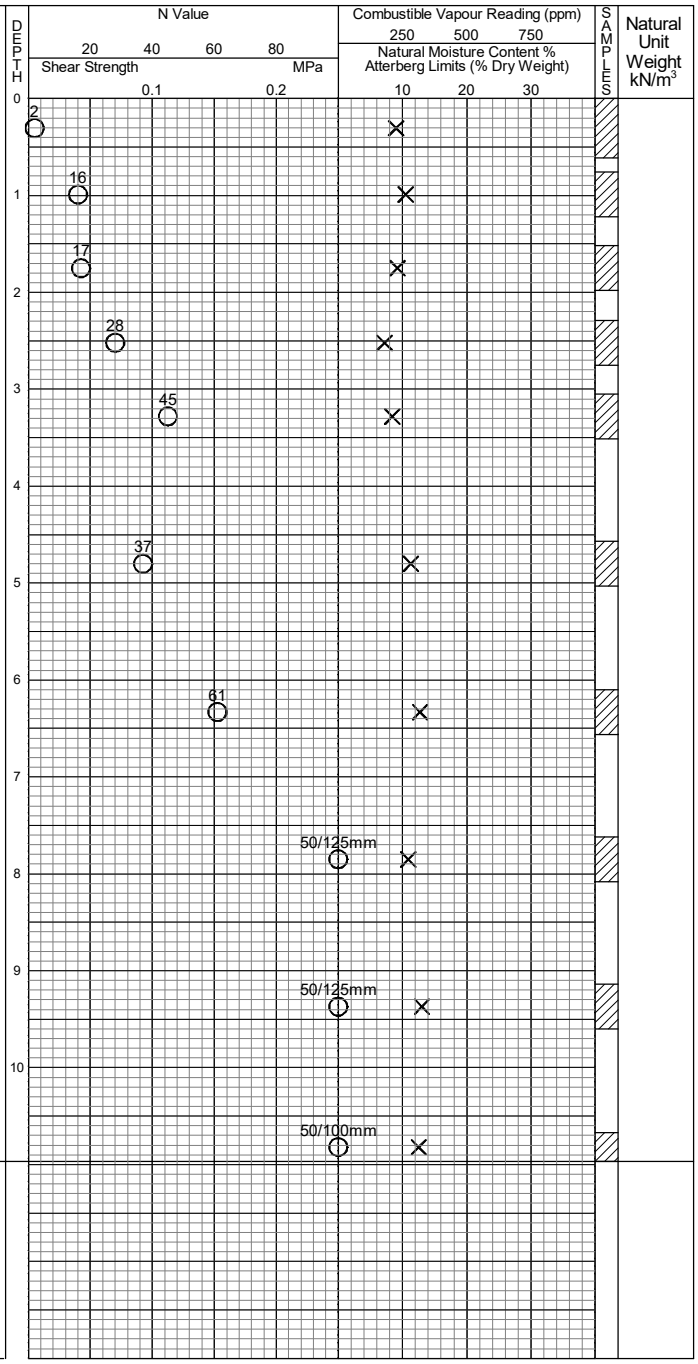
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
		FILL - silty sand to clayey silt, topsoil inclusions; brown, moist	151.33
		SANDY SILT TILL - trace to some clay, trace gravel; brown, moist, compact to dense	149.8
		- numerous wet sand seams	148.41
		- becoming very moist	
		SILT TILL - some sand, trace to some clay, trace gravel; grey, moist to very moist, very dense	144.5
		END OF BOREHOLE	140.4

NOTES
1. Goundwater monitoring well installed to 3.05 m depth.



Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	Well
September 6, 2018	2.99	
September 11, 2018	2.93	
September 12, 2018	2.54	
September 20, 2018	2.92	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-4

Project No. BRM-00604892-A0 | Drawing No. 5

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: August 31, 2018

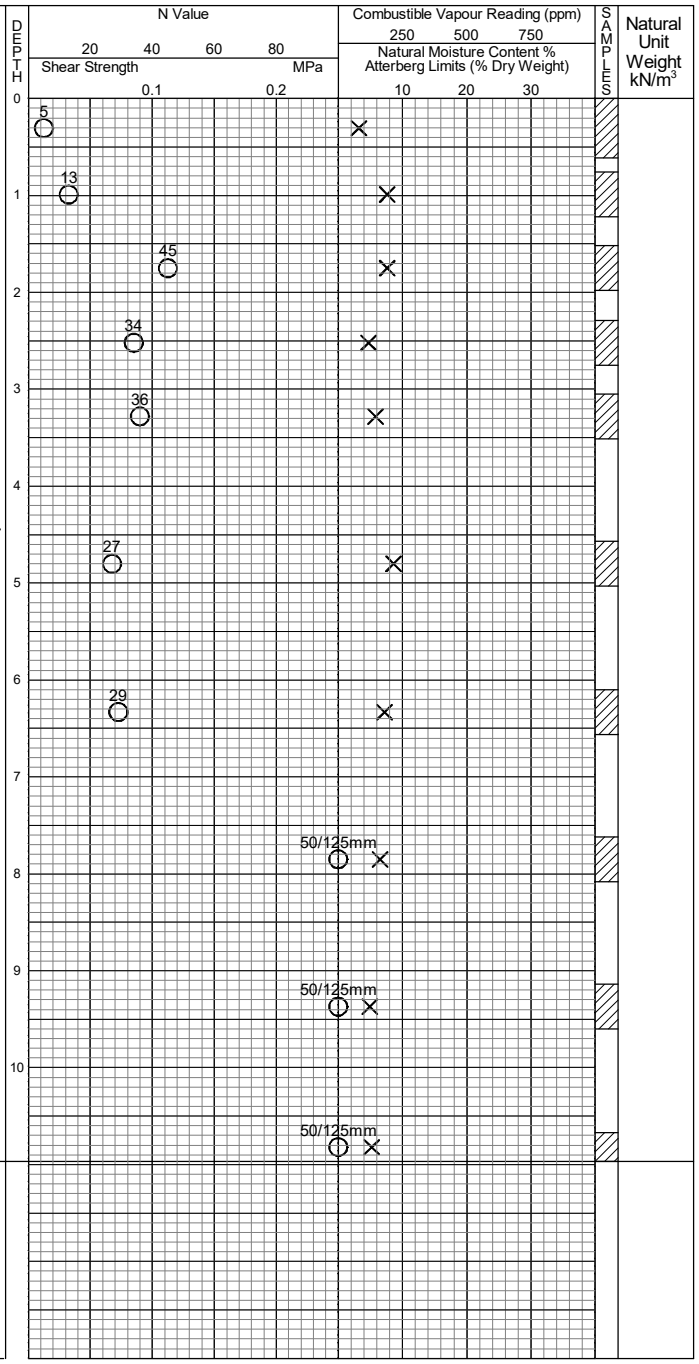
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			151.54
		TOPSOIL - about 150mm thick	151.4
		FILL - silty sand to clayey silt, trace gravel; brown, moist	150.0
		SANDY SILT TILL - trace clay, trace gravel; brown, moist, dense	
▼		- wet sand layer, becoming compact	146.97
			146.2
		SILT TILL - trace clay, trace sand, trace gravel; grey, moist, compact	
		- becoming very dense	
			140.6
		END OF BOREHOLE	



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	4.57	5.18

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-5

Project No. BRM-00604892-A0 | Drawing No. 6

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: August 31, 2018

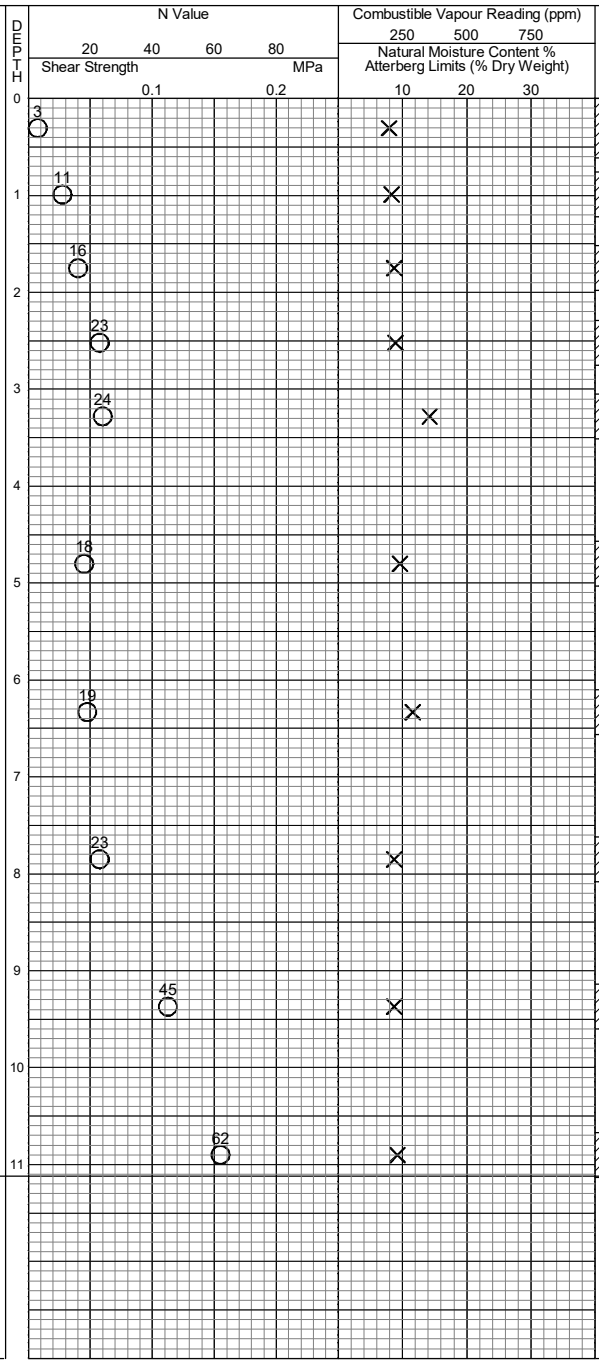
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			152.38
		TOPSOIL - about 180mm thick	152.2
		FILL - sandy silt, some clay, trace gravel, topsoil inclusions; dark brown to brown, moist	150.4
		SANDY SILT TILL - some clay, trace gravel; brown, moist to very moist, compact	
		- wet sand layer	
		- becoming grey	147.1
		SILT - some clay, trace gravel; grey, moist to very moist, compact	143.2
		SILT TILL - some sand, trace to some clay, trace gravel; grey, moist, dense to very dense	141.3
		END OF BOREHOLE	



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	Open

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-6

Project No. BRM-00604892-A0

Drawing No. 7

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 4, 2018

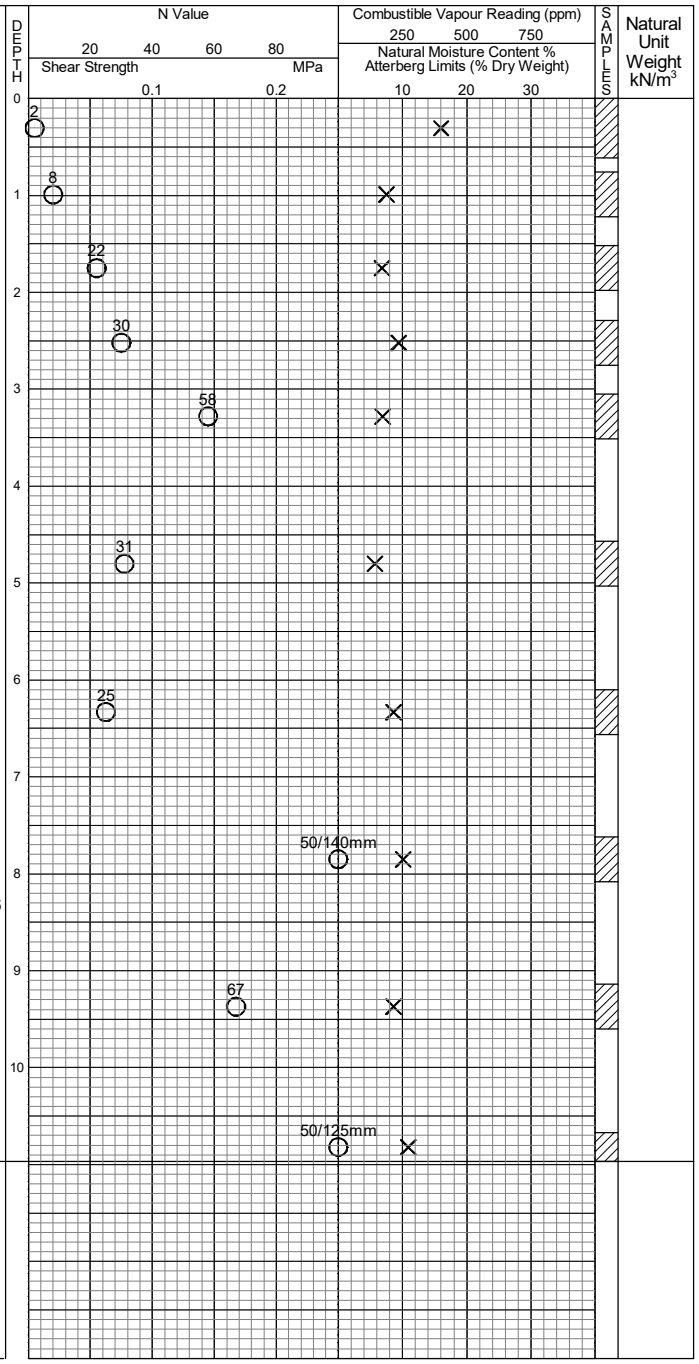
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			151.94
		TOPSOIL - about 150mm thick	151.8
		FILL - sandy silt, some clay, trace gravel; brown, moist	
			150.4
		SANDY SILT TILL - trace clay, trace gravel, occassional sand layers; brown, moist, compact to very dense	
		- becoming very moist to wet	
		- becoming grey	
			145.1
		SILT - trace sand, trace clay; grey, very moist, very dense	
▼			143.6 143.56
		SILT TILL - trace sand, trace clay, trace gravel; grey, very moist, very dense	
			141.0
		END OF BOREHOLE	



Time	Water Level (m)	Depth to Cave (m)
On completion	8.38	10.52

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-7

Project No. BRM-00604892-A0 | Drawing No. 8

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: August 31, 2018

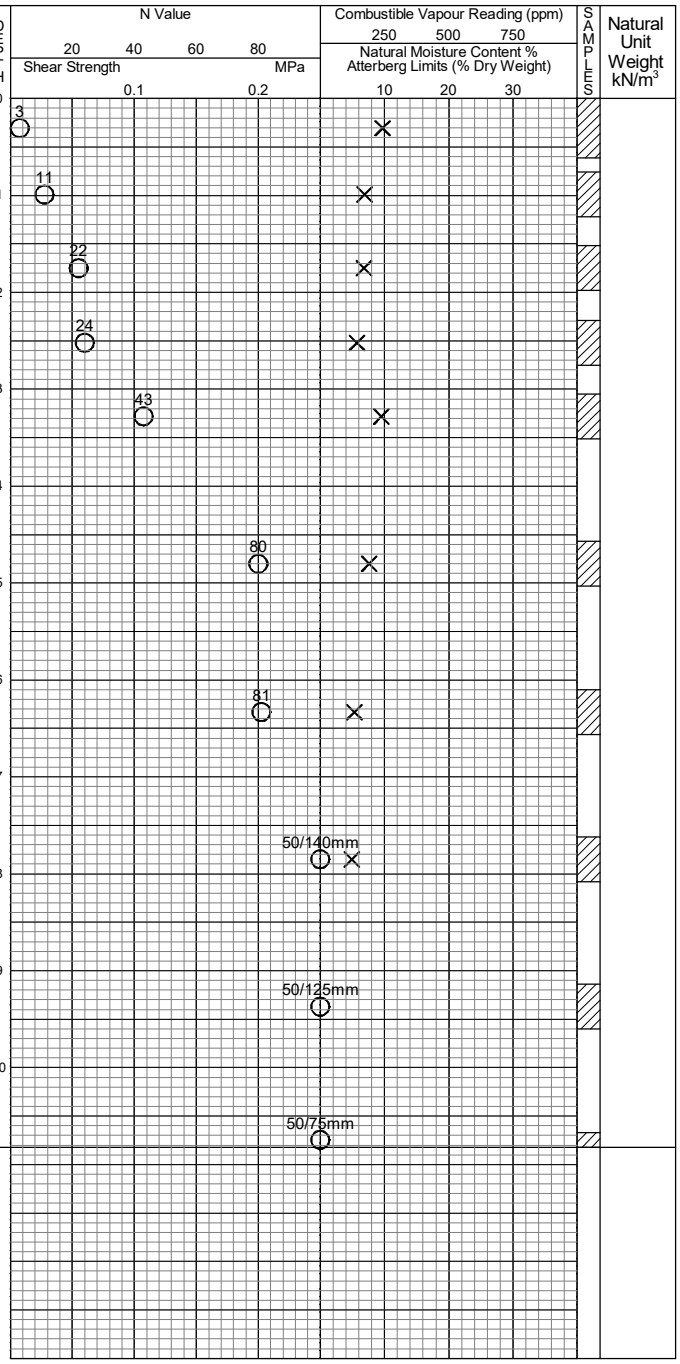
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			150.49
		TOPSOIL - about 200mm thick	150.3
		FILL - sandy silt, trace to some clay, trace gravel; brown, moist	149.0
		SANDY SILT TILL - trace clay, trace gravel, occassional sand layers; brown, moist, compact	
		- becoming wet and dense	
▼		- becoming very dense	145.92
			144.4
		SILT TILL - trace sand, trace gravel; grey, moist, very dense	
			139.7
		END OF BOREHOLE	



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	4.57	Open

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-8

Project No. BRM-00604892-A0 | Drawing No. 9

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: August 30, 2018

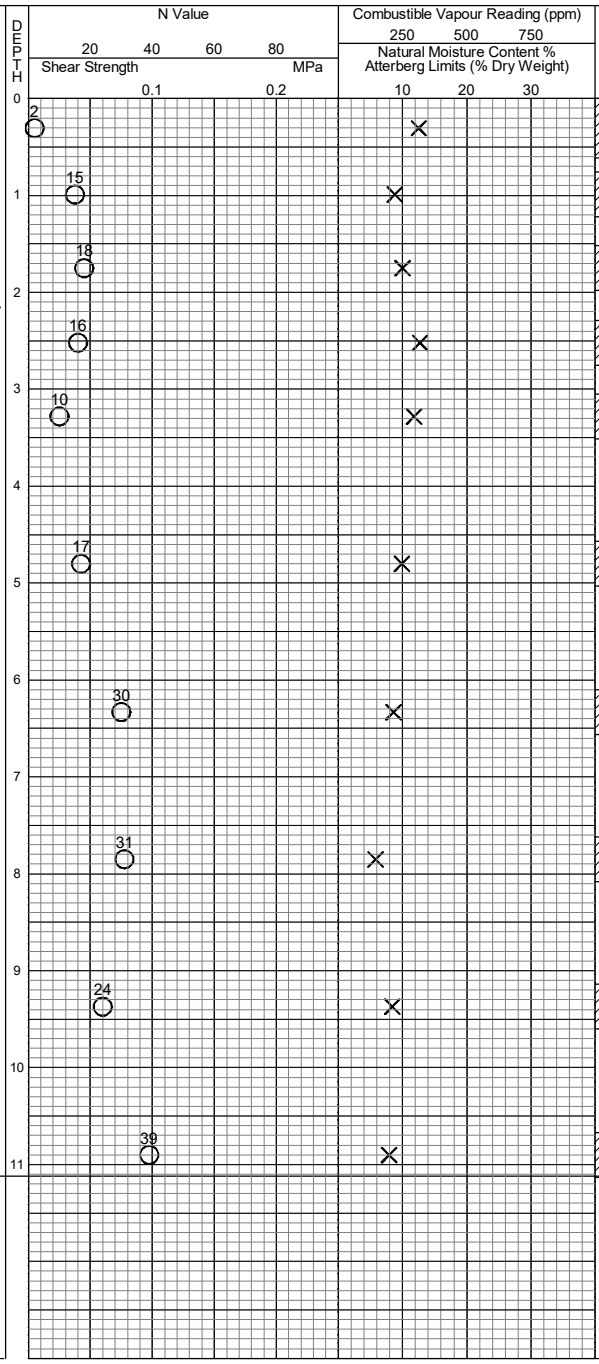
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			151.74
		TOPSOIL - about 220mm thick	151.5
		FILL - sandy silt, trace to some clay; brown, moist	149.47
			149.0
		SANDY SILT TILL - trace clay, trace gravel; brown, very moist to wet, compact	147.2
		SILT TILL - trace sand, trace gravel; grey, very moist, compact	145.6
		SILT - trace sand, trace gravel; grey, very moist, dense	144.1
		SILT TILL - trace clay, trace sand, trace gravel; grey, moist, compact to dense	140.6
		END OF BOREHOLE	



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	2.27	4.72

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH/MW-9

Project No. BRM-00604892-A0 | Drawing No. 10

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 6, 2018

Drill Type: CME 750 Track Mount

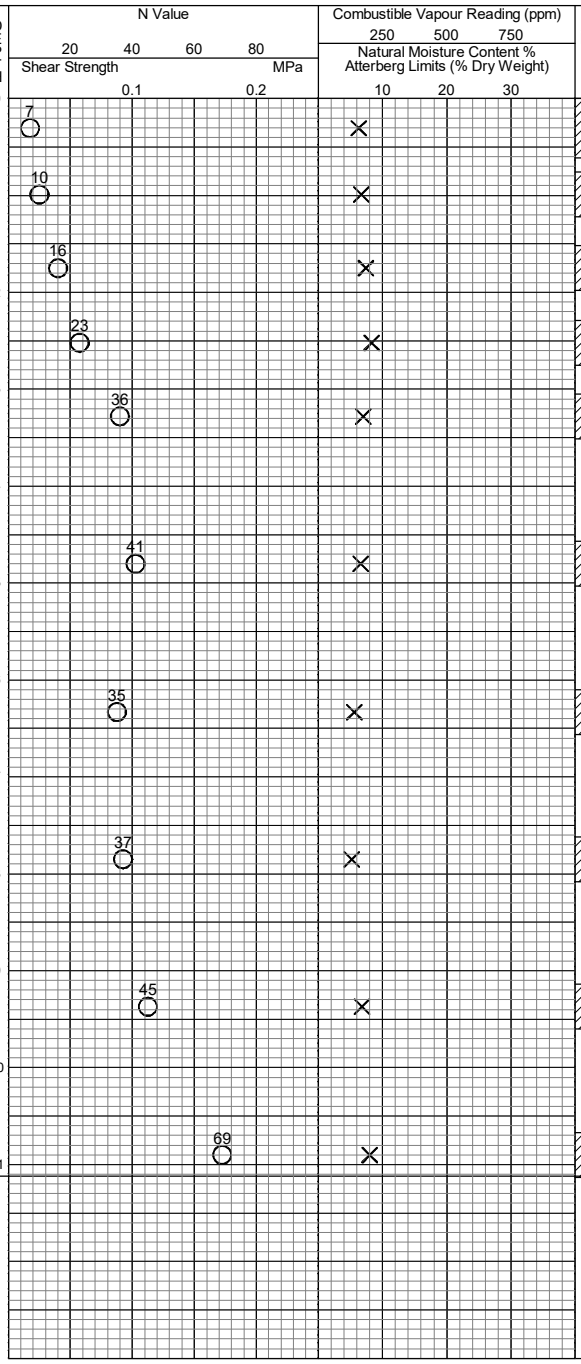
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			152.56
		TOPSOIL - about 300mm thick	152.3
		FILL - clayey silt, trace sand, trace gravel; dark brown to brown, moist	151.0
		SANDY SILT - till-like, trace clay, trace gravel; brown, moist, compact	149.69
		SANDY SILT TILL - trace clay, trace gravel; grey, wet, dense	
		- becoming wet	
		- some clay	144.2
		SILT TILL - grey, very moist, dense to very dense	141.4
		END OF BOREHOLE	

NOTES
1. Goundwater monitoring well installed to 4.57 m depth.



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	3.62	Well
September 11, 2018	3.16	
September 12, 2018	2.73	
September 20, 2018	2.87	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-10

Project No. BRM-00604892-A0 | Drawing No. 11

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 4, 2018

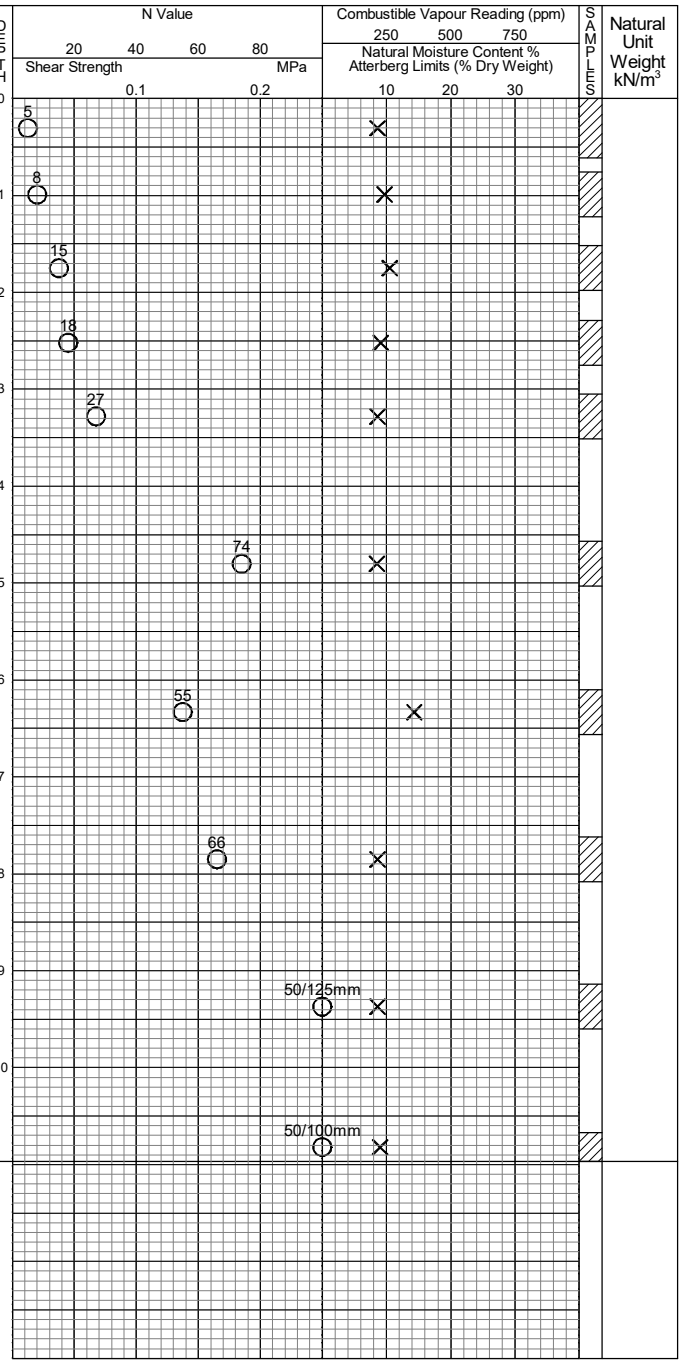
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
		FILL - clayey silt, trace sand, topsoil inclusions, scattered rootlets; brown, moist	151.07
		SANDY SILT TILL - trace clay, trace gravel; brown, moist, compact to very dense	149.1
▼		- numerous wet sand layers	146.25
		SILT TILL - trace clay, trace gravel; grey, moist to very moist, very dense	144.2
		END OF BOREHOLE	140.1



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	4.82	4.91

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-11

Project No. BRM-00604892-A0 | Drawing No. 12

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: August 30, 2018

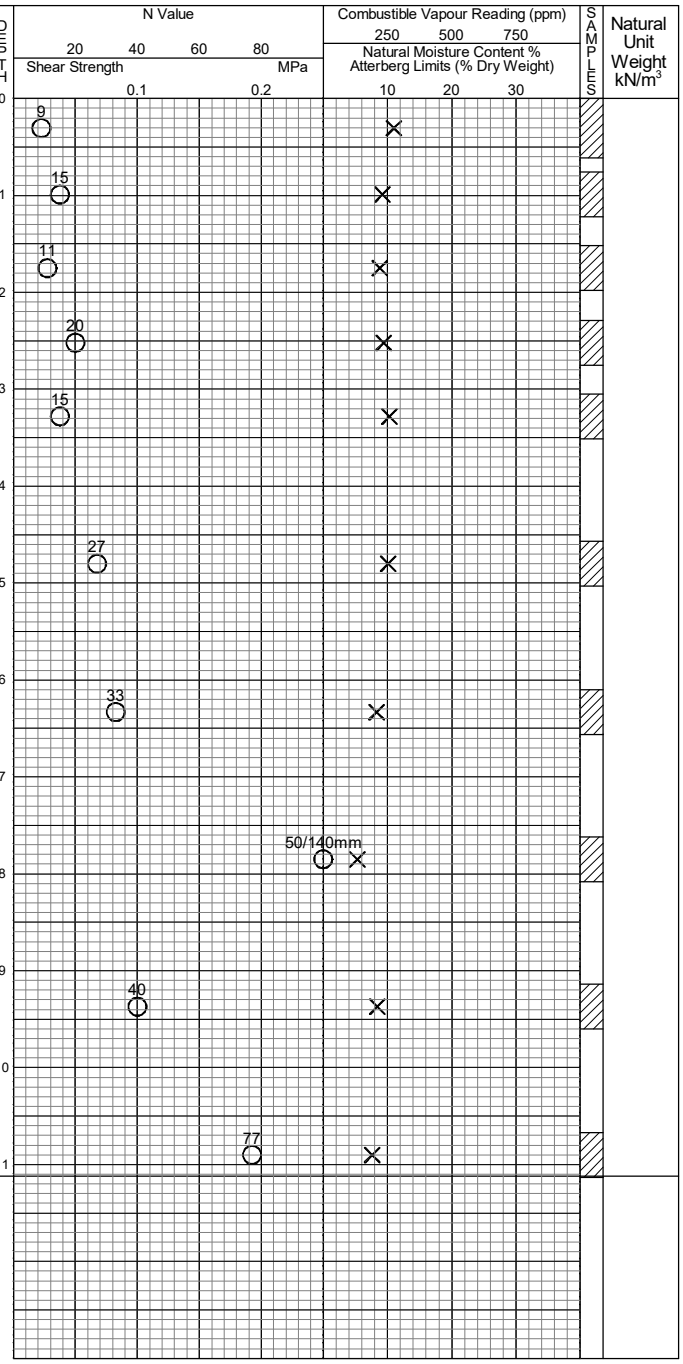
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			152.26
		FILL - clayey silt, some sand, trace gravel, topsoil inclusions; brown, moist	
			151.5
		SANDY SILT TILL - trace clay, trace gravel, oxidized fissures; brown, moist to very moist, compact	
▼			147.69
		- becoming grey and dense	
			145.4
		SILT TILL - some clay, trace sand, trace gravel and cobbles; grey, moist to very moist, dense to very dense	
			141.1
		END OF BOREHOLE	



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	4.57	6.02

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-12

Project No. BRM-00604892-A0 | Drawing No. 13

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: August 30, 2018

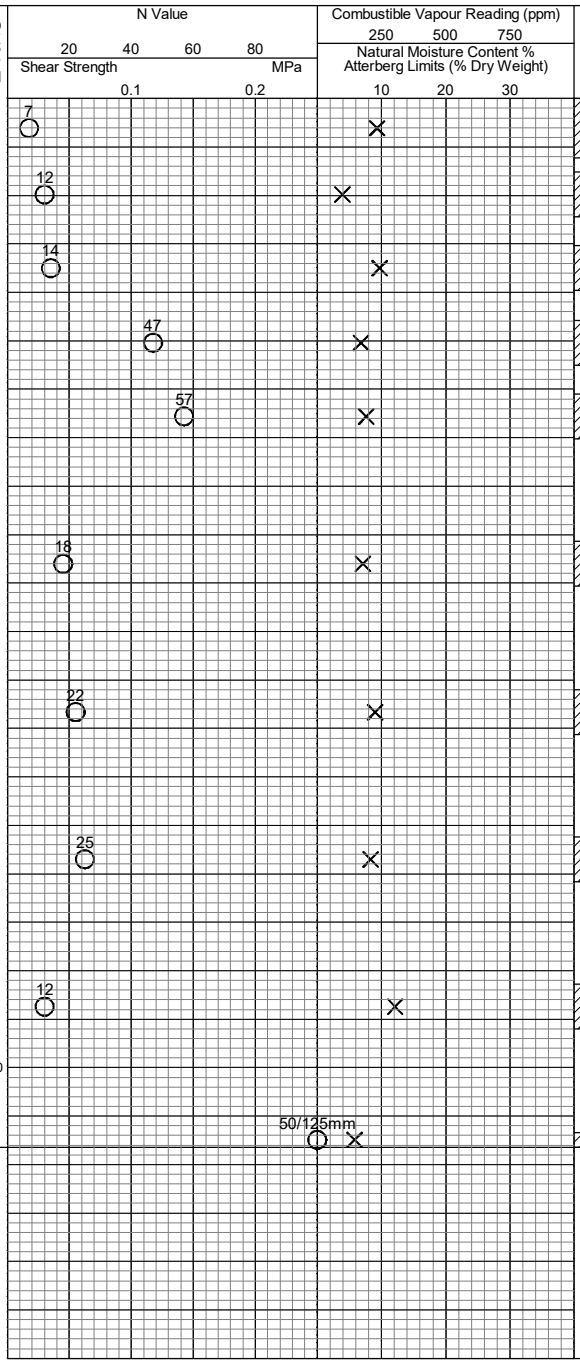
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
		FILL - clayey silt, trace gravel, topsoil inclusions; brown, moist	152.73
		SANDY SILT TILL - some clay, trace gravel, oxidized fissures; brown, moist, compact to very dense	152.0
▼		- becoming grey and compact	149.37
		SILT TILL - some sand, trace to some clay, trace gravel; grey, moist to very moist, compact	146.6
		- becoming clayey	
		- becoming very dense	141.9
		END OF BOREHOLE	



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	3.36	10.06

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH/MW-13

Project No. BRM-00604892-A0 | Drawing No. 14

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 4, 2018

Drill Type: CME 750 Track Mount

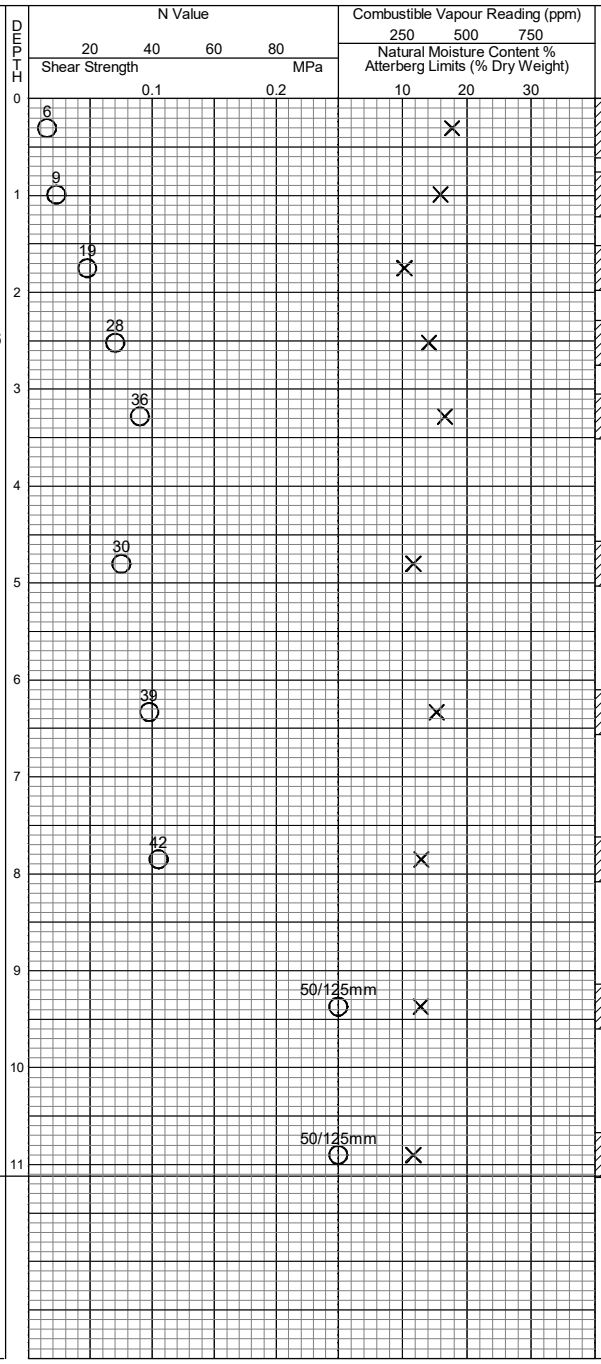
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			150.80
		TOPSOIL - about 250mm thick	150.6
		FILL - clayey silt, trace sand, trace gravel; brown, very moist	149.3
		SANDY SILT TILL - trace clay, trace gravel, occasional sand layers; brown, moist to wet, compact	148.26
		- becoming dense	143.9
		SILT TILL - trace clay, trace sand, trace gravel; grey, moist to very moist, dense	139.7
		- becoming very dense	
		END OF BOREHOLE	

NOTES
1. Goundwater monitoring well installed to 3.05 m depth.



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	Well
September 6, 2018	2.26	
September 11, 2018	2.39	
September 12, 2018	2.40	
September 20, 2018	2.54	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH-14

Project No. BRM-00604892-A0 | Drawing No. 15

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 6, 2018

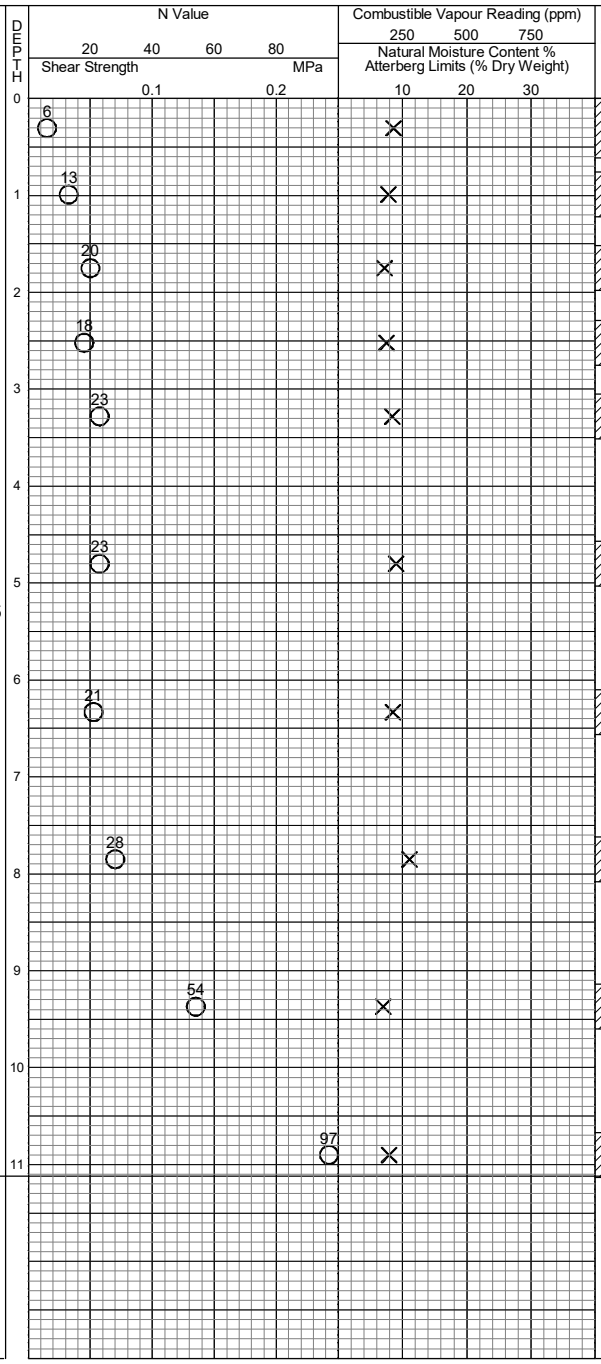
Drill Type: CME 750 Track Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			152.21
		TOPSOIL - about 250mm thick	152.0
		FILL - sandy silt, some clay, trace gravel; dark brown to brown, moist	150.4
		SANDY SILT TILL - some clay, trace gravel; brown, moist, compact	
		- becoming very moist	
▼		- becoming grey	146.85
		- becoming very dense	141.1
		END OF BOREHOLE	



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	5.36	5.94

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH/MW-15

Project No. BRM-00604892-A0 | Drawing No. 16

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: NW Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 6, 2018

Drill Type: CME 750 Track Mount

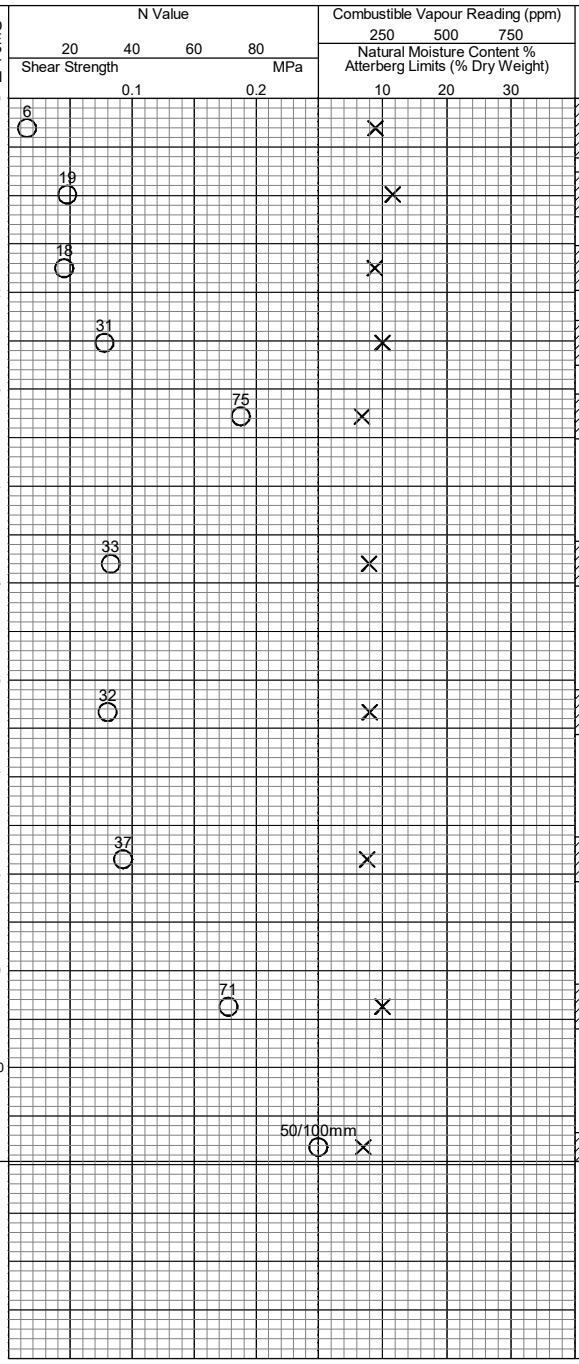
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			153.05
		TOPSOIL - about 230mm thick	152.8
		FILL - sandy silt, some clay; brown, moist	151.5
		SANDY SILT - some clay; brown, moist, compact to dense	150.53
			150.2
		SANDY SILT TILL - trace clay, trace gravel; brown, moist, dense to very dense	
		- becoming grey, very moist	
			144.7
		SAND AND GRAVEL - grey, wet, very dense	
			142.1
		END OF BOREHOLE	

NOTES
1. Goundwater monitoring well installed to 4.57 m depth.



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	2.68	Well
September 11, 2018	2.37	
September 12, 2018	2.39	
September 20, 2018	2.52	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 15 GEO BHS.GPJ NEW.GDT 10/9/18

Log of Borehole BH/MW-101

Project No. BRM-00604892-A0 | Drawing No. 17

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 5, 2018

Drill Type: CME 750 Track Mount

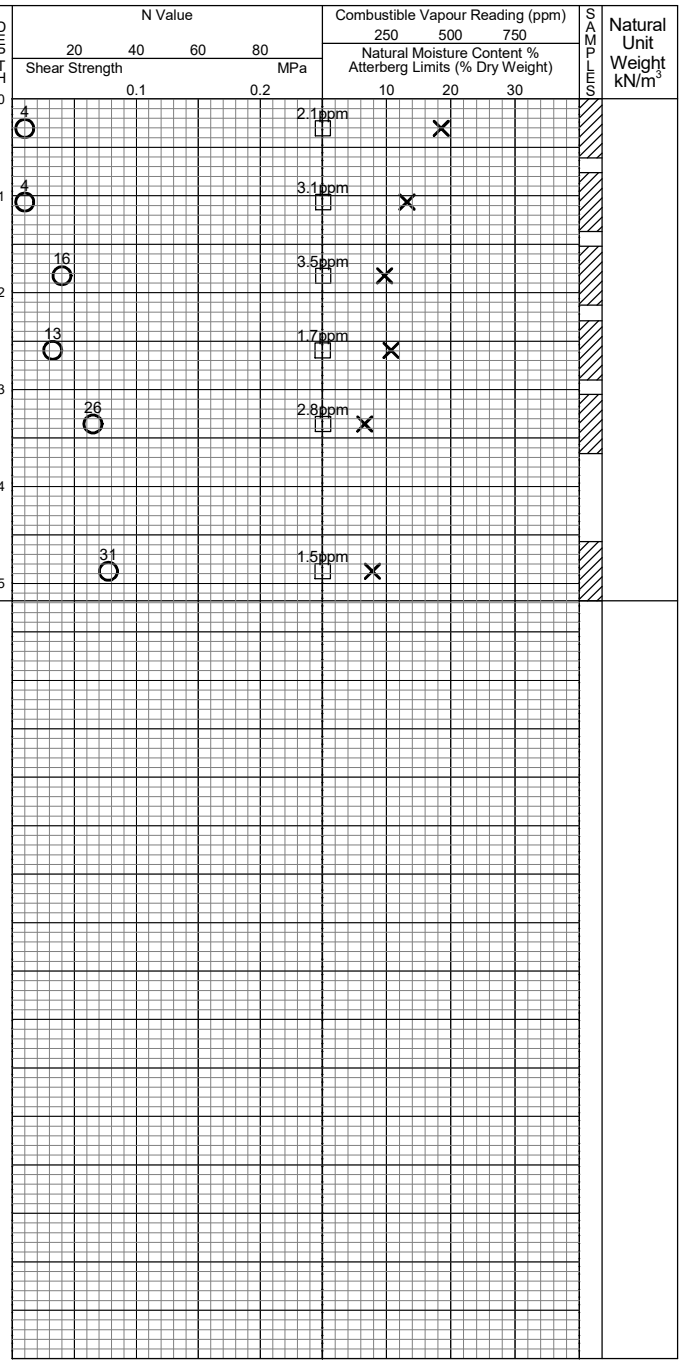
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
		TOPSOIL - about 250mm thick	149.57
		FILL - silty sand to clayey silt; brown, moist, soft; no odours or staining	149.3
		CLAYEY SILT TILL - trace sand, trace gravel; grey, very moist, stiff to very stiff; no odours or staining	148.19
		SILT TILL - trace clay, trace sand, trace gravel; grey, moist, compact to dense; no odours or staining	146.5
		END OF BOREHOLE	144.4

NOTES
1. Goundwater monitoring well installed to 4.57 m depth.



Time	Water Level (m)	Depth to Cave (m)
On completion	1.29	Well
September 6, 2018	1.22	
September 11, 2018	1.08	
September 12, 2018	1.03	
September 20, 2018	1.38	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 3 ENV BHS.GPJ NEW.GDT 10/1/18

Log of Borehole BH/MW-102

Project No. BRM-00604892-A0 | Drawing No. 18

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 5, 2018

Drill Type: CME 750 Track Mount

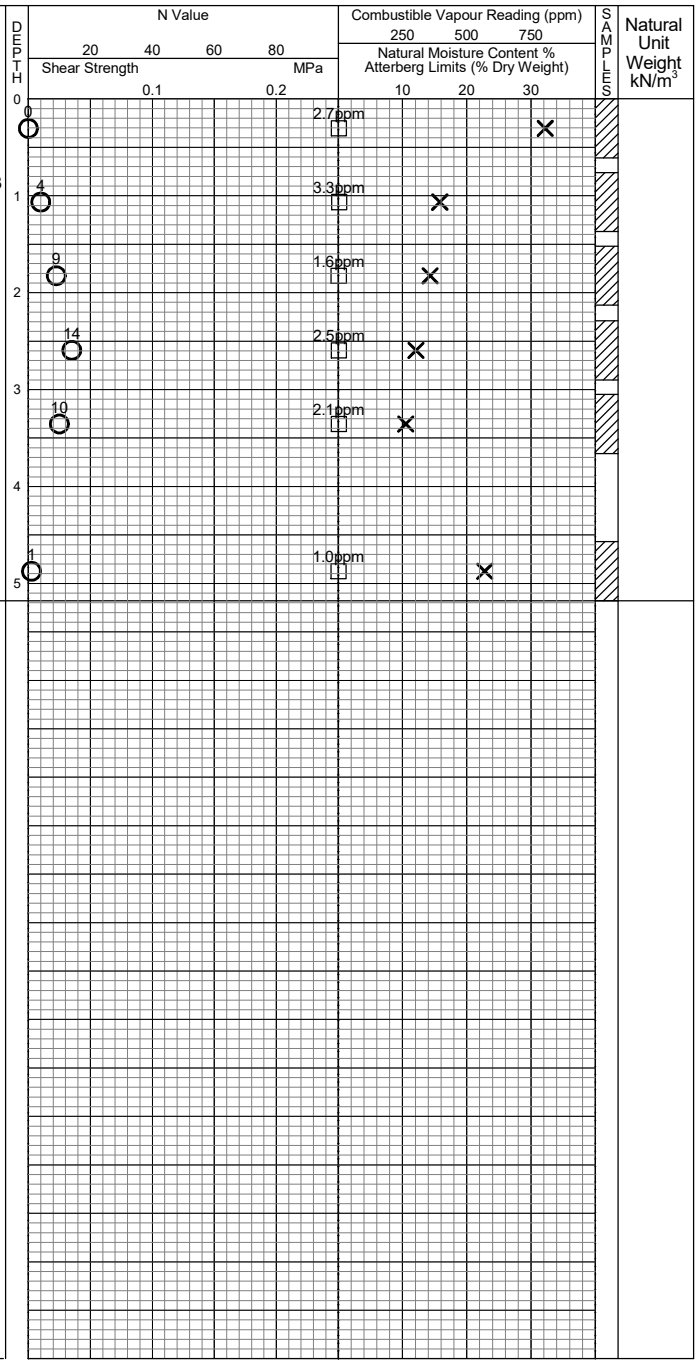
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			149.76
		TOPSOIL - about 250mm thick	149.5
		FILL - clayey silt, trace sand, trace gravel; brown, moist to very moist, very soft to soft; no odours or staining	148.83
		CLAYEY SILT TILL - some sand, trace gravel; brown, very moist, stiff; no odours or staining	148.2
		CLAYEY SILT - grey, very moist, firm; no odours or staining	146.7
		- becoming very soft, wet	144.6
		END OF BOREHOLE	

NOTES
1. Goundwater monitoring well installed to 4.57 m depth.



Time	Water Level (m)	Depth to Cave (m)
On completion	0.90	Well
September 6, 2018	0.91	
September 11, 2018	0.33	
September 12, 2018	0.48	
September 20, 2018	0.93	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 3 ENV BHS.GPJ NEW.GDT 10/1/18

Log of Borehole BH/MW-103

Project No. BRM-00604892-A0 | Drawing No. 19

Project: Geotechnical Investigation | Sheet No. 1 of 1

Location: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Date Drilled: September 4, 2018

Drill Type: CME 750 Track Mount

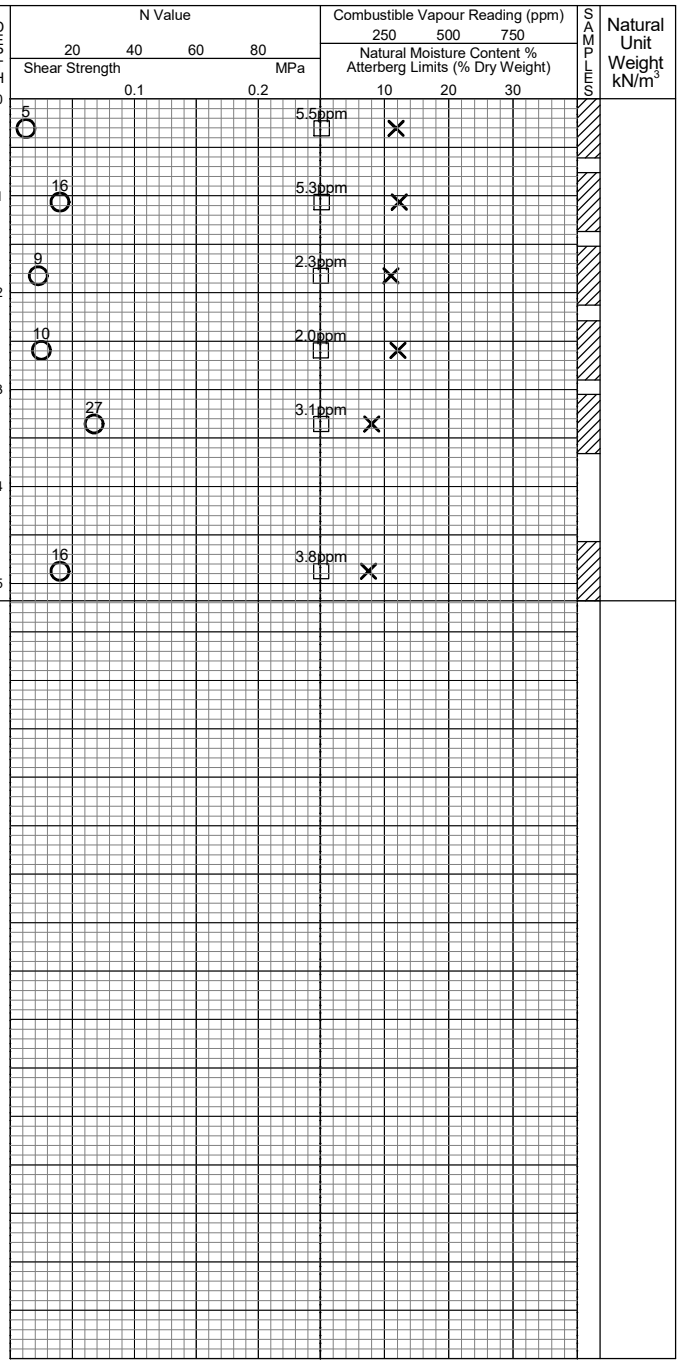
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
		FILL - silty sand to clayey silt, trace gravel; brown, moist, loose to compact; no odours or staining	151.09
		- becoming very moist, stiff	149.18
		CLAYEY SILT TILL - trace sand, trace gravel; brown, moist, very stiff; no odours or staining	147.7
		CLAYEY SILT - trace sand; grey, very moist, very stiff; no odours or staining	146.8
		END OF BOREHOLE	145.9

NOTES
1. Goundwater monitoring well installed to 4.57 m depth.



Natural Unit Weight kN/m³

Time	Water Level (m)	Depth to Cave (m)
On completion	1.56	Well
September 6, 2018	1.75	
September 11, 2018	1.80	
September 12, 2018	1.90	
September 20, 2018	1.91	

LAGWGL02 BRM-00604892-A0 - DURHAM EMS 3 ENV BHS.GPJ NEW.GDT 10/1/18

Appendix A

Grain Size Analyses

exp Services Inc.
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 307699-1 **Report No.:** 1 **Date Reported:** 02-Oct-18

Project No.: brm-00604892-a0
Project Name: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario - Geotechnical Investigation and Phase

Grain Size Proportion (%)

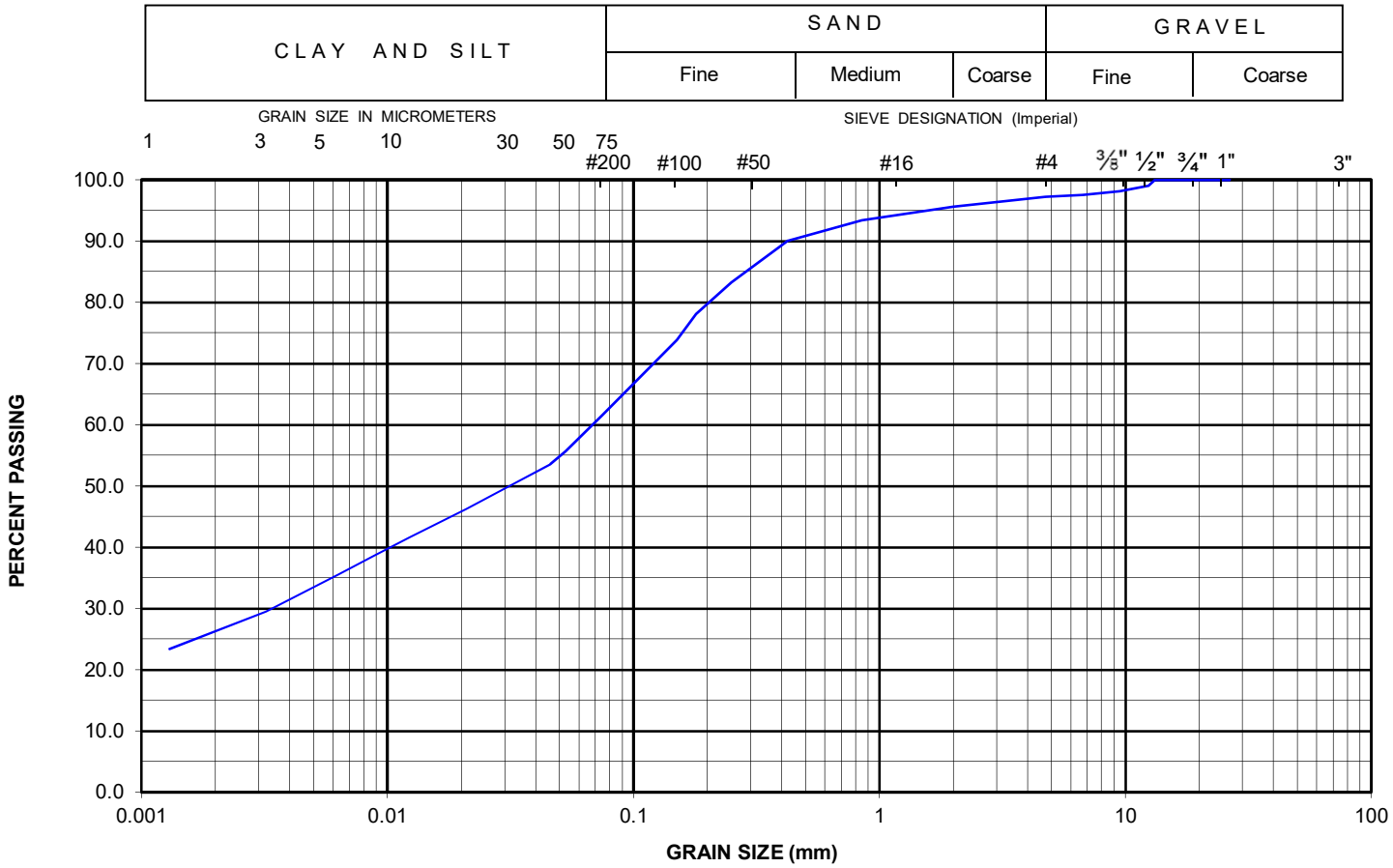
Gravel (> 4.75mm):	**2.7**
Sand (> 75µm, < 4.75mm):	**35.7**
Silt (> 2µm), < 75µm):	**36.0**
Clay (< 2µm):	**25.6**
Total:	**100.0**

Sample Information

Location: BH 5
Sample Method: SS
Sample No.: 9
Depth: 9.1 - 9.6 m
Sample Description: Clayey, Silt and Sand; trace Gravel; Grey
Sampled By: exp Markham
Sampling Date: 8/31/2018
Date Received: 9/27/2018
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0458**	53.5
22.4	100.0	**0.0327**	50.4
19	100.0	**0.0210**	46.2
16	100.0	**0.0123**	41.6
13.2	100.0	**0.0088**	38.6
12.5	99.1	**0.0063**	35.5
9.5	98.2	**0.0032**	29.5
6.7	97.5	**0.0013**	23.4
4.75	97.3		
2	95.6		
0.85	93.4		
0.425	90.1		
0.25	83.2		
0.18	78.1		
0.15	73.8		
0.075	61.6		
0.053	55.7		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Stacy Meek **Approved By:** *Original Signed By* **Date Approved:** 02-Oct-18
Willie Rodych, Lab Supervisor

exp Services Inc.
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Ontario, Canada, L6T 4V1
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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 307701-1 **Report No.:** 2 **Date Reported:** 02-Oct-18

Project No.: brm-00604892-a0
Project Name: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario - Geotechnical Investigation and Phase

Grain Size Proportion (%)

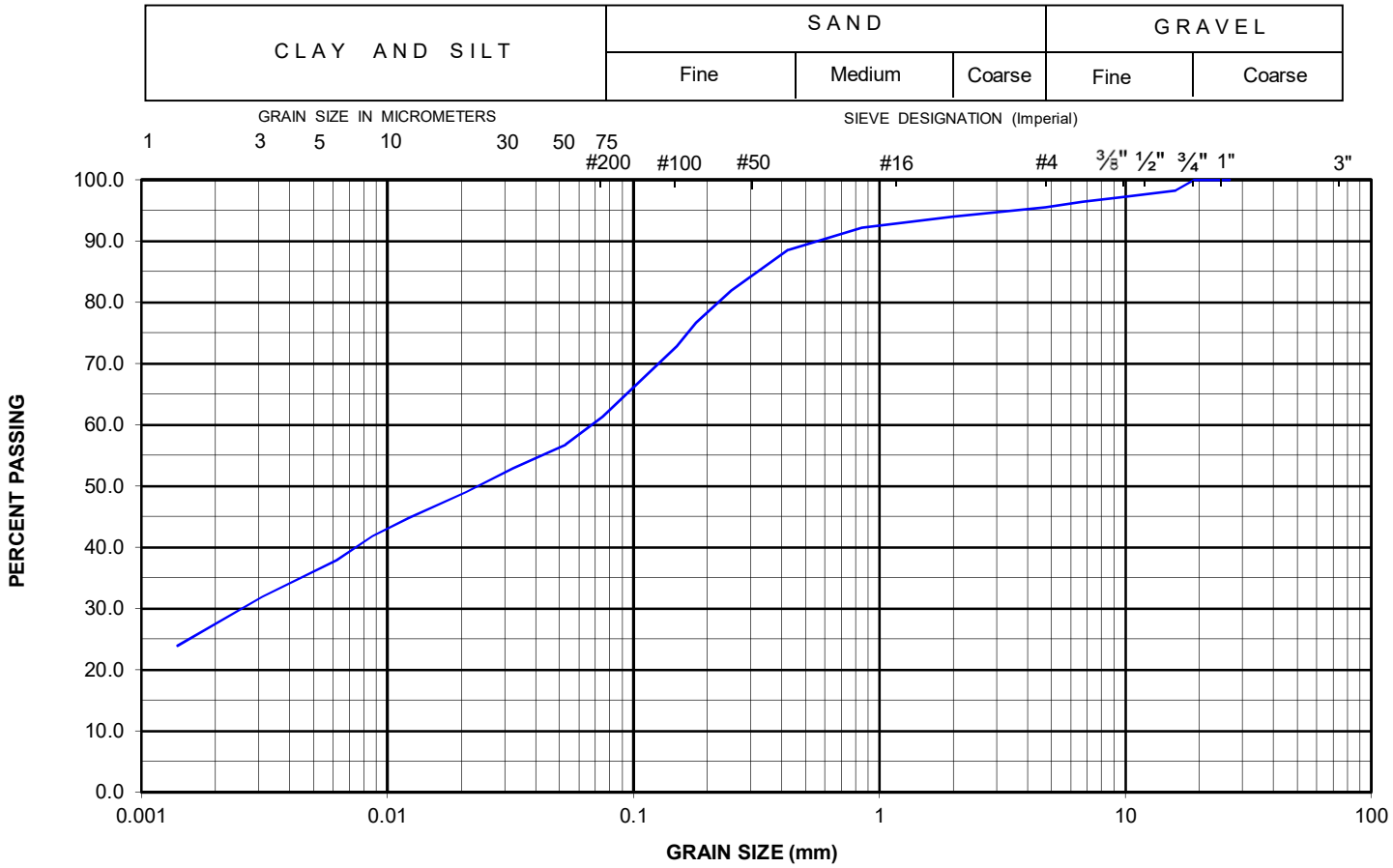
Gravel (> 4.75mm):	**4.5**
Sand (> 75µm, < 4.75mm):	**34.3**
Silt (> 2µm), < 75µm):	**34.5**
Clay (< 2µm):	**26.7**
Total:	**100.0**

Sample Information

Location: BH 5
Sample Method: SS
Sample No.: 10
Depth: 10.7 - 11.1 m
Sample Description: Clayey, Silt and Sand; trace Gravel; Grey
Sampled By: exp Markham
Sampling Date: 8/31/2018
Date Received: 9/27/2018
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0208**	49.0
22.4	100.0	**0.0122**	44.8
19	100.0	**0.0087**	41.8
16	98.3	**0.0062**	37.9
9.5	97.1	**0.0031**	31.9
6.7	96.5	**0.0014**	23.9
4.75	95.5		
2	94.0		
0.85	92.3		
0.425	88.6		
0.25	81.9		
0.18	76.7		
0.15	72.8		
0.075	61.3		
0.053	56.7		
0.0452	55.5		
0.0323	52.9		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Stacy Meek **Approved By:** *Original Signed By* **Date Approved:** 02-Oct-18
Willie Rodych, Lab Supervisor

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 307702-1 **Report No.:** 3 **Date Reported:** 02-Oct-18

Project No.: brm-00604892-a0
Project Name: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario - Geotechnical Investigation and Phase

Grain Size Proportion (%)

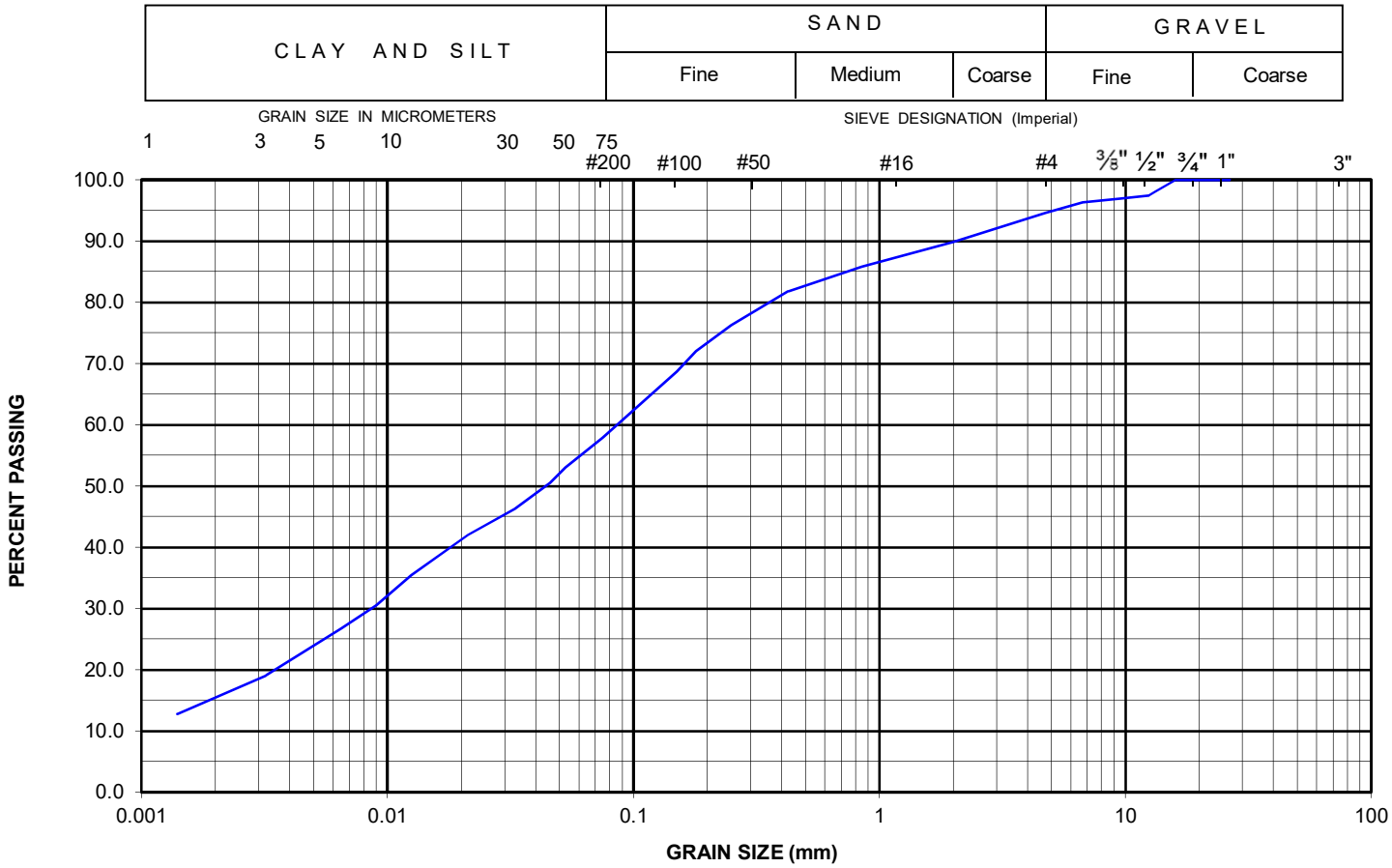
Gravel (> 4.75mm):	**5.4**
Sand (> 75µm, < 4.75mm):	**36.7**
Silt (> 2µm), < 75µm):	**43.0**
Clay (< 2µm):	**14.9**
Total:	**100.0**

Sample Information

Location: BH 12
Sample Method: SS
Sample No.: 8
Depth: 7.6 - 8.1 m
Sample Description: Silt and Sand, some Clay; trace Gravel; Grey
Sampled By: exp Markham
Sampling Date: 8/30/2018
Date Received: 9/27/2018
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0457**	50.5
22.4	100.0	**0.0329**	46.2
19	100.0	**0.0212**	42.0
16	100.0	**0.0125**	35.4
13.2	98.1	**0.0090**	30.5
12.5	97.5	**0.0065**	26.8
9.5	97.0	**0.0032**	19.1
6.7	96.3	**0.0014**	12.8
4.75	94.6		
2	89.9		
0.85	85.8		
0.425	81.8		
0.25	76.2		
0.18	72.0		
0.15	68.7		
0.075	57.9		
0.053	53.0		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Stacy Meek **Approved By:** *Original Signed By* **Date Approved:** 02-Oct-18
Willie Rodych, Lab Supervisor

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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 307703-1 **Report No.:** 4 **Date Reported:** 02-Oct-18

Project No.: brm-00604892-a0
Project Name: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario - Geotechnical Investigation and Phase

Grain Size Proportion (%)

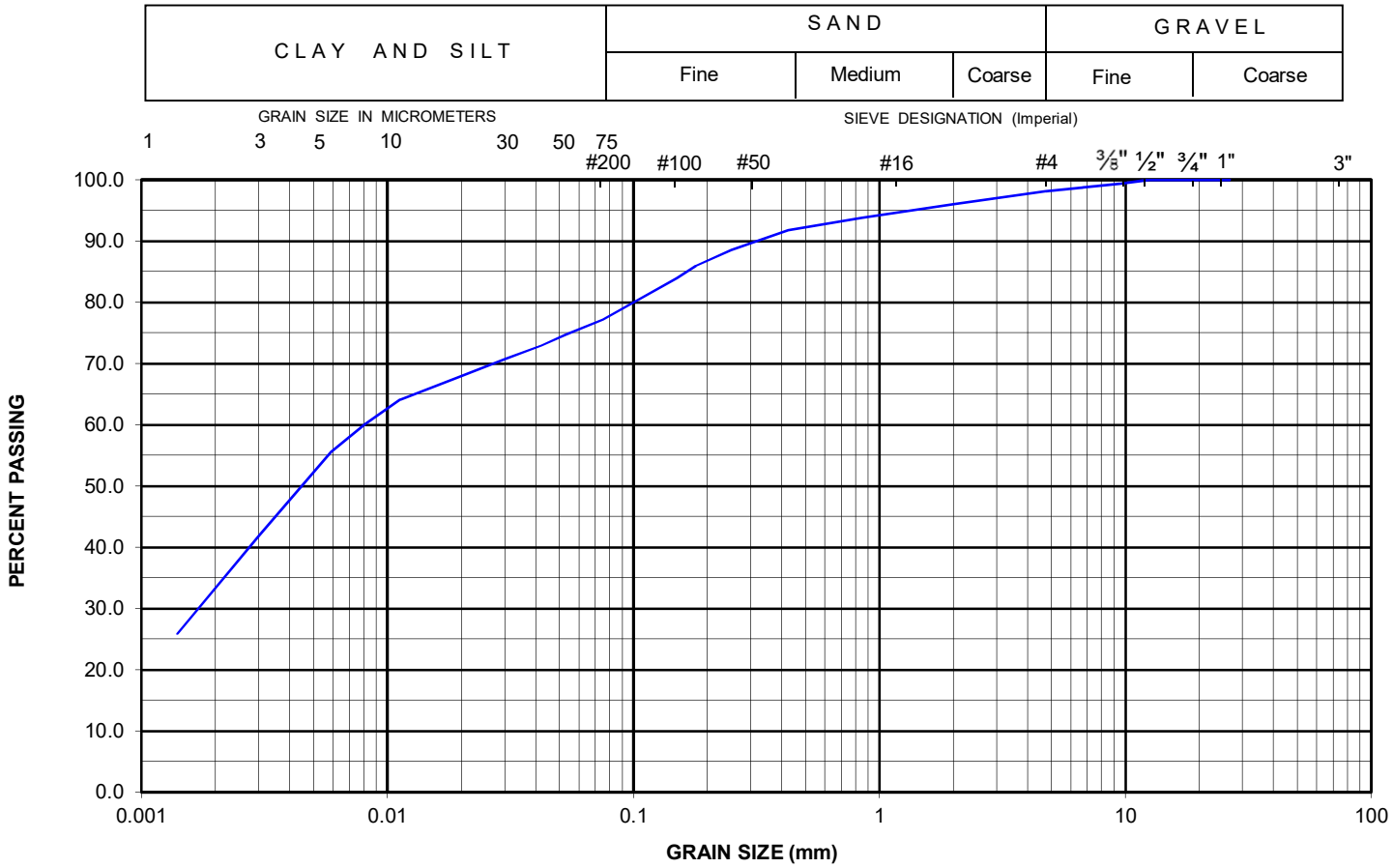
Gravel (> 4.75mm):	**1.8**
Sand (> 75µm, < 4.75mm):	**21.1**
Silt (> 2µm), < 75µm):	**45.2**
Clay (< 2µm):	**31.9**
Total:	**100.0**

Sample Information

Location: BH 12
Sample Method: SS
Sample No.: 9
Depth: 9.1 - 9.6 m
Sample Description: Sandy, Clayey Silt; trace Gravel; Grey
Sampled By: exp Markham
Sampling Date: 8/30/2018
Date Received: 9/27/2018
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0423**	72.9
22.4	100.0	**0.0302**	70.8
19	100.0	**0.0193**	67.8
16	100.0	**0.0113**	64.1
13.2	100.0	**0.0081**	60.1
12.5	100.0	**0.0059**	55.5
9.5	99.4	**0.0030**	41.8
6.7	98.8	**0.0014**	25.9
4.75	98.2		
2	96.1		
0.85	93.8		
0.425	91.8		
0.25	88.6		
0.18	85.9		
0.15	83.9		
0.075	77.1		
0.053	74.7		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Stacy Meek **Approved By:** *Original Signed By* **Date Approved:** 02-Oct-18
Willie Rodych, Lab Supervisor

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Ontario, Canada, L6T 4V1
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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 307704-1 **Report No.:** 5 **Date Reported:** 02-Oct-18

Project No.: brm-00604892-a0
Project Name: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario - Geotechnical Investigation and Phase

Grain Size Proportion (%)

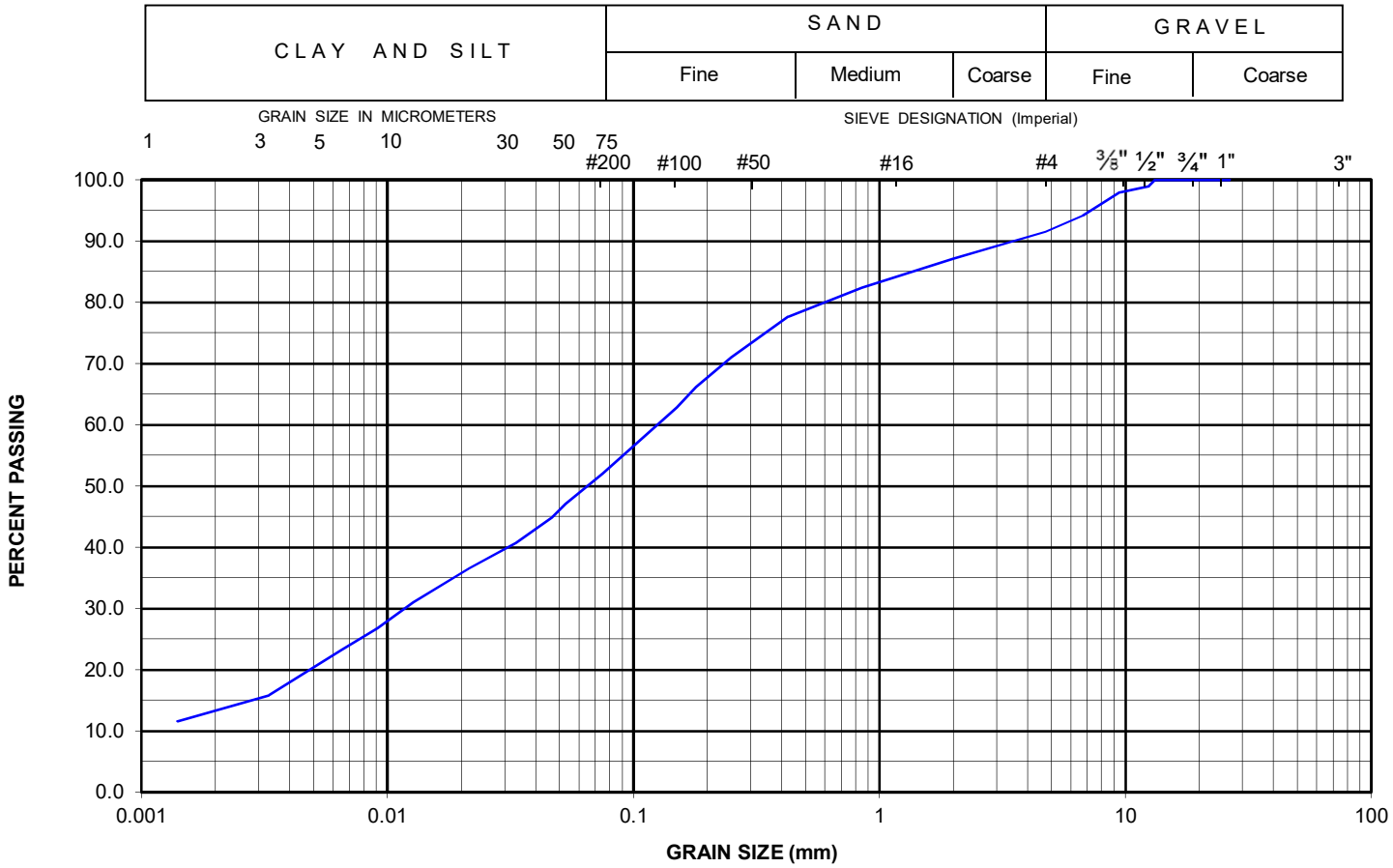
Gravel (> 4.75mm):	**8.4**
Sand (> 75µm, < 4.75mm):	**39.6**
Silt (> 2µm), < 75µm):	**39.1**
Clay (< 2µm):	**12.9**
Total:	**100.0**

Sample Information

Location: BH 14
Sample Method: SS
Sample No.: 5
Depth: 3.0 - 3.5 m
Sample Description: Sand and Silt, some Clay; trace Gravel; Brown
Sampled By: exp Markham
Sampling Date: 9/6/2018
Date Received: 9/27/2018
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0465**	44.8
22.4	100.0	**0.0334**	40.7
19	100.0	**0.0215**	36.5
16	100.0	**0.0127**	31.0
13.2	100.0	**0.0091**	26.8
12.5	98.9	**0.0065**	23.2
9.5	97.9	**0.0033**	15.8
6.7	94.2	**0.0014**	11.6
4.75	91.6		
2	87.1		
0.85	82.5		
0.425	77.6		
0.25	71.0		
0.18	66.2		
0.15	62.8		
0.075	52.0		
0.053	47.0		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Stacy Meek **Approved By:** *Original Signed By* **Date Approved:** 02-Oct-18
Willie Rodych, Lab Supervisor

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Ontario, Canada, L6T 4V1
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Grain Size Analysis & Hydrometer Test Report

ST08

Sample Test No.: 307705-1 **Report No.:** 6 **Date Reported:** 02-Oct-18

Project No.: brm-00604892-a0
Project Name: Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario - Geotechnical Investigation and Phase

Grain Size Proportion (%)

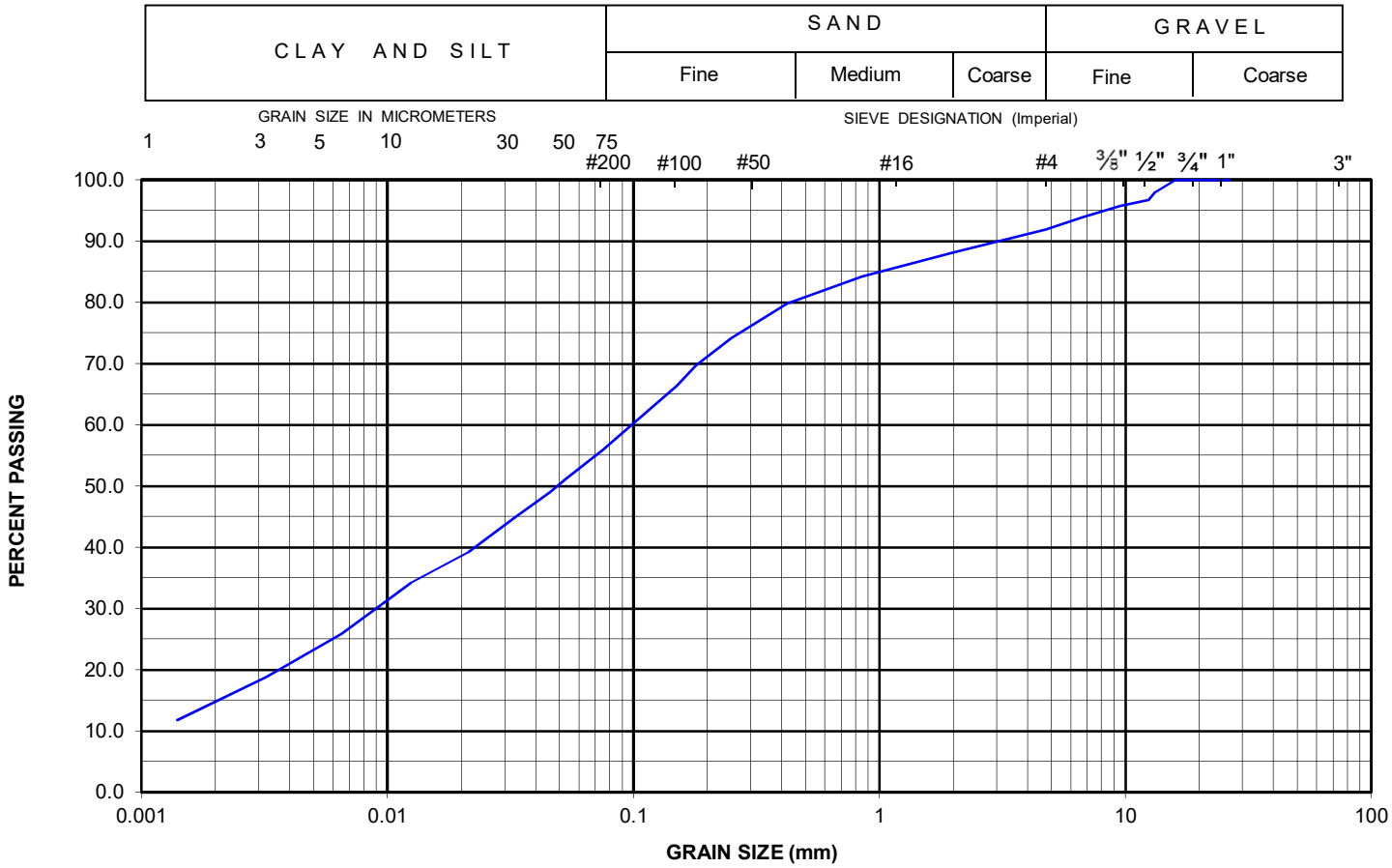
Gravel (> 4.75mm):	**8.1**
Sand (> 75µm, < 4.75mm):	**36.1**
Silt (> 2µm), < 75µm):	**41.7**
Clay (< 2µm):	**14.1**
Total:	**100.0**

Sample Information

Location: BH 14
Sample Method: SS
Sample No.: 6
Depth: 4.6 - 5.0 m
Sample Description: Silt and Sand, some Clay; trace Gravel; Brown
Sampled By: exp Markham
Sampling Date: 9/6/2018
Date Received: 9/27/2018
Client Sample ID:
Comments:

Grain Size (mm)	% Passing	Grain Size (mm)	% Passing
26.5	100.0	**0.0458**	49.0
22.4	100.0	**0.0330**	44.8
19	100.0	**0.0213**	39.2
16	100.0	**0.0125**	34.2
13.2	97.9	**0.0090**	30.0
12.5	96.8	**0.0065**	25.8
9.5	95.8	**0.0032**	18.8
6.7	93.9	**0.0014**	11.8
4.75	91.9		
2	88.2		
0.85	84.2		
0.425	79.8		
0.25	74.2		
0.18	69.7		
0.15	66.3		
0.075	55.8		
0.053	51.1		

UNIFIED SOIL CLASSIFICATION SYSTEM



Project Manager: Stacy Meek **Approved By:** *Original Signed By* **Date Approved:** 02-Oct-18
Willie Rodych, Lab Supervisor

Appendix B

pH and Sulphate Analysis

Maxxam
A Bureau Veritas Group Company

Your Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Your C.O.C. #: 665931-65-01, 665931-66-01

Attention: Payam Saboni

exp Services Inc
Markham Branch
220 Commerce Valley Dr W
Suite 500
Markham, ON
CANADA L3T 0A8

Report Date: 2018/09/17
Report #: R5402381
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8N4839
Received: 2018/09/10, 15:11

Sample Matrix: Soil
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Methylnaphthalene Sum	1	N/A	2018/09/13	CAM SOP-00301	EPA 8270D m
Methylnaphthalene Sum	3	N/A	2018/09/14	CAM SOP-00301	EPA 8270D m
Hot Water Extractable Boron	4	2018/09/13	2018/09/13	CAM SOP-00408	R153 Ana. Prot. 2011
1,3-Dichloropropene Sum	4	N/A	2018/09/13		EPA 8260C m
Free (WAD) Cyanide	4	2018/09/12	2018/09/13	CAM SOP-00457	OMOE E3015 m
Conductivity	4	2018/09/13	2018/09/13	CAM SOP-00414	OMOE E3530 v1 m
Hexavalent Chromium in Soil by IC (1)	4	2018/09/13	2018/09/13	CAM SOP-00436	EPA 3060/7199 m
Petroleum Hydrocarbons F2-F4 in Soil (2)	4	2018/09/12	2018/09/13	CAM SOP-00316	CCME CWS m
Strong Acid Leachable Metals by ICPMS	4	2018/09/13	2018/09/13	CAM SOP-00447	EPA 6020B m
Moisture	5	N/A	2018/09/12	CAM SOP-00445	Carter 2nd ed 51.2 m
Moisture	6	N/A	2018/09/13	CAM SOP-00445	Carter 2nd ed 51.2 m
OC Pesticides (Selected) & PCB (3)	4	2018/09/15	2018/09/15	CAM SOP-00307	SW846 8081, 8082
OC Pesticides Summed Parameters	4	N/A	2018/09/13	CAM SOP-00307	EPA 8081/8082 m
PAH Compounds in Soil by GC/MS (SIM)	1	2018/09/12	2018/09/12	CAM SOP-00318	EPA 8270D m
PAH Compounds in Soil by GC/MS (SIM)	3	2018/09/12	2018/09/13	CAM SOP-00318	EPA 8270D m
Polychlorinated Biphenyl in Soil	3	2018/09/12	2018/09/13	CAM SOP-00309	EPA 8082A m
pH CaCl2 EXTRACT	5	2018/09/13	2018/09/13	CAM SOP-00413	EPA 9045 D m
Sodium Adsorption Ratio (SAR)	4	N/A	2018/09/14	CAM SOP-00102	EPA 6010C
Sulphate (20:1 Extract)	1	N/A	2018/09/13	CAM SOP-00464	EPA 375.4 m
Volatile Organic Compounds and F1 PHCs	4	N/A	2018/09/12	CAM SOP-00230	EPA 8260C m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Your Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Your C.O.C. #: 665931-65-01, 665931-66-01

Attention: Payam Saboni

exp Services Inc
Markham Branch
220 Commerce Valley Dr W
Suite 500
Markham, ON
CANADA L3T 0A8

Report Date: 2018/09/17
Report #: R5402381
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8N4839
Received: 2018/09/10, 15:11

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.
(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(3) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Tanya Fidlin, Project Manager
Email: tfidlin@maxxam.ca
Phone# (905)817-5700
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		HSA744			HSA744			HSA746		
Sampling Date		2018/09/04 17:00			2018/09/04 17:00			2018/09/05 08:45		
COC Number		665931-65-01			665931-65-01			665931-65-01		
	UNITS	**BH103 SS6**	**RDL**	**QC Batch**	**BH103 SS6 Lab-Dup**	**RDL**	**QC Batch**	**BH102 SS4**	**RDL**	**QC Batch**
Calculated Parameters										
Sodium Adsorption Ratio	N/A	0.26		5726627				0.38		5726627
Inorganics										
Conductivity	mS/cm	0.17	0.002	5728797				0.13	0.002	5729121
Available (CaCl2) pH	pH	7.86		5728767				7.76		5728767
WAD Cyanide (Free)	ug/g	<0.01	0.01	5727974	<0.01	0.01	5727974	<0.01	0.01	5727974
Chromium (VI)	ug/g	<0.2	0.2	5728713				<0.2	0.2	5728713
Metals										
Hot Water Ext. Boron (B)	ug/g	<0.050	0.050	5729138				<0.050	0.050	5729138
Acid Extractable Antimony (Sb)	ug/g	<0.20	0.20	5729081				<0.20	0.20	5729081
Acid Extractable Arsenic (As)	ug/g	1.9	1.0	5729081				1.1	1.0	5729081
Acid Extractable Barium (Ba)	ug/g	37	0.50	5729081				81	0.50	5729081
Acid Extractable Beryllium (Be)	ug/g	0.29	0.20	5729081				0.40	0.20	5729081
Acid Extractable Boron (B)	ug/g	<5.0	5.0	5729081				7.6	5.0	5729081
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.10	5729081				<0.10	0.10	5729081
Acid Extractable Chromium (Cr)	ug/g	13	1.0	5729081				17	1.0	5729081
Acid Extractable Cobalt (Co)	ug/g	5.3	0.10	5729081				6.1	0.10	5729081
Acid Extractable Copper (Cu)	ug/g	13	0.50	5729081				11	0.50	5729081
Acid Extractable Lead (Pb)	ug/g	6.6	1.0	5729081				5.7	1.0	5729081
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	5729081				<0.50	0.50	5729081
Acid Extractable Nickel (Ni)	ug/g	11	0.50	5729081				13	0.50	5729081
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	5729081				<0.50	0.50	5729081
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	5729081				<0.20	0.20	5729081
Acid Extractable Thallium (Tl)	ug/g	0.11	0.050	5729081				0.14	0.050	5729081
Acid Extractable Uranium (U)	ug/g	0.63	0.050	5729081				0.47	0.050	5729081
Acid Extractable Vanadium (V)	ug/g	20	5.0	5729081				24	5.0	5729081
Acid Extractable Zinc (Zn)	ug/g	26	5.0	5729081				34	5.0	5729081
Acid Extractable Mercury (Hg)	ug/g	<0.050	0.050	5729081				<0.050	0.050	5729081

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 METALS & INORGANICS PKG (SOIL)

Maxxam ID		HSA755			HSA756		
Sampling Date		2018/09/05 11:30			2018/09/05 11:45		
COC Number		665931-66-01			665931-66-01		
	UNITS	**BH101 SS6**	**RDL**	**QC Batch**	**BH101 SS6D**	**RDL**	**QC Batch**
Calculated Parameters							
Sodium Adsorption Ratio	N/A	0.46		5726627	0.50		5726627
Inorganics							
Conductivity	mS/cm	0.15	0.002	5728797	0.15	0.002	5729121
Moisture	%				8.6	1.0	5728226
Available (CaCl2) pH	pH	8.18		5728767	8.15		5728767
WAD Cyanide (Free)	ug/g	<0.01	0.01	5727974	<0.01	0.01	5727974
Chromium (VI)	ug/g	<0.2	0.2	5728713	<0.2	0.2	5728713
Metals							
Hot Water Ext. Boron (B)	ug/g	0.19	0.050	5729138	0.20	0.050	5729138
Acid Extractable Antimony (Sb)	ug/g	<0.20	0.20	5729081	<0.20	0.20	5729081
Acid Extractable Arsenic (As)	ug/g	1.0	1.0	5729081	1.2	1.0	5729081
Acid Extractable Barium (Ba)	ug/g	82	0.50	5729081	77	0.50	5729081
Acid Extractable Beryllium (Be)	ug/g	0.36	0.20	5729081	0.37	0.20	5729081
Acid Extractable Boron (B)	ug/g	8.2	5.0	5729081	8.1	5.0	5729081
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.10	5729081	<0.10	0.10	5729081
Acid Extractable Chromium (Cr)	ug/g	18	1.0	5729081	18	1.0	5729081
Acid Extractable Cobalt (Co)	ug/g	5.7	0.10	5729081	5.7	0.10	5729081
Acid Extractable Copper (Cu)	ug/g	11	0.50	5729081	12	0.50	5729081
Acid Extractable Lead (Pb)	ug/g	4.4	1.0	5729081	4.5	1.0	5729081
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	5729081	<0.50	0.50	5729081
Acid Extractable Nickel (Ni)	ug/g	12	0.50	5729081	12	0.50	5729081
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	5729081	<0.50	0.50	5729081
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	5729081	<0.20	0.20	5729081
Acid Extractable Thallium (Tl)	ug/g	0.10	0.050	5729081	0.096	0.050	5729081
Acid Extractable Uranium (U)	ug/g	0.68	0.050	5729081	0.62	0.050	5729081
Acid Extractable Vanadium (V)	ug/g	26	5.0	5729081	26	5.0	5729081
Acid Extractable Zinc (Zn)	ug/g	29	5.0	5729081	30	5.0	5729081
Acid Extractable Mercury (Hg)	ug/g	<0.050	0.050	5729081	<0.050	0.050	5729081

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		HSA744			HSA749			HSA749		
Sampling Date		2018/09/04 17:00			2018/09/05 09:20			2018/09/05 09:20		
COC Number		665931-65-01			665931-65-01			665931-65-01		
	UNITS	**BH103 SS6**	**RDL**	**QC Batch**	**BH102 SS6**	**RDL**	**QC Batch**	**BH102 SS6 Lab-Dup**	**RDL**	**QC Batch**
Inorganics										
Moisture	%				19	1.0	5728226	19	1.0	5728226
Calculated Parameters										
Chlordane (Total)	ug/g	<0.0020	0.0020	5727332	<0.0020	0.0020	5727332			
o,p-DDD + p,p-DDD	ug/g	<0.0020	0.0020	5727332	<0.0020	0.0020	5727332			
o,p-DDE + p,p-DDE	ug/g	<0.0020	0.0020	5727332	<0.0020	0.0020	5727332			
o,p-DDT + p,p-DDT	ug/g	<0.0020	0.0020	5727332	<0.0020	0.0020	5727332			
Total Endosulfan	ug/g	<0.0020	0.0020	5727332	<0.0020	0.0020	5727332			
Total PCB	ug/g	<0.015	0.015	5727332	<0.015	0.015	5727332			
Pesticides & Herbicides										
Aldrin	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
a-Chlordane	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
g-Chlordane	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
o,p-DDD	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
p,p-DDD	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
o,p-DDE	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
p,p-DDE	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
o,p-DDT	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
p,p-DDT	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Dieldrin	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Lindane	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Endosulfan I (alpha)	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Endosulfan II (beta)	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Endrin	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Heptachlor	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Heptachlor epoxide	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Hexachlorobenzene	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Hexachlorobutadiene	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Hexachloroethane	ug/g	<0.0020	0.0020	5733612	<0.0020	0.0020	5733612			
Methoxychlor	ug/g	<0.0050	0.0050	5733612	<0.0050	0.0050	5733612			
Aroclor 1242	ug/g	<0.015	0.015	5733612	<0.015	0.015	5733612			
Aroclor 1248	ug/g	<0.015	0.015	5733612	<0.015	0.015	5733612			
Aroclor 1254	ug/g	<0.015	0.015	5733612	<0.015	0.015	5733612			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		HSA744			HSA749			HSA749		
Sampling Date		2018/09/04 17:00			2018/09/05 09:20			2018/09/05 09:20		
COC Number		665931-65-01			665931-65-01			665931-65-01		
	UNITS	**BH103 SS6**	**RDL**	**QC Batch**	**BH102 SS6**	**RDL**	**QC Batch**	**BH102 SS6 Lab-Dup**	**RDL**	**QC Batch**
Aroclor 1260	ug/g	<0.015	0.015	5733612	<0.015	0.015	5733612			
Surrogate Recovery (%)										
2,4,5,6-Tetrachloro-m-xylene	%	81		5733612	84		5733612			
Decachlorobiphenyl	%	102		5733612	114		5733612			

RDL = Reportable Detection Limit
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Lab-Dup = Laboratory Initiated Duplicate

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Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		HSA750	HSA755		
Sampling Date		2018/09/05 09:30	2018/09/05 11:30		
COC Number		665931-65-01	665931-66-01		
	UNITS	**BH102 SS6D**	**BH101 SS6**	**RDL**	**QC Batch**
Inorganics					
Moisture	%	18	9.2	1.0	5728226
Calculated Parameters					
Chlordane (Total)	ug/g	<0.0020	<0.0020	0.0020	5727332
o,p-DDD + p,p-DDD	ug/g	<0.0020	<0.0020	0.0020	5727332
o,p-DDE + p,p-DDE	ug/g	<0.0020	<0.0020	0.0020	5727332
o,p-DDT + p,p-DDT	ug/g	<0.0020	<0.0020	0.0020	5727332
Total Endosulfan	ug/g	<0.0020	<0.0020	0.0020	5727332
Total PCB	ug/g	<0.015	<0.015	0.015	5727332
Pesticides & Herbicides					
Aldrin	ug/g	<0.0020	<0.0020	0.0020	5733612
a-Chlordane	ug/g	<0.0020	<0.0020	0.0020	5733612
g-Chlordane	ug/g	<0.0020	<0.0020	0.0020	5733612
o,p-DDD	ug/g	<0.0020	<0.0020	0.0020	5733612
p,p-DDD	ug/g	<0.0020	<0.0020	0.0020	5733612
o,p-DDE	ug/g	<0.0020	<0.0020	0.0020	5733612
p,p-DDE	ug/g	<0.0020	<0.0020	0.0020	5733612
o,p-DDT	ug/g	<0.0020	<0.0020	0.0020	5733612
p,p-DDT	ug/g	<0.0020	<0.0020	0.0020	5733612
Dieldrin	ug/g	<0.0020	<0.0020	0.0020	5733612
Lindane	ug/g	<0.0020	<0.0020	0.0020	5733612
Endosulfan I (alpha)	ug/g	<0.0020	<0.0020	0.0020	5733612
Endosulfan II (beta)	ug/g	<0.0020	<0.0020	0.0020	5733612
Endrin	ug/g	<0.0020	<0.0020	0.0020	5733612
Heptachlor	ug/g	<0.0020	<0.0020	0.0020	5733612
Heptachlor epoxide	ug/g	<0.0020	<0.0020	0.0020	5733612
Hexachlorobenzene	ug/g	<0.0020	<0.0020	0.0020	5733612
Hexachlorobutadiene	ug/g	<0.0020	<0.0020	0.0020	5733612
Hexachloroethane	ug/g	<0.0020	<0.0020	0.0020	5733612
Methoxychlor	ug/g	<0.0050	<0.0050	0.0050	5733612
Aroclor 1242	ug/g	<0.015	<0.015	0.015	5733612
Aroclor 1248	ug/g	<0.015	<0.015	0.015	5733612
Aroclor 1254	ug/g	<0.015	<0.015	0.015	5733612

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 OC PESTICIDES (SOIL)

Maxxam ID		HSA750	HSA755		
Sampling Date		2018/09/05 09:30	2018/09/05 11:30		
COC Number		665931-65-01	665931-66-01		
	UNITS	**BH102 SS6D**	**BH101 SS6**	**RDL**	**QC Batch**
Aroclor 1260	ug/g	<0.015	<0.015	0.015	5733612
Surrogate Recovery (%)					
2,4,5,6-Tetrachloro-m-xylene	%	80	87		5733612
Decachlorobiphenyl	%	97	113		5733612

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 PAHS (SOIL)

Maxxam ID		HSA744			HSA745		HSA746		
Sampling Date		2018/09/04 17:00			2018/09/04 17:15		2018/09/05 08:45		
COC Number		665931-65-01			665931-65-01		665931-65-01		
	UNITS	**BH103 SS6**	**RDL**	**QC Batch**	**BH103 SS6D**	**QC Batch**	**BH102 SS4**	**RDL**	**QC Batch**
Inorganics									
Moisture	%				10	5728226	12	1.0	5728070
Calculated Parameters									
Methylnaphthalene, 2-(1-)	ug/g	<0.0071	0.0071	5726498	<0.0071	5726498	<0.0071	0.0071	5726498
Polyaromatic Hydrocarbons									
Acenaphthene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Acenaphthylene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Anthracene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Benzo(a)anthracene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Benzo(a)pyrene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Benzo(b/j)fluoranthene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Benzo(g,h,i)perylene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Benzo(k)fluoranthene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Chrysene	ug/g	0.0065	0.0050	5728288	0.0051	5728216	<0.0050	0.0050	5728216
Dibenz(a,h)anthracene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Fluoranthene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Fluorene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
1-Methylnaphthalene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
2-Methylnaphthalene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Naphthalene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Phenanthrene	ug/g	<0.0050	0.0050	5728288	0.0056	5728216	<0.0050	0.0050	5728216
Pyrene	ug/g	<0.0050	0.0050	5728288	<0.0050	5728216	<0.0050	0.0050	5728216
Surrogate Recovery (%)									
D10-Anthracene	%	103		5728288	99	5728216	105		5728216
D14-Terphenyl (FS)	%	100		5728288	104	5728216	106		5728216
D8-Acenaphthylene	%	92		5728288	90	5728216	91		5728216

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 PAHS (SOIL)

Maxxam ID		HSA746			HSA752		
Sampling Date		2018/09/05 08:45			2018/09/05 11:15		
COC Number		665931-65-01			665931-65-01		
	UNITS	**BH102 SS4 Lab-Dup**	**RDL**	**QC Batch**	**BH101 SS5**	**RDL**	**QC Batch**
Inorganics							
Moisture	%				8.6	1.0	5728226
Calculated Parameters							
Methylnaphthalene, 2-(1-)	ug/g				<0.0071	0.0071	5726498
Polyaromatic Hydrocarbons							
Acenaphthene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Acenaphthylene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Anthracene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Benzo(a)anthracene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Benzo(a)pyrene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Benzo(b/j)fluoranthene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Benzo(g,h,i)perylene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Benzo(k)fluoranthene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Chrysene	ug/g	<0.0050	0.0050	5728216	0.0062	0.0050	5728216
Dibenz(a,h)anthracene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Fluoranthene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Fluorene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
1-Methylnaphthalene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
2-Methylnaphthalene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Naphthalene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Phenanthrene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Pyrene	ug/g	<0.0050	0.0050	5728216	<0.0050	0.0050	5728216
Surrogate Recovery (%)							
D10-Anthracene	%	97		5728216	101		5728216
D14-Terphenyl (FS)	%	98		5728216	107		5728216
D8-Acenaphthylene	%	83		5728216	93		5728216

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Report Date: 2018/09/17

exp Services Inc
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Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 PCBS (SOIL)

Maxxam ID		HSA745	HSA746	HSA746	HSA752		
Sampling Date		2018/09/04 17:15	2018/09/05 08:45	2018/09/05 08:45	2018/09/05 11:15		
COC Number		665931-65-01	665931-65-01	665931-65-01	665931-65-01		
	UNITS	**BH103 SS6D**	**BH102 SS4**	**BH102 SS4 Lab-Dup**	**BH101 SS5**	**RDL**	**QC Batch**
PCBs							
Aroclor 1242	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5728347
Aroclor 1248	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5728347
Aroclor 1254	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5728347
Aroclor 1260	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5728347
Total PCB	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5728347
Surrogate Recovery (%)							
Decachlorobiphenyl	%	82	99	91	90		5728347

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

Maxxam ID		HSA744		HSA747	HSA748	HSA751		
Sampling Date		2018/09/04 17:00		2018/09/05 09:00	2018/09/05 09:15	2018/09/05 11:00		
COC Number		665931-65-01		665931-65-01	665931-65-01	665931-65-01		
	UNITS	**BH103 SS6**	**QC Batch**	**BH102 SS5**	**BH102 SS5D**	**BH101 SS3**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	9.8	5728070	11	12	12	1.0	5728070
Calculated Parameters								
1,3-Dichloropropene (cis+trans)	ug/g	<0.050	5727330	<0.050	<0.050	<0.050	0.050	5727330
Volatile Organics								
Acetone (2-Propanone)	ug/g	<0.50	5726360	<0.50	<0.50	<0.50	0.50	5726360
Benzene	ug/g	<0.020	5726360	<0.020	<0.020	<0.020	0.020	5726360
Bromodichloromethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Bromoform	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Bromomethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Carbon Tetrachloride	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Chlorobenzene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Chloroform	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Dibromochloromethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,2-Dichlorobenzene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,3-Dichlorobenzene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,4-Dichlorobenzene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Dichlorodifluoromethane (FREON 12)	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,1-Dichloroethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,2-Dichloroethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,1-Dichloroethylene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
cis-1,2-Dichloroethylene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
trans-1,2-Dichloroethylene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,2-Dichloropropane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
cis-1,3-Dichloropropene	ug/g	<0.030	5726360	<0.030	<0.030	<0.030	0.030	5726360
trans-1,3-Dichloropropene	ug/g	<0.040	5726360	<0.040	<0.040	<0.040	0.040	5726360
Ethylbenzene	ug/g	<0.020	5726360	<0.020	<0.020	<0.020	0.020	5726360
Ethylene Dibromide	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Hexane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Methylene Chloride(Dichloromethane)	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Methyl Ethyl Ketone (2-Butanone)	ug/g	<0.50	5726360	<0.50	<0.50	<0.50	0.50	5726360
Methyl Isobutyl Ketone	ug/g	<0.50	5726360	<0.50	<0.50	<0.50	0.50	5726360
Methyl t-butyl ether (MTBE)	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

Maxxam ID		HSA744		HSA747	HSA748	HSA751		
Sampling Date		2018/09/04 17:00		2018/09/05 09:00	2018/09/05 09:15	2018/09/05 11:00		
COC Number		665931-65-01		665931-65-01	665931-65-01	665931-65-01		
	UNITS	**BH103 SS6**	**QC Batch**	**BH102 SS5**	**BH102 SS5D**	**BH101 SS3**	**RDL**	**QC Batch**
Styrene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,1,1,2-Tetrachloroethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,1,2,2-Tetrachloroethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Tetrachloroethylene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Toluene	ug/g	<0.020	5726360	<0.020	<0.020	<0.020	0.020	5726360
1,1,1-Trichloroethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
1,1,2-Trichloroethane	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Trichloroethylene	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Trichlorofluoromethane (FREON 11)	ug/g	<0.050	5726360	<0.050	<0.050	<0.050	0.050	5726360
Vinyl Chloride	ug/g	<0.020	5726360	<0.020	<0.020	<0.020	0.020	5726360
p+m-Xylene	ug/g	<0.020	5726360	<0.020	<0.020	<0.020	0.020	5726360
o-Xylene	ug/g	<0.020	5726360	<0.020	<0.020	<0.020	0.020	5726360
Total Xylenes	ug/g	<0.020	5726360	<0.020	<0.020	<0.020	0.020	5726360
F1 (C6-C10)	ug/g	<10	5726360	<10	<10	<10	10	5726360
F1 (C6-C10) - BTEX	ug/g	<10	5726360	<10	<10	<10	10	5726360
F2-F4 Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	ug/g	12	5728285	<10	<10	<10	10	5728084
F3 (C16-C34 Hydrocarbons)	ug/g	66	5728285	<50	<50	<50	50	5728084
F4 (C34-C50 Hydrocarbons)	ug/g	<50	5728285	<50	<50	<50	50	5728084
Reached Baseline at C50	ug/g	Yes	5728285	Yes	Yes	Yes		5728084
Surrogate Recovery (%)								
o-Terphenyl	%	85	5728285	87	81	82		5728084
4-Bromofluorobenzene	%	94	5726360	94	94	95		5726360
D10-o-Xylene	%	105	5726360	111	113	110		5726360
D4-1,2-Dichloroethane	%	103	5726360	103	103	103		5726360
D8-Toluene	%	97	5726360	97	98	97		5726360

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

Maxxam ID		HSA751		
Sampling Date		2018/09/05 11:00		
COC Number		665931-65-01		
	UNITS	**BH101 SS3 Lab-Dup**	**RDL**	**QC Batch**
Inorganics				
Moisture	%	12	1.0	5728070

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

RESULTS OF ANALYSES OF SOIL

Maxxam ID		HSA757		HSA757		
Sampling Date		2018/08/30 10:00		2018/08/30 10:00		
COC Number		665931-66-01		665931-66-01		
	UNITS	**BH8 SS3**	**QC Batch**	**BH8 SS3 Lab-Dup**	**RDL**	**QC Batch**
Inorganics						
Available (CaCl2) pH	pH	7.71	5728767			
Soluble (20:1) Sulphate (SO4)	ug/g	<20	5729057	<20	20	5729057

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HSA744
Sample ID: BH103 SS6
Matrix: Soil

Collected: 2018/09/04
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5726498	N/A	2018/09/13	Automated Statchk
Hot Water Extractable Boron	ICP	5729138	2018/09/13	2018/09/13	Suban Kanapathippllai
1,3-Dichloropropene Sum	CALC	5727330	N/A	2018/09/13	Automated Statchk
Free (WAD) Cyanide	TECH	5727974	2018/09/12	2018/09/13	Louise Harding
Conductivity	AT	5728797	2018/09/13	2018/09/13	Tahir Anwar
Hexavalent Chromium in Soil by IC	IC/SPEC	5728713	2018/09/13	2018/09/13	Rupinder Sihota
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5728285	2018/09/12	2018/09/13	Zhiyue (Frank) Zhu
Strong Acid Leachable Metals by ICPMS	ICP/MS	5729081	2018/09/13	2018/09/13	Daniel Teclu
Moisture	BAL	5728070	N/A	2018/09/12	Prgya Panchal
OC Pesticides (Selected) & PCB	GC/ECD	5733612	2018/09/15	2018/09/15	Joy Zhang
OC Pesticides Summed Parameters	CALC	5727332	N/A	2018/09/13	Automated Statchk
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5728288	2018/09/12	2018/09/12	Mitesh Raj
pH CaCl2 EXTRACT	AT	5728767	2018/09/13	2018/09/13	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5726627	N/A	2018/09/14	Automated Statchk
Volatile Organic Compounds and F1 PHCs	GC/MSFD	5726360	N/A	2018/09/12	Blair Gannon

Maxxam ID: HSA744 Dup
Sample ID: BH103 SS6
Matrix: Soil

Collected: 2018/09/04
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Free (WAD) Cyanide	TECH	5727974	2018/09/12	2018/09/13	Louise Harding

Maxxam ID: HSA745
Sample ID: BH103 SS6D
Matrix: Soil

Collected: 2018/09/04
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5726498	N/A	2018/09/14	Automated Statchk
Moisture	BAL	5728226	N/A	2018/09/13	Prgya Panchal
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5728216	2018/09/12	2018/09/13	Mitesh Raj
Polychlorinated Biphenyl in Soil	GC/ECD	5728347	2018/09/12	2018/09/13	Svitlana Shaula

Maxxam ID: HSA746
Sample ID: BH102 SS4
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5726498	N/A	2018/09/14	Automated Statchk
Hot Water Extractable Boron	ICP	5729138	2018/09/13	2018/09/13	Suban Kanapathippllai
Free (WAD) Cyanide	TECH	5727974	2018/09/12	2018/09/13	Louise Harding
Conductivity	AT	5729121	2018/09/13	2018/09/13	Tahir Anwar
Hexavalent Chromium in Soil by IC	IC/SPEC	5728713	2018/09/13	2018/09/13	Rupinder Sihota
Strong Acid Leachable Metals by ICPMS	ICP/MS	5729081	2018/09/13	2018/09/13	Daniel Teclu

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HSA746
Sample ID: BH102 SS4
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5728070	N/A	2018/09/12	Prgya Panchal
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5728216	2018/09/12	2018/09/13	Mitesh Raj
Polychlorinated Biphenyl in Soil	GC/ECD	5728347	2018/09/12	2018/09/13	Svitlana Shaula
pH CaCl2 EXTRACT	AT	5728767	2018/09/13	2018/09/13	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5726627	N/A	2018/09/14	Automated Statchk

Maxxam ID: HSA746 Dup
Sample ID: BH102 SS4
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5728216	2018/09/12	2018/09/13	Mitesh Raj
Polychlorinated Biphenyl in Soil	GC/ECD	5728347	2018/09/12	2018/09/13	Svitlana Shaula

Maxxam ID: HSA747
Sample ID: BH102 SS5
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	5727330	N/A	2018/09/13	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5728084	2018/09/12	2018/09/13	Zhiyue (Frank) Zhu
Moisture	BAL	5728070	N/A	2018/09/12	Prgya Panchal
Volatile Organic Compounds and F1 PHCs	GC/MSFD	5726360	N/A	2018/09/12	Blair Gannon

Maxxam ID: HSA748
Sample ID: BH102 SS5D
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	5727330	N/A	2018/09/13	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5728084	2018/09/12	2018/09/13	Zhiyue (Frank) Zhu
Moisture	BAL	5728070	N/A	2018/09/12	Prgya Panchal
Volatile Organic Compounds and F1 PHCs	GC/MSFD	5726360	N/A	2018/09/12	Blair Gannon

Maxxam ID: HSA749
Sample ID: BH102 SS6
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5728226	N/A	2018/09/13	Prgya Panchal
OC Pesticides (Selected) & PCB	GC/ECD	5733612	2018/09/15	2018/09/15	Joy Zhang
OC Pesticides Summed Parameters	CALC	5727332	N/A	2018/09/13	Automated Statchk

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
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Site Location: DURHAM EMS
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HSA749 Dup
Sample ID: BH102 SS6
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5728226	N/A	2018/09/13	Prgya Panchal

Maxxam ID: HSA750
Sample ID: BH102 SS6D
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5728226	N/A	2018/09/13	Prgya Panchal
OC Pesticides (Selected) & PCB	GC/ECD	5733612	2018/09/15	2018/09/15	Joy Zhang
OC Pesticides Summed Parameters	CALC	5727332	N/A	2018/09/13	Automated Statchk

Maxxam ID: HSA751
Sample ID: BH101 SS3
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	5727330	N/A	2018/09/13	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	5728084	2018/09/12	2018/09/13	Zhiyue (Frank) Zhu
Moisture	BAL	5728070	N/A	2018/09/12	Prgya Panchal
Volatile Organic Compounds and F1 PHCs	GC/MSFD	5726360	N/A	2018/09/12	Blair Gannon

Maxxam ID: HSA751 Dup
Sample ID: BH101 SS3
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	5728070	N/A	2018/09/12	Prgya Panchal

Maxxam ID: HSA752
Sample ID: BH101 SS5
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	5726498	N/A	2018/09/14	Automated Statchk
Moisture	BAL	5728226	N/A	2018/09/13	Prgya Panchal
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	5728216	2018/09/12	2018/09/13	Mitesh Raj
Polychlorinated Biphenyl in Soil	GC/ECD	5728347	2018/09/12	2018/09/13	Svitlana Shaula

Maxxam ID: HSA755
Sample ID: BH101 SS6
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	5729138	2018/09/13	2018/09/13	Suban Kanapathippllai
Free (WAD) Cyanide	TECH	5727974	2018/09/12	2018/09/13	Louise Harding

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

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Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HSA755
Sample ID: BH101 SS6
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	AT	5728797	2018/09/13	2018/09/13	Tahir Anwar
Hexavalent Chromium in Soil by IC	IC/SPEC	5728713	2018/09/13	2018/09/13	Rupinder Sihota
Strong Acid Leachable Metals by ICPMS	ICP/MS	5729081	2018/09/13	2018/09/13	Daniel Teclu
Moisture	BAL	5728226	N/A	2018/09/13	Prgya Panchal
OC Pesticides (Selected) & PCB	GC/ECD	5733612	2018/09/15	2018/09/15	Joy Zhang
OC Pesticides Summed Parameters	CALC	5727332	N/A	2018/09/13	Automated Statchk
pH CaCl2 EXTRACT	AT	5728767	2018/09/13	2018/09/13	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5726627	N/A	2018/09/14	Automated Statchk

Maxxam ID: HSA756
Sample ID: BH101 SS6D
Matrix: Soil

Collected: 2018/09/05
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	5729138	2018/09/13	2018/09/13	Suban Kanapathippllai
Free (WAD) Cyanide	TECH	5727974	2018/09/12	2018/09/13	Louise Harding
Conductivity	AT	5729121	2018/09/13	2018/09/13	Tahir Anwar
Hexavalent Chromium in Soil by IC	IC/SPEC	5728713	2018/09/13	2018/09/13	Rupinder Sihota
Strong Acid Leachable Metals by ICPMS	ICP/MS	5729081	2018/09/13	2018/09/13	Daniel Teclu
Moisture	BAL	5728226	N/A	2018/09/13	Prgya Panchal
pH CaCl2 EXTRACT	AT	5728767	2018/09/13	2018/09/13	Gnana Thomas
Sodium Adsorption Ratio (SAR)	CALC/MET	5726627	N/A	2018/09/14	Automated Statchk

Maxxam ID: HSA757
Sample ID: BH8 SS3
Matrix: Soil

Collected: 2018/08/30
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	5728767	2018/09/13	2018/09/13	Gnana Thomas
Sulphate (20:1 Extract)	KONE/EC	5729057	N/A	2018/09/13	Alina Dobreanu

Maxxam ID: HSA757 Dup
Sample ID: BH8 SS3
Matrix: Soil

Collected: 2018/08/30
Shipped:
Received: 2018/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate (20:1 Extract)	KONE/EC	5729057	N/A	2018/09/13	Alina Dobreanu

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Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.0°C

Cooler custody seal was present and intact.

Sample HSA744 [BH103 SS6] : VOC F1 Analysis: Greater than 10g of soil was submitted in the field preserved vial. This significantly exceeds the protocol specification of approximately 5g. Additional methanol was added to the vial to ensure extraction efficiency.
SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio

Results relate only to the items tested.

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A Bureau Veritas Group Company

Maxxam Job #: B8N4839
Report Date: 2018/09/17

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5726360	4-Bromofluorobenzene	2018/09/12	100	60 - 140	100	60 - 140	95	%		
5726360	D10-o-Xylene	2018/09/12	112	60 - 130	95	60 - 130	99	%		
5726360	D4-1,2-Dichloroethane	2018/09/12	97	60 - 140	99	60 - 140	101	%		
5726360	D8-Toluene	2018/09/12	101	60 - 140	101	60 - 140	99	%		
5728084	o-Terphenyl	2018/09/13	83	60 - 130	88	60 - 130	83	%		
5728216	D10-Anthracene	2018/09/13	88	50 - 130	96	50 - 130	94	%		
5728216	D14-Terphenyl (FS)	2018/09/13	90	50 - 130	96	50 - 130	94	%		
5728216	D8-Acenaphthylene	2018/09/13	79	50 - 130	86	50 - 130	82	%		
5728285	o-Terphenyl	2018/09/12	104	60 - 130	79	60 - 130	86	%		
5728288	D10-Anthracene	2018/09/12	92	50 - 130	100	50 - 130	94	%		
5728288	D14-Terphenyl (FS)	2018/09/12	89	50 - 130	96	50 - 130	90	%		
5728288	D8-Acenaphthylene	2018/09/12	79	50 - 130	90	50 - 130	87	%		
5728347	Decachlorobiphenyl	2018/09/13	94	60 - 130	74	60 - 130	93	%		
5733612	2,4,5,6-Tetrachloro-m-xylene	2018/09/15	73	50 - 130	85	50 - 130	86	%		
5733612	Decachlorobiphenyl	2018/09/15	100	50 - 130	108	50 - 130	109	%		
5726360	1,1,1,2-Tetrachloroethane	2018/09/12	99	60 - 140	99	60 - 130	<0.050	ug/g	NC	50
5726360	1,1,1-Trichloroethane	2018/09/12	100	60 - 140	101	60 - 130	<0.050	ug/g	NC	50
5726360	1,1,2,2-Tetrachloroethane	2018/09/12	94	60 - 140	95	60 - 130	<0.050	ug/g	NC	50
5726360	1,1,2-Trichloroethane	2018/09/12	100	60 - 140	100	60 - 130	<0.050	ug/g	NC	50
5726360	1,1-Dichloroethane	2018/09/12	97	60 - 140	98	60 - 130	<0.050	ug/g	NC	50
5726360	1,1-Dichloroethylene	2018/09/12	99	60 - 140	100	60 - 130	<0.050	ug/g	NC	50
5726360	1,2-Dichlorobenzene	2018/09/12	98	60 - 140	99	60 - 130	<0.050	ug/g	NC	50
5726360	1,2-Dichloroethane	2018/09/12	97	60 - 140	99	60 - 130	<0.050	ug/g	NC	50
5726360	1,2-Dichloropropane	2018/09/12	93	60 - 140	94	60 - 130	<0.050	ug/g	NC	50
5726360	1,3-Dichlorobenzene	2018/09/12	102	60 - 140	104	60 - 130	<0.050	ug/g	NC	50
5726360	1,4-Dichlorobenzene	2018/09/12	108	60 - 140	110	60 - 130	<0.050	ug/g	NC	50
5726360	Acetone (2-Propanone)	2018/09/12	93	60 - 140	94	60 - 140	<0.50	ug/g	NC	50
5726360	Benzene	2018/09/12	96	60 - 140	97	60 - 130	<0.020	ug/g	NC	50
5726360	Bromodichloromethane	2018/09/12	94	60 - 140	95	60 - 130	<0.050	ug/g	NC	50
5726360	Bromoform	2018/09/12	89	60 - 140	89	60 - 130	<0.050	ug/g	NC	50
5726360	Bromomethane	2018/09/12	94	60 - 140	95	60 - 140	<0.050	ug/g	NC	50

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5726360	Carbon Tetrachloride	2018/09/12	99	60 - 140	100	60 - 130	<0.050	ug/g	NC	50
5726360	Chlorobenzene	2018/09/12	96	60 - 140	97	60 - 130	<0.050	ug/g	NC	50
5726360	Chloroform	2018/09/12	96	60 - 140	97	60 - 130	<0.050	ug/g	NC	50
5726360	cis-1,2-Dichloroethylene	2018/09/12	95	60 - 140	96	60 - 130	<0.050	ug/g	NC	50
5726360	cis-1,3-Dichloropropene	2018/09/12	91	60 - 140	91	60 - 130	<0.030	ug/g	NC	50
5726360	Dibromochloromethane	2018/09/12	93	60 - 140	94	60 - 130	<0.050	ug/g	NC	50
5726360	Dichlorodifluoromethane (FREON 12)	2018/09/12	95	60 - 140	98	60 - 140	<0.050	ug/g	NC	50
5726360	Ethylbenzene	2018/09/12	100	60 - 140	100	60 - 130	<0.020	ug/g	NC	50
5726360	Ethylene Dibromide	2018/09/12	94	60 - 140	95	60 - 130	<0.050	ug/g	NC	50
5726360	F1 (C6-C10) - BTEX	2018/09/12					<10	ug/g	NC	30
5726360	F1 (C6-C10)	2018/09/12	101	60 - 140	92	80 - 120	<10	ug/g	NC	30
5726360	Hexane	2018/09/12	96	60 - 140	97	60 - 130	<0.050	ug/g	NC	50
5726360	Methyl Ethyl Ketone (2-Butanone)	2018/09/12	92	60 - 140	93	60 - 140	<0.50	ug/g	NC	50
5726360	Methyl Isobutyl Ketone	2018/09/12	87	60 - 140	88	60 - 130	<0.50	ug/g	NC	50
5726360	Methyl t-butyl ether (MTBE)	2018/09/12	95	60 - 140	96	60 - 130	<0.050	ug/g	NC	50
5726360	Methylene Chloride(Dichloromethane)	2018/09/12	89	60 - 140	91	60 - 130	<0.050	ug/g	NC	50
5726360	o-Xylene	2018/09/12	97	60 - 140	97	60 - 130	<0.020	ug/g	NC	50
5726360	p+m-Xylene	2018/09/12	98	60 - 140	98	60 - 130	<0.020	ug/g	NC	50
5726360	Styrene	2018/09/12	96	60 - 140	96	60 - 130	<0.050	ug/g	NC	50
5726360	Tetrachloroethylene	2018/09/12	99	60 - 140	99	60 - 130	<0.050	ug/g	NC	50
5726360	Toluene	2018/09/12	95	60 - 140	95	60 - 130	<0.020	ug/g	NC	50
5726360	Total Xylenes	2018/09/12					<0.020	ug/g	NC	50
5726360	trans-1,2-Dichloroethylene	2018/09/12	96	60 - 140	98	60 - 130	<0.050	ug/g	NC	50
5726360	trans-1,3-Dichloropropene	2018/09/12	90	60 - 140	88	60 - 130	<0.040	ug/g	NC	50
5726360	Trichloroethylene	2018/09/12	98	60 - 140	99	60 - 130	<0.050	ug/g	NC	50
5726360	Trichlorofluoromethane (FREON 11)	2018/09/12	103	60 - 140	104	60 - 130	<0.050	ug/g	NC	50
5726360	Vinyl Chloride	2018/09/12	91	60 - 140	93	60 - 130	<0.020	ug/g	NC	50
5727974	WAD Cyanide (Free)	2018/09/13	100	75 - 125	100	80 - 120	<0.01	ug/g	NC	35
5728070	Moisture	2018/09/12							1.6	20
5728084	F2 (C10-C16 Hydrocarbons)	2018/09/13	102	50 - 130	100	80 - 120	<10	ug/g	NC	30
5728084	F3 (C16-C34 Hydrocarbons)	2018/09/13	100	50 - 130	99	80 - 120	<50	ug/g	NC	30

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5728084	F4 (C34-C50 Hydrocarbons)	2018/09/13	95	50 - 130	93	80 - 120	<50	ug/g	NC	30
5728216	1-Methylnaphthalene	2018/09/13	102	50 - 130	98	50 - 130	<0.0050	ug/g	NC	40
5728216	2-Methylnaphthalene	2018/09/13	91	50 - 130	87	50 - 130	<0.0050	ug/g	NC	40
5728216	Acenaphthene	2018/09/13	90	50 - 130	85	50 - 130	<0.0050	ug/g	NC	40
5728216	Acenaphthylene	2018/09/13	86	50 - 130	82	50 - 130	<0.0050	ug/g	NC	40
5728216	Anthracene	2018/09/13	91	50 - 130	87	50 - 130	<0.0050	ug/g	NC	40
5728216	Benzo(a)anthracene	2018/09/13	93	50 - 130	87	50 - 130	<0.0050	ug/g	NC	40
5728216	Benzo(a)pyrene	2018/09/13	90	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40
5728216	Benzo(b/j)fluoranthene	2018/09/13	94	50 - 130	93	50 - 130	<0.0050	ug/g	NC	40
5728216	Benzo(g,h,i)perylene	2018/09/13	80	50 - 130	77	50 - 130	<0.0050	ug/g	NC	40
5728216	Benzo(k)fluoranthene	2018/09/13	88	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40
5728216	Chrysene	2018/09/13	94	50 - 130	91	50 - 130	<0.0050	ug/g	NC	40
5728216	Dibenz(a,h)anthracene	2018/09/13	79	50 - 130	70	50 - 130	<0.0050	ug/g	NC	40
5728216	Fluoranthene	2018/09/13	99	50 - 130	96	50 - 130	<0.0050	ug/g	NC	40
5728216	Fluorene	2018/09/13	91	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40
5728216	Indeno(1,2,3-cd)pyrene	2018/09/13	83	50 - 130	77	50 - 130	<0.0050	ug/g	NC	40
5728216	Naphthalene	2018/09/13	85	50 - 130	82	50 - 130	<0.0050	ug/g	NC	40
5728216	Phenanthrene	2018/09/13	89	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40
5728216	Pyrene	2018/09/13	99	50 - 130	95	50 - 130	<0.0050	ug/g	NC	40
5728226	Moisture	2018/09/13							1.6	20
5728285	F2 (C10-C16 Hydrocarbons)	2018/09/12	119	50 - 130	93	80 - 120	<10	ug/g	NC	30
5728285	F3 (C16-C34 Hydrocarbons)	2018/09/12	121	50 - 130	92	80 - 120	<50	ug/g	NC	30
5728285	F4 (C34-C50 Hydrocarbons)	2018/09/12	113	50 - 130	86	80 - 120	<50	ug/g	NC	30
5728288	1-Methylnaphthalene	2018/09/12	87	50 - 130	90	50 - 130	<0.0050	ug/g	NC	40
5728288	2-Methylnaphthalene	2018/09/12	83	50 - 130	84	50 - 130	<0.0050	ug/g	NC	40
5728288	Acenaphthene	2018/09/12	91	50 - 130	92	50 - 130	<0.0050	ug/g	NC	40
5728288	Acenaphthylene	2018/09/12	89	50 - 130	90	50 - 130	<0.0050	ug/g	NC	40
5728288	Anthracene	2018/09/12	96	50 - 130	92	50 - 130	<0.0050	ug/g	NC	40
5728288	Benzo(a)anthracene	2018/09/12	93	50 - 130	94	50 - 130	<0.0050	ug/g	NC	40
5728288	Benzo(a)pyrene	2018/09/12	89	50 - 130	86	50 - 130	<0.0050	ug/g	NC	40
5728288	Benzo(b/j)fluoranthene	2018/09/12	96	50 - 130	98	50 - 130	<0.0050	ug/g	NC	40

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QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5728288	Benzo(g,h,i)perylene	2018/09/12	73	50 - 130	74	50 - 130	<0.0050	ug/g	NC	40
5728288	Benzo(k)fluoranthene	2018/09/12	91	50 - 130	95	50 - 130	<0.0050	ug/g	NC	40
5728288	Chrysene	2018/09/12	98	50 - 130	98	50 - 130	<0.0050	ug/g	NC	40
5728288	Dibenz(a,h)anthracene	2018/09/12	83	50 - 130	76	50 - 130	<0.0050	ug/g	NC	40
5728288	Fluoranthene	2018/09/12	101	50 - 130	104	50 - 130	<0.0050	ug/g	NC	40
5728288	Fluorene	2018/09/12	87	50 - 130	89	50 - 130	<0.0050	ug/g	NC	40
5728288	Indeno(1,2,3-cd)pyrene	2018/09/12	82	50 - 130	82	50 - 130	<0.0050	ug/g	NC	40
5728288	Naphthalene	2018/09/12	83	50 - 130	88	50 - 130	<0.0050	ug/g	NC	40
5728288	Phenanthrene	2018/09/12	91	50 - 130	99	50 - 130	<0.0050	ug/g	NC	40
5728288	Pyrene	2018/09/12	100	50 - 130	102	50 - 130	<0.0050	ug/g	NC	40
5728347	Aroclor 1242	2018/09/13					<0.010	ug/g	NC	50
5728347	Aroclor 1248	2018/09/13					<0.010	ug/g	NC	50
5728347	Aroclor 1254	2018/09/13					<0.010	ug/g	NC	50
5728347	Aroclor 1260	2018/09/13	102	30 - 130	80	30 - 130	<0.010	ug/g	NC	50
5728347	Total PCB	2018/09/13	102	30 - 130	80	30 - 130	<0.010	ug/g	NC	50
5728713	Chromium (VI)	2018/09/13	67 (1)	70 - 130	89	80 - 120	<0.2	ug/g	NC	35
5728767	Available (CaCl2) pH	2018/09/13			100	97 - 103			0.84	N/A
5728797	Conductivity	2018/09/13			104	90 - 110	<0.002	mS/cm	2.9	10
5729057	Soluble (20:1) Sulphate (SO4)	2018/09/13	111	70 - 130	108	70 - 130	<20	ug/g	NC	35
5729081	Acid Extractable Antimony (Sb)	2018/09/13	98	75 - 125	94	80 - 120	<0.20	ug/g	NC	30
5729081	Acid Extractable Arsenic (As)	2018/09/13	105	75 - 125	100	80 - 120	<1.0	ug/g	5.3	30
5729081	Acid Extractable Barium (Ba)	2018/09/13	96	75 - 125	99	80 - 120	<0.50	ug/g	1.1	30
5729081	Acid Extractable Beryllium (Be)	2018/09/13	99	75 - 125	95	80 - 120	<0.20	ug/g	NC	30
5729081	Acid Extractable Boron (B)	2018/09/13	97	75 - 125	95	80 - 120	<5.0	ug/g	4.6	30
5729081	Acid Extractable Cadmium (Cd)	2018/09/13	101	75 - 125	95	80 - 120	<0.10	ug/g	36 (2)	30
5729081	Acid Extractable Chromium (Cr)	2018/09/13	101	75 - 125	100	80 - 120	<1.0	ug/g	4.2	30
5729081	Acid Extractable Cobalt (Co)	2018/09/13	99	75 - 125	99	80 - 120	<0.10	ug/g	3.8	30
5729081	Acid Extractable Copper (Cu)	2018/09/13	100	75 - 125	99	80 - 120	<0.50	ug/g	11	30
5729081	Acid Extractable Lead (Pb)	2018/09/13	NC	75 - 125	100	80 - 120	<1.0	ug/g	2.8	30
5729081	Acid Extractable Mercury (Hg)	2018/09/13	99	75 - 125	97	80 - 120	<0.050	ug/g	NC	30
5729081	Acid Extractable Molybdenum (Mo)	2018/09/13	103	75 - 125	97	80 - 120	<0.50	ug/g	2.1	30

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QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5729081	Acid Extractable Nickel (Ni)	2018/09/13	101	75 - 125	99	80 - 120	<0.50	ug/g	1.1	30
5729081	Acid Extractable Selenium (Se)	2018/09/13	105	75 - 125	105	80 - 120	<0.50	ug/g	NC	30
5729081	Acid Extractable Silver (Ag)	2018/09/13	101	75 - 125	100	80 - 120	<0.20	ug/g	NC	30
5729081	Acid Extractable Thallium (Tl)	2018/09/13	100	75 - 125	99	80 - 120	<0.050	ug/g	20	30
5729081	Acid Extractable Uranium (U)	2018/09/13	103	75 - 125	100	80 - 120	<0.050	ug/g	2.2	30
5729081	Acid Extractable Vanadium (V)	2018/09/13	105	75 - 125	97	80 - 120	<5.0	ug/g	6.0	30
5729081	Acid Extractable Zinc (Zn)	2018/09/13	NC	75 - 125	99	80 - 120	<5.0	ug/g	3.3	30
5729121	Conductivity	2018/09/13			104	90 - 110	<0.002	mS/cm	1.9	10
5729138	Hot Water Ext. Boron (B)	2018/09/13	98	75 - 125	98	75 - 125	<0.050	ug/g	NC	40
5733612	a-Chlordane	2018/09/15	78	50 - 130	89	50 - 130	<0.0020	ug/g	NC	40
5733612	Aldrin	2018/09/15	71	50 - 130	82	50 - 130	<0.0020	ug/g	NC	40
5733612	Aroclor 1242	2018/09/15					<0.015	ug/g	NC	40
5733612	Aroclor 1248	2018/09/15					<0.015	ug/g	NC	40
5733612	Aroclor 1254	2018/09/15					<0.015	ug/g	NC	40
5733612	Aroclor 1260	2018/09/15					<0.015	ug/g	NC	40
5733612	Dieldrin	2018/09/15	98	50 - 130	102	50 - 130	<0.0020	ug/g	NC	40
5733612	Endosulfan I (alpha)	2018/09/15	97	50 - 130	96	50 - 130	<0.0020	ug/g	NC	40
5733612	Endosulfan II (beta)	2018/09/15	78	50 - 130	97	50 - 130	<0.0020	ug/g	NC	40
5733612	Endrin	2018/09/15	81	50 - 130	91	50 - 130	<0.0020	ug/g	NC	40
5733612	g-Chlordane	2018/09/15	73	50 - 130	86	50 - 130	<0.0020	ug/g	NC	40
5733612	Heptachlor epoxide	2018/09/15	74	50 - 130	79	50 - 130	<0.0020	ug/g	NC	40
5733612	Heptachlor	2018/09/15	79	50 - 130	81	50 - 130	<0.0020	ug/g	NC	40
5733612	Hexachlorobenzene	2018/09/15	89	50 - 130	99	50 - 130	<0.0020	ug/g	NC	40
5733612	Hexachlorobutadiene	2018/09/15	82	50 - 130	93	50 - 130	<0.0020	ug/g	NC	40
5733612	Hexachloroethane	2018/09/15	61	50 - 130	78	50 - 130	<0.0020	ug/g	NC	40
5733612	Lindane	2018/09/15	68	50 - 130	78	50 - 130	<0.0020	ug/g	NC	40
5733612	Methoxychlor	2018/09/15	100	50 - 130	89	50 - 130	<0.0050	ug/g	NC	40
5733612	o,p-DDD	2018/09/15	89	50 - 130	101	50 - 130	<0.0020	ug/g	NC	40
5733612	o,p-DDE	2018/09/15	78	50 - 130	94	50 - 130	<0.0020	ug/g	NC	40
5733612	o,p-DDT	2018/09/15	79	50 - 130	94	50 - 130	<0.0020	ug/g	NC	40
5733612	p,p-DDD	2018/09/15	83	50 - 130	106	50 - 130	<0.0020	ug/g	NC	40

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QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
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Site Location: DURHAM EMS
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5733612	p,p-DDE	2018/09/15	105	50 - 130	101	50 - 130	<0.0020	ug/g	NC	40
5733612	p,p-DDT	2018/09/15	76	50 - 130	94	50 - 130	<0.0020	ug/g	NC	40

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) The matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample. The matrix spike was reanalyzed to confirm result.

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B8N4839
Report Date: 2018/09/17

exp Services Inc
Client Project #: BRM-00604892-A0
Site Location: DURHAM EMS
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Service Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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10-Sep-18 15:11
Deepthi Shaji
B8N4839
MAF ENV-1282

Page 1 of 2

ottle Order #: 665931
oject Manager: Deepthi Shaji
C#665931-65-01

IMMEDIATE

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:	
Company Name:	#17435 / exp Services Inc	Company Name:	Payam Saboni; Stacy Meek	Quotation #:	B45998
Attention:	Simon Lan	Attention:	~~Paula Rotenberg~~	P.O. #:	
Address:	220 Commerce Valley Dr W Suite 500	Address:	Payam.saboni@exp.com	Project:	BRM-00604992-A0
	Markham ON L3T 0A8		Stacy.meek@exp.com	Project Name:	Durham EMS
Tel:	(905) 695-3217 Fax:	Tel:	(905) 695-3217 Ext: 3670 Fax:	Site #:	
Email:	simon.lan@exp.com; AP@exp.com	Email:	~~Paula.Rotenberg@exp.com~~, simon.lan@exp.com	Sampled By:	PS

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
[X] Table 1 [ ] Res/Park [ ] Medium/Fine	[ ] CCME [ ] Sanitary Sewer Bylaw	
[ ] Table 2 [ ] Ind/Comm [ ] Coarse	[ ] Reg 558 [ ] Storm Sewer Bylaw	
[ ] Table 3 [ ] Agri/Other [X] For RSC	[ ] MISA Municipality _____	
[ ] Table ___	[ ] PWQO	
	[ ] Other _____	

Include Criteria on Certificate of Analysis (Y/N)? _____

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC): Metals + Inorganics; VOCs PHC (F1-F4); OC Pesticides; PAHs; PCBs

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: [X]
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: _____ Time Required: _____
Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals + Inorganics	VOCs PHC (F1-F4)	OC Pesticides	PAHs	PCBs	# of Bottles	Comments
1		BH103 SS6	18/09/04	5:00pm	SOIL	X	X	X	X	X	6	
2		BH103 SS6D	↓	5:15pm					X	X	1	
3		BH102 SS4	18/09/05	8:45am								
4		BH102 SS5		9:00am			X				3	
5		BH102 SS5D		9:15am			X				3	
6		BH102 SS6		9:20am				X			1	
7		BH102 SS6D		9:30am				X			1	
8		BH102 SS4		8:45am		X			X	X	2	
9		BH101 SS3		11:00am			X				3	
10		BH101 SS5	↓	11:15am	↓				X	X	1	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Payam Saboni / Payam Saboni	18/09/10	11:00am	Oleh VLADA MARKEVICH	2018/09/10	15:10	

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Recei 7/0/-1	Custody Seal Present	Yes	No
		Intact	Y	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxa Yellow: Client

406019

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CHAIN OF CUSTODY RECORD

Page 2 of 2

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#17485 exp Services Inc	Company Name:	Payam Sabori; Stacy Meek	Quotation #:	B45998	Maxxam Job #: B8 4839	Bottle Order #: 665931
Attention:	Simon Lan	Attention:	~~Paula Rotenberg~~	P.O. #:			
Address:	220 Commerce Valley Dr W Suite 500	Address:	Payam.Sabori@exp.com	Project:	Durham EMS		
	Markham ON L3T 0A8		Stacy.meek@exp.com	Project Name:	BRM-00604892-A0	COC #: C#665931-66-01	Project Manager: Deepthi Shaji
Tel:	(905) 695-3217 Fax:	Tel:	(905) 695-3217 Ext: 3670 Fax:	Site #:			
Email:	simon.lan@exp.com; AP@exp.com	Email:	~~Paula.Rotenberg@exp.com, simon.lan@exp.com~~	Sampled By:	RS		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
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[ ] Table 2 [ ] Ind/Comm [ ] Coarse	[ ] Reg 558 [ ] Storm Sewer Bylaw	
[ ] Table 3 [ ] Agri/Other [X] For RSC	[ ] MISA Municipality _____	
[ ] Table ___	[ ] PWQO	
	[ ] Other _____	

Include Criteria on Certificate of Analysis (Y/N)? _____

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Field Filtered (please circle): Metals / Hg / Cr VI

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: [X]
(will be applied if Rush TAT is not specified).
Standard TAT = 5-7 Working days for most tests.
Please note. Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: _____ Time Required: _____ [ ]
Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Metals + Inorganics	Or pesticide	PH and Sulphate							# of Bottles	Comments
1		BH 101 556	18/09/05	11:30am	SOIL		X	X								2	
2		BH 101 556D	↓	11:45am	↓		X									1	
3		BH 8 553	18/09/30	10:00am	SOIL				X							1	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Recei	Custody Seal Present	Yes	No
Payam Sabori / Payam Sabori	18/09/10	11:30am	SEE PAGE 1					7/0/-1	Intact	Y	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

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** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

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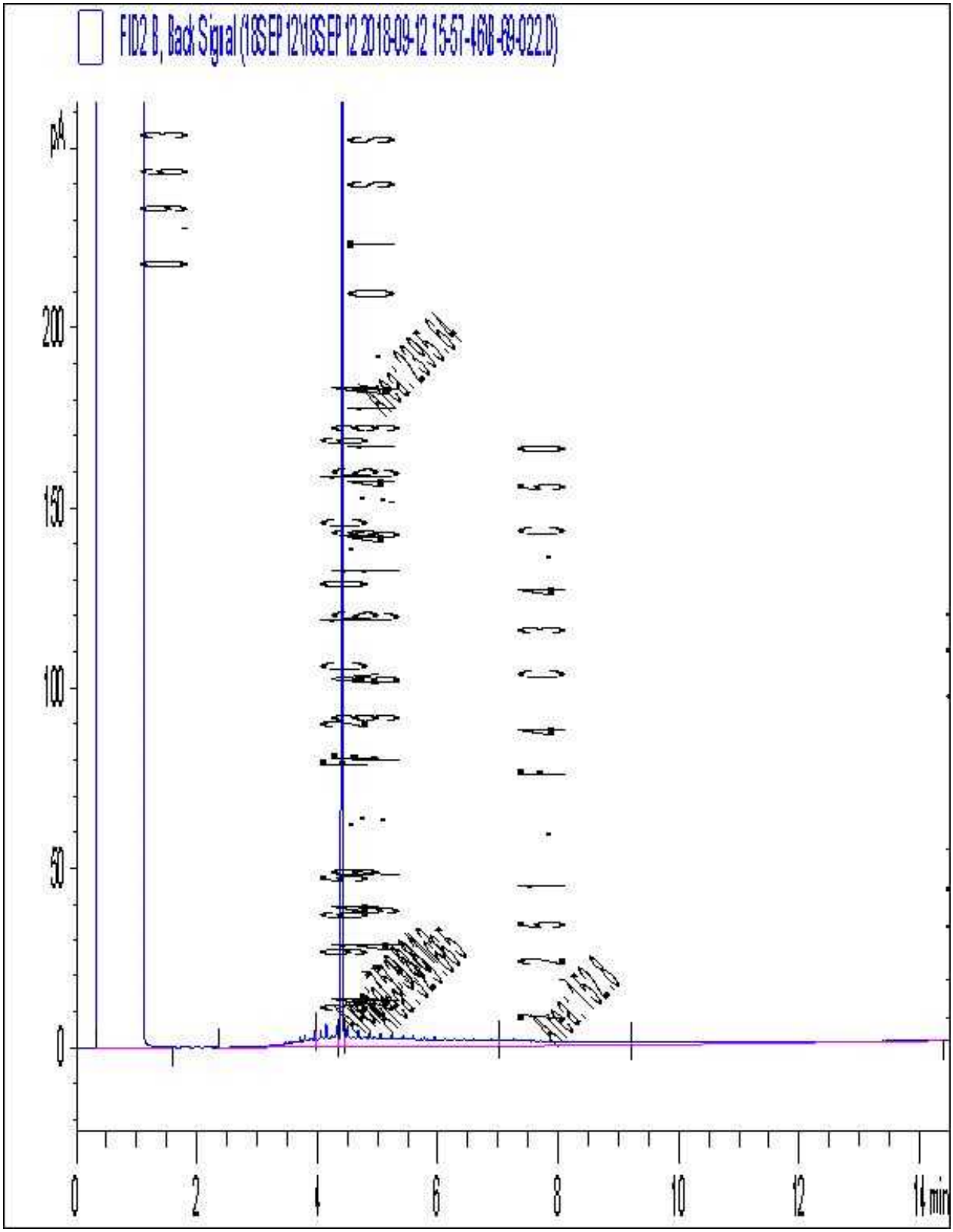
Maxxam Job #: B8N4839
Report Date: 2018/09/17
Maxxam Sample: HSA744

exp Services Inc
Client Project #: BRM-00604892-A0
Project name: DURHAM EMS
Client ID: BH103 SS6

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

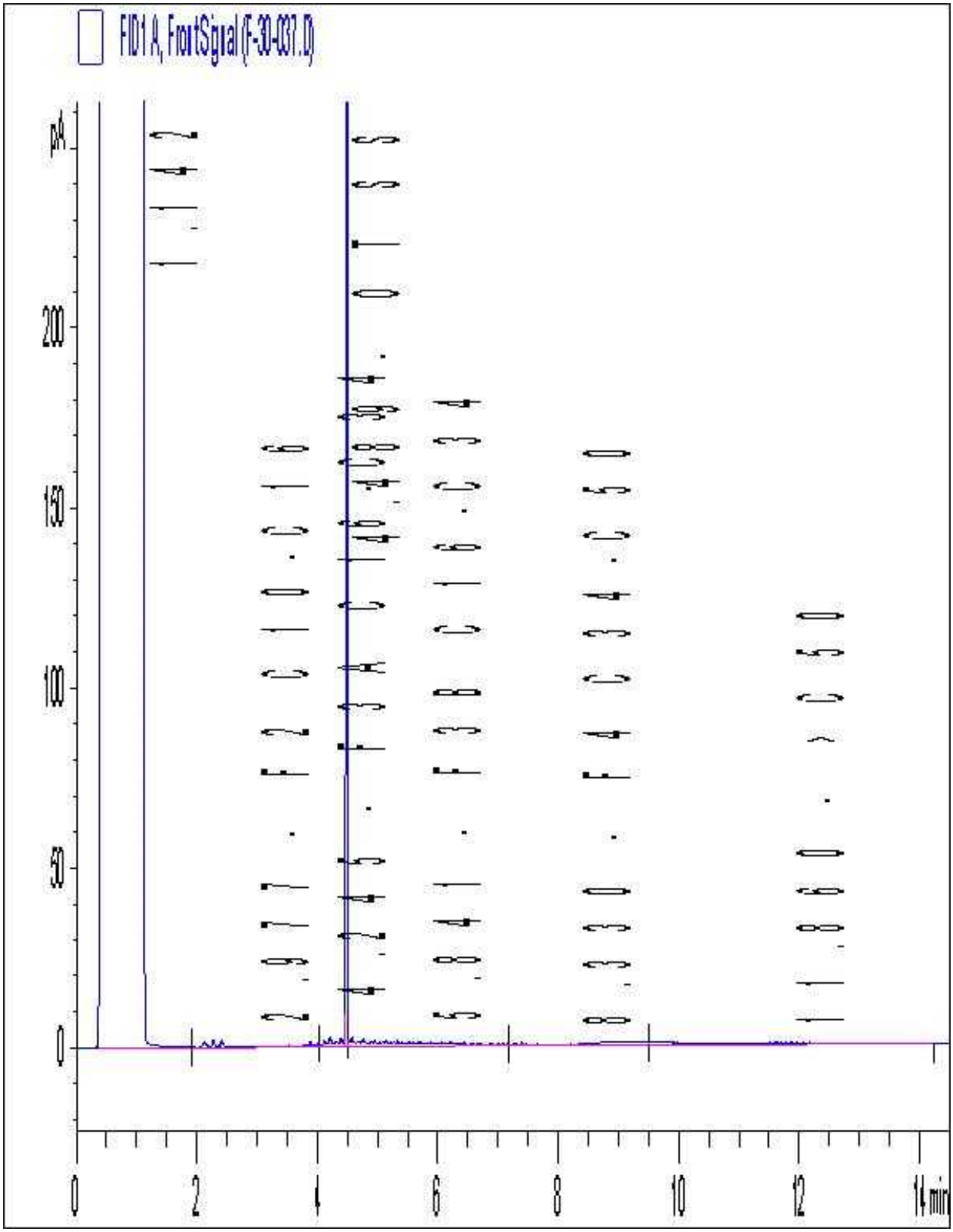


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8N4839
Report Date: 2018/09/17
Maxxam Sample: HSA747

exp Services Inc
Client Project #: BRM-00604892-A0
Project name: DURHAM EMS
Client ID: BH102 SS5

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

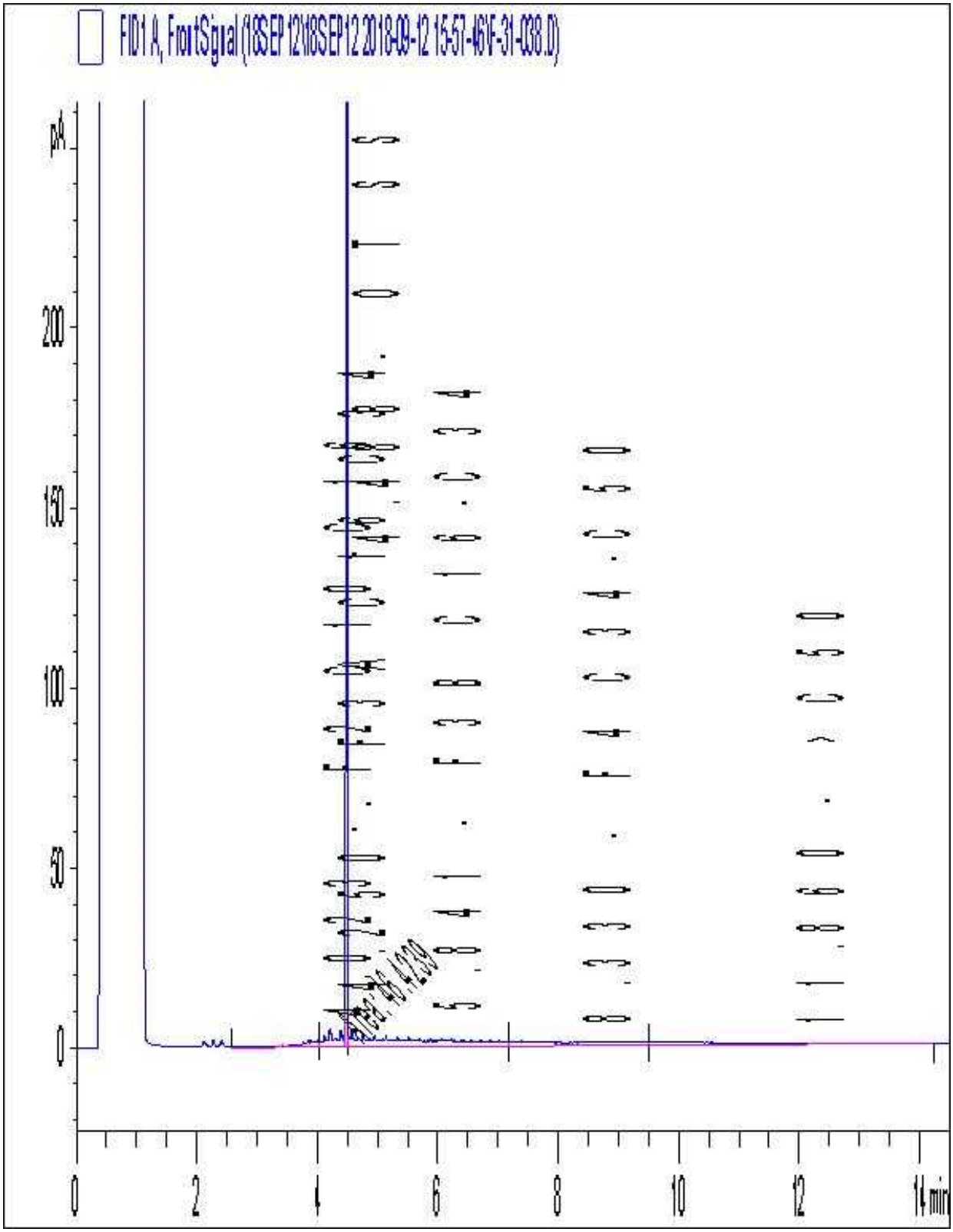


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8N4839
Report Date: 2018/09/17
Maxxam Sample: HSA748

exp Services Inc
Client Project #: BRM-00604892-A0
Project name: DURHAM EMS
Client ID: BH102 SS5D

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

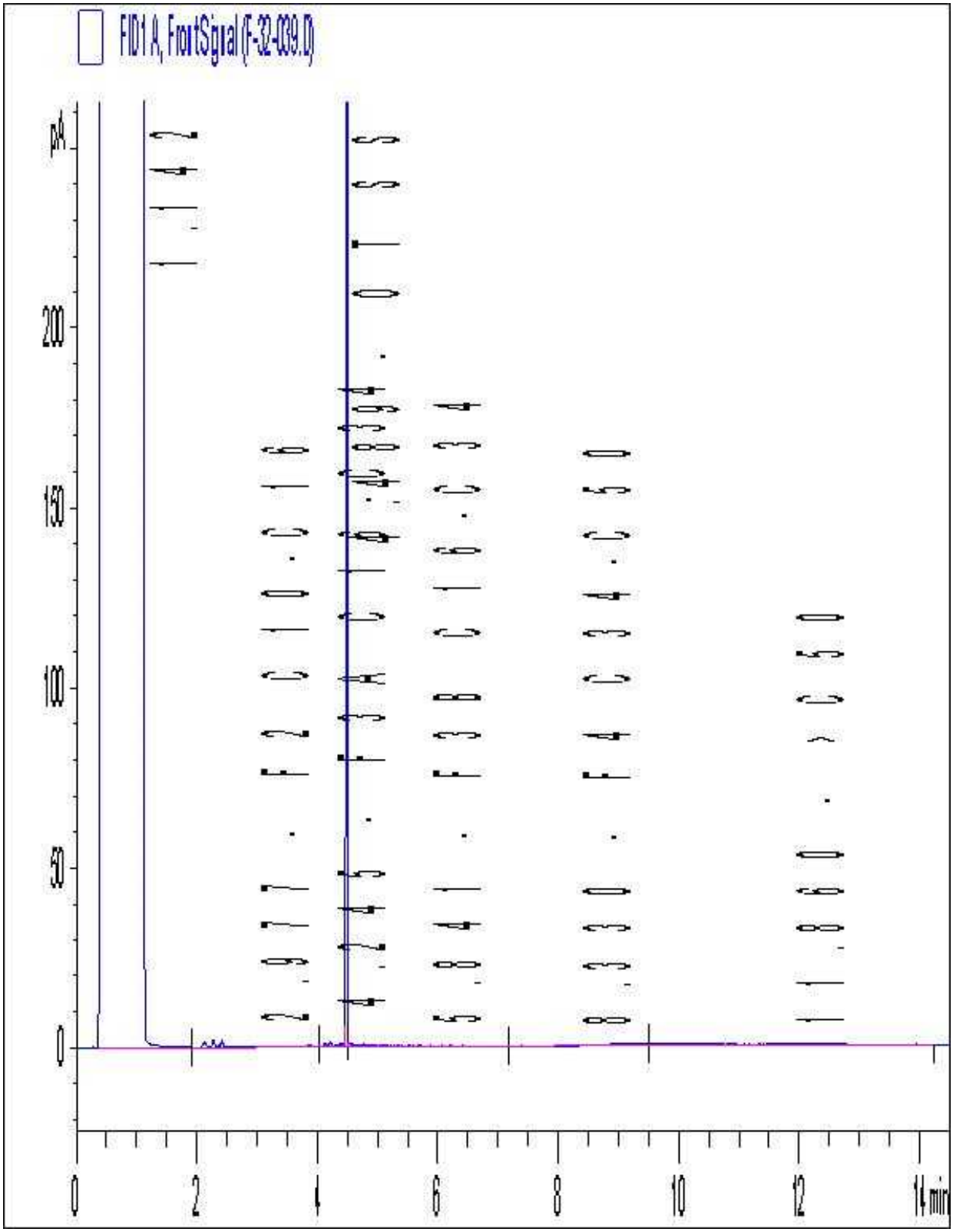


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B8N4839
Report Date: 2018/09/17
Maxxam Sample: HSA751

exp Services Inc
Client Project #: BRM-00604892-A0
Project name: DURHAM EMS
Client ID: BH101 SS3

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

April 7, 2021

The Regional Municipality of Durham
605 Rossland Road East
Whitby, ON L1N 6A3

Attention: Sameh George Wahba, P.Eng
Senior Project Engineer

Re: Phase One Environmental Site Assessment Update
Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario
BRM-00604892-B0

1. Introduction

EXP Services Inc. (EXP) pleased to present the findings of a Phase One Environmental Site Assessment (ESA) Update for the above noted property. Hereinafter referred to as the 'Site' or 'Phase One Property'. This purpose of this study is to update the current environmental conditions of the Site in accordance with Ontario Regulation 153/04 (as amended) in support of the proposed development on the Site.

2. Previous Phase One Environmental Site Assessment

EXP had previously completed a study entitled, "Phase One Environmental Site Assessment, Proposed Pickering Emergency Medical Services (EMS) Facility, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario," dated October 15, 2018. The Phase One Conceptual Site Model from the 2018 Phase One Environmental Site Assessment is summarized below.

The Site is located at the northwest Corner of Concession Road 5 and Sideline 16 in Pickering, Ontario. The Site is irregular in shape with approximately 100 m of frontage along the Concession 5 Road and approximately 165 m of frontage along Sideline 16. The Site is approximately 1.67 hectares (~4.1 acres) in size in size. The legal description and Property Identification Numbers (PIN) of Site is Part of Lot 17, Concession 5, being further designated as Part 10 on Registered Plan 40R-29609, City of Pickering, Regional Municipality of Durham, Ontario (PIN 26402-0094).

At the time of the 2018 Phase One ESA, the Site consists primarily of undeveloped land under agricultural use. No permanent structures were developed on Site. The Phase One Property was covered with rows of various tree types planted by Dutchmaster Nurseries Limited. The planted trees are planned to be harvested in 1 to 2 years time.

Through a review of available historical information, it appears that the property has historically been under agricultural use.

The Site was owned by The Regional Municipality of Durham, who acquired the property in 2016. The approximate Universal Transverse Mercator (UTM) coordinates for the centroid of the Phase One Property was NAD83 17- 4863075N and 653387E.

Based on geological maps reviewed, the Site is underlain predominantly by Halton Till (Ontario -Erie Lobe) predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor. The bedrock in the general area was Upper Ordovician (Georgian Bay Formation) consisting of shale, limestone, dolostone and siltstone. The overall topography of the Site is generally sloping downward to the southwest.

Based on topographic maps reviewed, the shallow groundwater gradient in the area of the Phase One Property likely follows the topography of the surrounding area and may be influenced by the presence of swale land west adjacent to the Site. The swale land is observed to be sloping in the southwest direction towards the tributary of Urfe Creek located approximately 1 km southwest of Site.

The Phase One Property is not located in close proximity to an area of natural significance. The Phase One Property is not located within, adjacent to or within 30 m of an area of natural significance, as referenced in the Ontario Ministry of Natural Resources information reviewed.

During the 2018 Phase One ESA site visit, no potentially contaminating activities (PCAs) were identified on the Phase One Property.

Four (4) PCAs were identified within a 250 m radius study of RSC Property, summarized below

- **PCA 1:** A spill record for 0.5L furnace oil spill due to above ground storage tank leak to land occurred in 2003. The ERIS report indicated that that environmental impact to land due to the oil spill was not anticipated. The location of the spill is considered to be trans-gradient to the Site with respect to the direction of groundwater flow. Given the volume of the spill, direction of groundwater flow and that environmental impact to land was not anticipated, this PCA does not present an APEC on the Phase One Property.

- **PCA 2:** Brock North landfill site is located approximately 50m northeast of the Site, on the opposite side of Sideline 16. The recently completed geotechnical investigation included limited soil and groundwater testing on the Phase One Property, which included ground water sample from three (3) monitoring wells along the northeast boundary of Site and tested for OC pesticides, PCBs, BTEX and PHCs, VOCs, PAHs, metals and inorganic parameters. The analytical results of the groundwater samples were found to have met the MECP Table 1 Site Condition Standards for all property use. As such, the Phase One Property did not appear to be impacted by the landfill, and does not present an APEC on the Phase One Property.

- **PCA 3:** Standard Aggregates Inc. was listed with a former fuel storage facility 150 m east of the Site. Due to the significant distance away from the Site, the former fuel storage facility does not present an APEC to the Site.

- **PCA 4:** The adjacent property northwest of the Site was approved by the MECP for the deposit of organic biosolid sludge waste. As this PCA is located down-gradient of inferred groundwater flow, it is not expected to present an APEC on the Phase One Property.

3. Scope of Work

The current Phase One ESA Update includes the following components:

1. Records Review;
2. Visual Site Assessment;
3. Evaluation of Information; and
4. Completion of a Phase One ESA Update letter

3.1 Records Review

Historical records including Fire Insurance Plans (FIPs), city directories, aerial photographs and previous environmental reports were reviewed in the 2018 EXP Phase One ESA report and remain unchanged.

For the purpose of this Phase One ESA Update, EXP requested an updated Environmental Risk Information Services Ltd (ERIS) report for the Site and surrounding properties within a 250-metre radius of the approximate centroid of the Site. No additional records were reported since the ERIS report from the 2018 EXP Phase One ESA. For additional information, refer to the ERIS Report, dated April 1, 2021 in Appendix A.

In addition, a request for information was submitted to the Ontario Ministry of the Environment, Conservation and Parks (MECP) Freedom of Information, Protection of Privacy Office for information in their files regarding the Site that pertain to any Environmental Concerns, Orders and Spills from 2018 to 2021. A written response from the MECP typically requires several months. If upon receipt of the response from the MECP, any significant environmental issues are identified, EXP will forward their response to the Client as an addendum to this letter. A copy of the request is included in Appendix B.

The Technical Standards and Safety Authority (TSSA) is the Provincial regulatory agency responsible for overseeing the storage of fuels in Ontario. As such, the TSSA maintains a database (approximately 1987 to present) of all registered fuel storage tanks in Ontario. On March 29, 2021 the TSSA was contacted by e-mail and requested to search the TSSA database for records of fuel storage at the Site and it was reported that the TSSA database did not identify any records of fuel storage at the Site. The e-mail correspondence with the TSSA is presented in Appendix B.

3.2 Visual Site Assessment

On March 30, 2021, Ms. Rachel Baldwin of EXP conducted the Site visit in accordance with EXP's internal health and safety protocols and with the Ministry of Labour health and safety regulations. The purpose of the visit was to assess the current conditions of the Site. At the time of EXP's Site visit the weather was clear and sunny with an average temperature of 10°C.

The Site and the adjoining properties were observed from the Site and/or publicly accessible areas. Photographs documenting the Site visit are included in Appendix C.

At the time of the Site visit, the Phase One Property was undeveloped and under agricultural use. The single row planted trees noted on Site in the 2018 EXP Phase One ESA were no longer present at the time of the Site visit. The Site was not improved with any permanent structures or buildings. The overall topography of the Site is generally sloping downward to the southwest.

No deviations from the Specific Observations at Phase One Property (Section 6.2) in the 2018 EXP Phase One ESA report were noted at the time of the current Site visit, with the exception of the presence of eight (8) monitoring wells associated with a Geotechnical Investigation conducted on the Phase One Property.

Additionally, the Adjacent and Surrounding Properties (Section 6.4) have changed since the 2018 EXP Phase One ESA report. Agricultural and/or residential land use was identified on the adjacent and surrounding properties to the north and west. The south adjacent property (across Concession Road 5) was undergoing earthworks for construction. The property southeast of the Site was under parkland use (cemetery). The east adjacent property is under rural residential land use (residential dwelling) and industrial land use (former landfill). Further to the east of the residential dwelling was a containers and equipment storage facility with roadway access for vehicular traffic to an aggregate storage area located northeast of the Site.

3.3 Review and Evaluation

Based upon review of the available information, including Site observations, review of environmental databases, historical information and pending information requested from the MECP, no new PCAs from those outlined in the 2018 EXP Phase One ESA were identified. As such, no new APECs are identified on the Phase One Property.

4. Conclusions

Based on the findings of this Phase One ESA Update, it is our opinion that a Phase Two ESA (i.e. sampling and analysis) is not required at this time.

5. Signatures

This Phase One ESA Update was conducted under the supervision of Ms. Stacy Meek, a Qualified Person, who hereby confirms the carrying out of this Phase One ESA and the findings and conclusions of this report.

Rachel Baldwin
Geo-Environmental Scientist
Earth and Environment

Stacy Meek, P.Eng
Senior Project Manager
Earth and Environment

Encl: Figures
Appendix A – ERIS Report
Appendix B – Regulatory Requests
Appendix C – Site Photographs

FIGURES

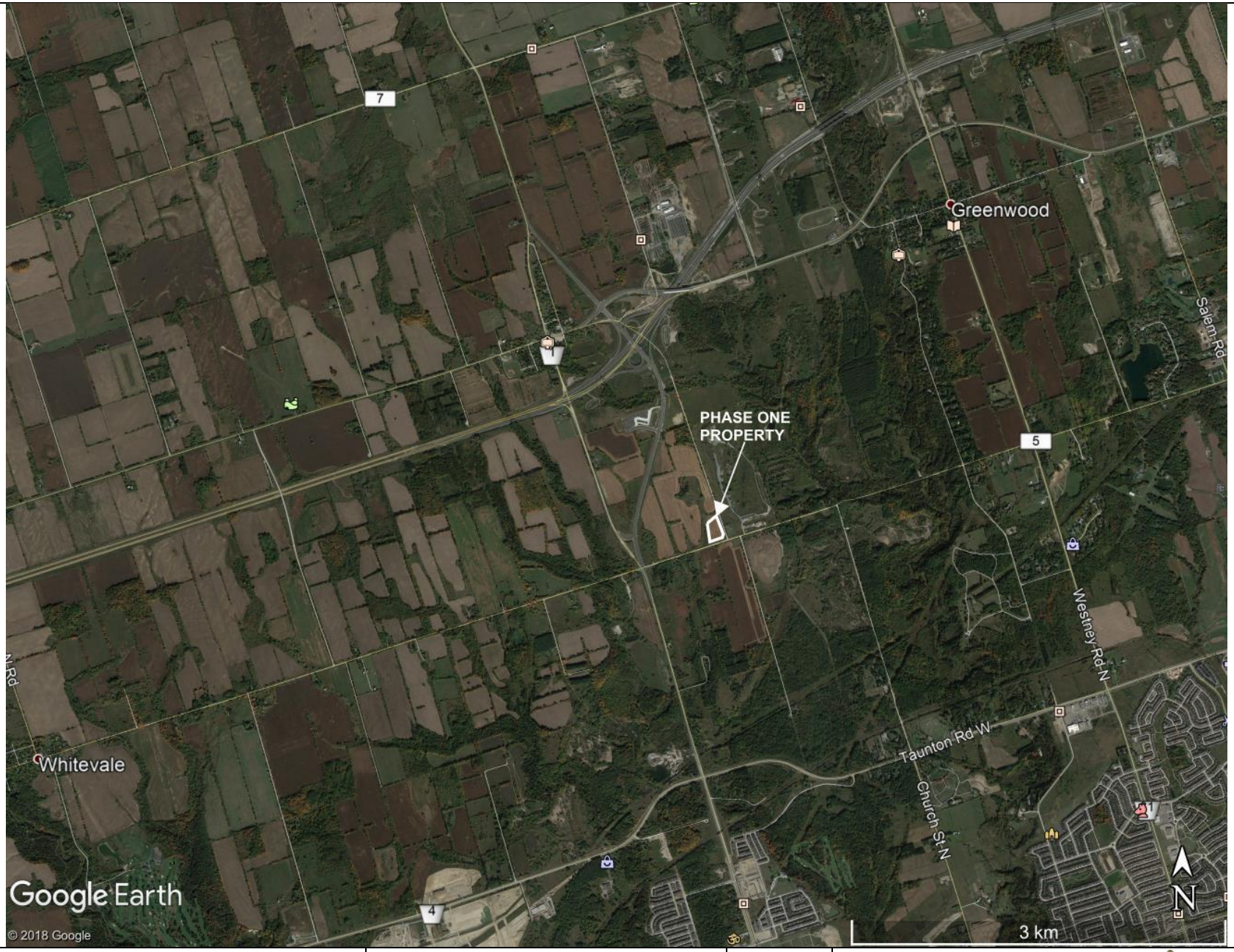


Figure 1: Site Location Plan
Phase One Environmental Site Assessment
Northwest Corner of Concession Road 5 and Sideline 16, Pickering, ON

Project Number: BRM-00604892-B0
Date: April 2021
Drawn By: RB
Checked By: SM

N

220 Commerce Valley Drive West
Suite 110
Markham, Ontario L3T 0A8
(905) 695-3217 www.exp.com

Figure 2: Site Plan
Phase One Environmental Site Assessment
Northwest Corner of Concession Road 5 and Sideline 16, Pickering, ON

Project Number: BRM-00604892-B0
Date: April 2021
Drawn By: RB
Checked By: SM

N

220 Commerce Valley Drive West
Suite 110
Markham, Ontario L3T 0A8
(905) 695-3217 www.exp.com

APPENDIX A

ENVIRONMENTAL RISK INFORMATION SERVICES

DATABASE REPORT

Project Property:	*Concession Road 5 and Sideline 16, Pickering* *1805 Concession Road 5* *Pickering ON L1X 2R2*
Project No:	*BRM-00604892-B0*
Report Type:	*Standard Report*
Order No:	*21032900899*
Requested by:	*exp Services Inc.*
Date Completed:	*April 1, 2021*

Environmental Risk Information Services
A division of Glacier Media Inc.
1.866.517.5204 | info@erisinfo.com | erisinfo.com

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Executive Summary

Property Information:

Project Property:	*Concession Road 5 and Sideline 16, Pickering* *1805 Concession Road 5 Pickering ON L1X 2R2*
Project No:	*BRM-00604892-B0*

Coordinates:

Latitude:	*43.9050023*
Longitude:	*-79.0898086*
UTM Northing:	*4,863,095.27*
UTM Easting:	*653,393.18*
UTM Zone:	*17T*

Elevation:	*494 FT* *150.62 M*

Order Information:

Order No:	*21032900899*
Date Requested:	*March 29, 2021*
Requested by:	*exp Services Inc.*
Report Type:	*Standard Report*

Historical/Products:

Executive Summary: Report Summary

Database	Name	Searched	Project Property	Within 0.25 km	Total
AAGR	Abandoned Aggregate Inventory	Y	0	0	0
AGR	Aggregate Inventory	Y	0	0	0
AMIS	Abandoned Mine Information System	Y	0	0	0
ANDR	Anderson's Waste Disposal Sites	Y	0	0	0
AST	Aboveground Storage Tanks	Y	0	0	0
AUWR	Automobile Wrecking & Supplies	Y	0	0	0
BORE	Borehole	Y	0	1	1
CA	Certificates of Approval	Y	0	0	0
CDRY	Dry Cleaning Facilities	Y	0	0	0
CFOT	Commercial Fuel Oil Tanks	Y	0	0	0
CHEM	Chemical Manufacturers and Distributors	Y	0	0	0
CHM	Chemical Register	Y	0	0	0
CNG	Compressed Natural Gas Stations	Y	0	0	0
COAL	Inventory of Coal Gasification Plants and Coal Tar Sites	Y	0	0	0
CONV	Compliance and Convictions	Y	0	0	0
CPU	Certificates of Property Use	Y	0	0	0
DRL	Drill Hole Database	Y	0	0	0
DTNK	Delisted Fuel Tanks	Y	0	0	0
EASR	Environmental Activity and Sector Registry	Y	0	0	0
EBR	Environmental Registry	Y	0	0	0
ECA	Environmental Compliance Approval	Y	0	0	0
EEM	Environmental Effects Monitoring	Y	0	0	0
EHS	ERIS Historical Searches	Y	1	2	3
EIIS	Environmental Issues Inventory System	Y	0	0	0
EMHE	Emergency Management Historical Event	Y	0	0	0
EPAR	Environmental Penalty Annual Report	Y	0	0	0
EXP	List of Expired Fuels Safety Facilities	Y	0	0	0
FCON	Federal Convictions	Y	0	0	0
FCS	Contaminated Sites on Federal Land	Y	0	0	0
FOFT	Fisheries & Oceans Fuel Tanks	Y	0	0	0
FRST	Federal Identification Registry for Storage Tank Systems (FIRSTS)	Y	0	0	0
FST	Fuel Storage Tank	Y	0	0	0
FSTH	Fuel Storage Tank - Historic	Y	0	0	0
GEN	Ontario Regulation 347 Waste Generators Summary	Y	0	0	0
GHG	Greenhouse Gas Emissions from Large Facilities	Y	0	0	0
HINC	TSSA Historic Incidents	Y	0	0	0

Database	Name	Searched	Project Property	Within 0.25 km	Total
IAFT	Indian & Northern Affairs Fuel Tanks	Y	0	0	0
INC	Fuel Oil Spills and Leaks	Y	0	0	0
LIMO	Landfill Inventory Management Ontario	Y	0	0	0
MINE	Canadian Mine Locations	Y	0	0	0
MNR	Mineral Occurrences	Y	0	0	0
NATE	National Analysis of Trends in Emergencies System (NATES)	Y	0	0	0
NCPL	Non-Compliance Reports	Y	0	0	0
NDFT	National Defense & Canadian Forces Fuel Tanks	Y	0	0	0
NDSP	National Defense & Canadian Forces Spills	Y	0	0	0
NDWD	National Defence & Canadian Forces Waste Disposal Sites	Y	0	0	0
NEBI	National Energy Board Pipeline Incidents	Y	0	0	0
NEBP	National Energy Board Wells	Y	0	0	0
NEES	National Environmental Emergencies System (NEES)	Y	0	0	0
NPCB	National PCB Inventory	Y	0	0	0
NPRI	National Pollutant Release Inventory	Y	0	0	0
OGWE	Oil and Gas Wells	Y	0	0	0
OOGW	Ontario Oil and Gas Wells	Y	0	0	0
OPCB	Inventory of PCB Storage Sites	Y	0	0	0
ORD	Orders	Y	0	0	0
PAP	Canadian Pulp and Paper	Y	0	0	0
PCFT	Parks Canada Fuel Storage Tanks	Y	0	0	0
PES	Pesticide Register	Y	0	0	0
PINC	Pipeline Incidents	Y	0	0	0
PRT	Private and Retail Fuel Storage Tanks	Y	0	0	0
PTTW	Permit to Take Water	Y	0	0	0
REC	Ontario Regulation 347 Waste Receivers Summary	Y	0	0	0
RSC	Record of Site Condition	Y	0	0	0
RST	Retail Fuel Storage Tanks	Y	0	0	0
SCT	Scott's Manufacturing Directory	Y	0	0	0
SPL	Ontario Spills	Y	0	1	1
SRDS	Wastewater Discharger Registration Database	Y	0	0	0
TANK	Anderson's Storage Tanks	Y	0	0	0
TCFT	Transport Canada Fuel Storage Tanks	Y	0	0	0
VAR	Variances for Abandonment of Underground Storage Tanks	Y	0	0	0
WDS	Waste Disposal Sites - MOE CA Inventory	Y	0	0	0
WDSH	Waste Disposal Sites - MOE 1991 Historical Approval Inventory	Y	0	0	0
WWIS	Water Well Information System	Y	0	2	2
		Total:	1	6	7

Executive Summary: Site Report Summary - Project Property

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev diff (m)	Page Number
1	EHS		1805 Concession Road 5 Pickering ON L1V 2P8	SSE/22.0	0.33	13

Executive Summary: Site Report Summary - Surrounding Properties

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
2	EHS		3280 Sideline 16 Pickering ON	NNW/87.6	-0.77	13
3	WWIS		lot 16 con 5 ON ***Well ID:*** 4603801	E/124.7	-0.77	13
4	WWIS		ON ***Well ID:*** 7306399	SSE/157.7	0.67	16
5	BORE		ON	ENE/203.1	-2.76	16
6	SPL	Del Management Solutions Inc.	3280 Sideline Road 16 Pickering ON	N/250.0	2.61	18
6	EHS		3280 Sideline 16 Pickering ON L0H1A0	N/250.0	2.61	18

Executive Summary: Summary By Data Source

BORE - Borehole

A search of the BORE database, dated 1875-Jul 2018 has found that there are 1 BORE site(s) within approximately 0.25 kilometers of the project property.

Lower Elevation	Address	Direction	Distance (m)	Map Key
	ON	ENE	203.14	5

EHS - ERIS Historical Searches

A search of the EHS database, dated 1999-Jan 31, 2021 has found that there are 3 EHS site(s) within approximately 0.25 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
	1805 Concession Road 5 Pickering ON L1V 2P8	SSE	21.97	1
	3280 Sideline 16 Pickering ON L0H1A0	N	249.97	6

Lower Elevation	Address	Direction	Distance (m)	Map Key
	3280 Sideline 16 Pickering ON	NNW	87.60	2

SPL - Ontario Spills

A search of the SPL database, dated 1988-Mar 2020; Jul 2020 - Aug 2020 has found that there are 1 SPL site(s) within approximately 0.25 kilometers of the project property.

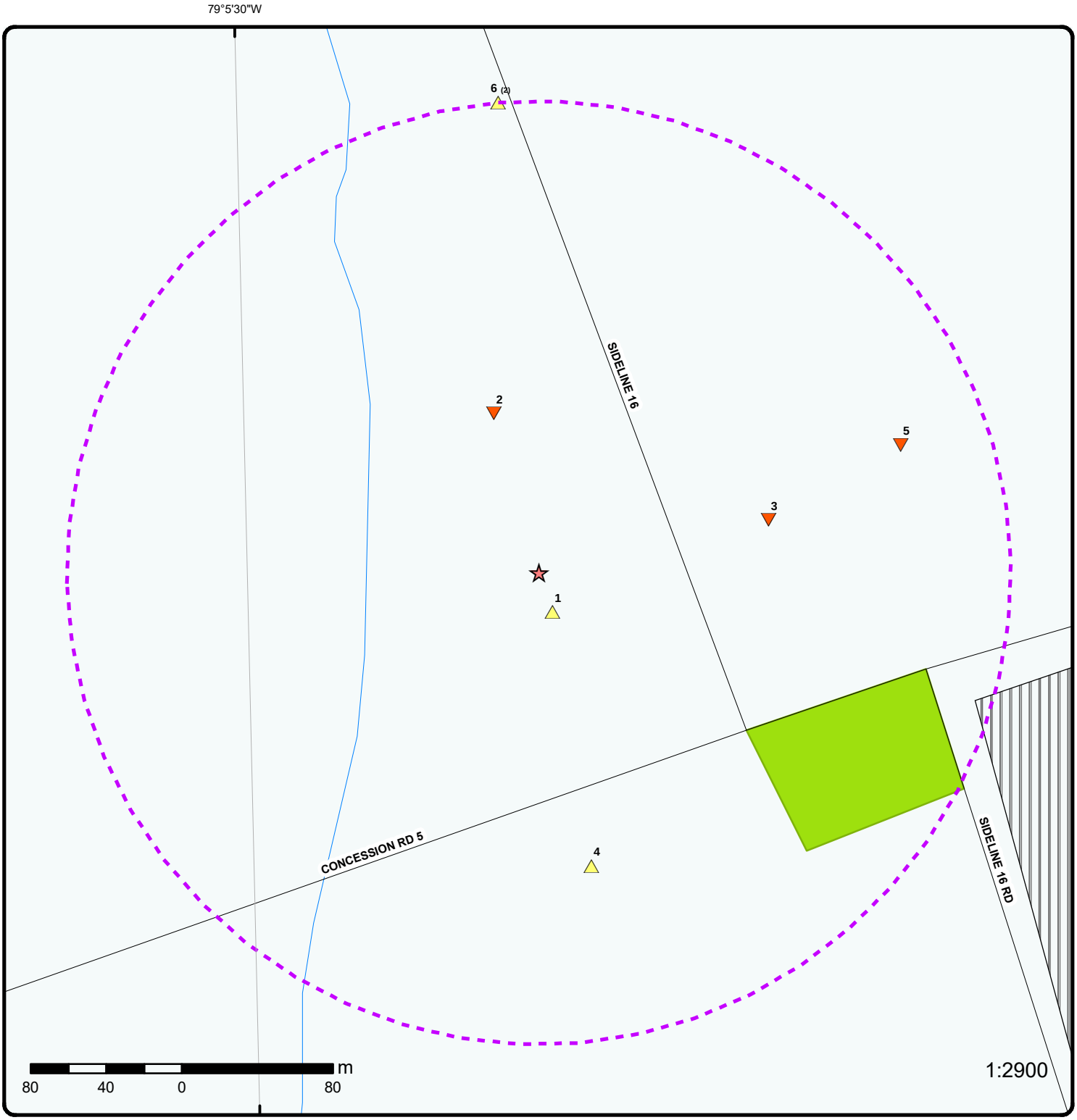
Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
Del Management Solutions Inc.	3280 Sideline Road 16 Pickering ON	N	249.97	6

WWIS - Water Well Information System

A search of the WWIS database, dated Apr 30, 2020 has found that there are 2 WWIS site(s) within approximately 0.25 kilometers of the project property.

Equal/Higher Elevation	Address	Direction	Distance (m)	Map Key
	ON ***Well ID:*** 7306399	SSE	157.74	4

Lower Elevation	Address	Direction	Distance (m)	Map Key
	lot 16 con 5 ON ***Well ID:*** 4603801	E	124.75	3



Map: 0.25 Kilometer Radius

Order Number: 21032900899
Address: 1805 Concession Road 5, Pickering, ON

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

Project Property	Expressway	Industrial and Resource - Regions	National Park
Buffer Outline	Principal Highway	Main Line	Provincial or Territorial Park
Eris Sites with Higher Elevation	Secondary Highway	Sidetrack	Other Park
Eris Sites with Same Elevation	Major Road	Transit Line	Golf Course or Driving Range
Eris Sites with Lower Elevation	Local road	Abandoned Line	Park or Sports Field
Eris Sites with Unknown Elevation	Trail		Other Recreation Area
	Proposed Road		
	Ferry Route/Ice Road		

Source: © 2015 DMTI Spatial Inc.

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Aerial

Year: 2019

Address: 1805 Concession Road 5, Pickering, ON

Source: ESRI World Imagery

Order Number: 21032900899

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

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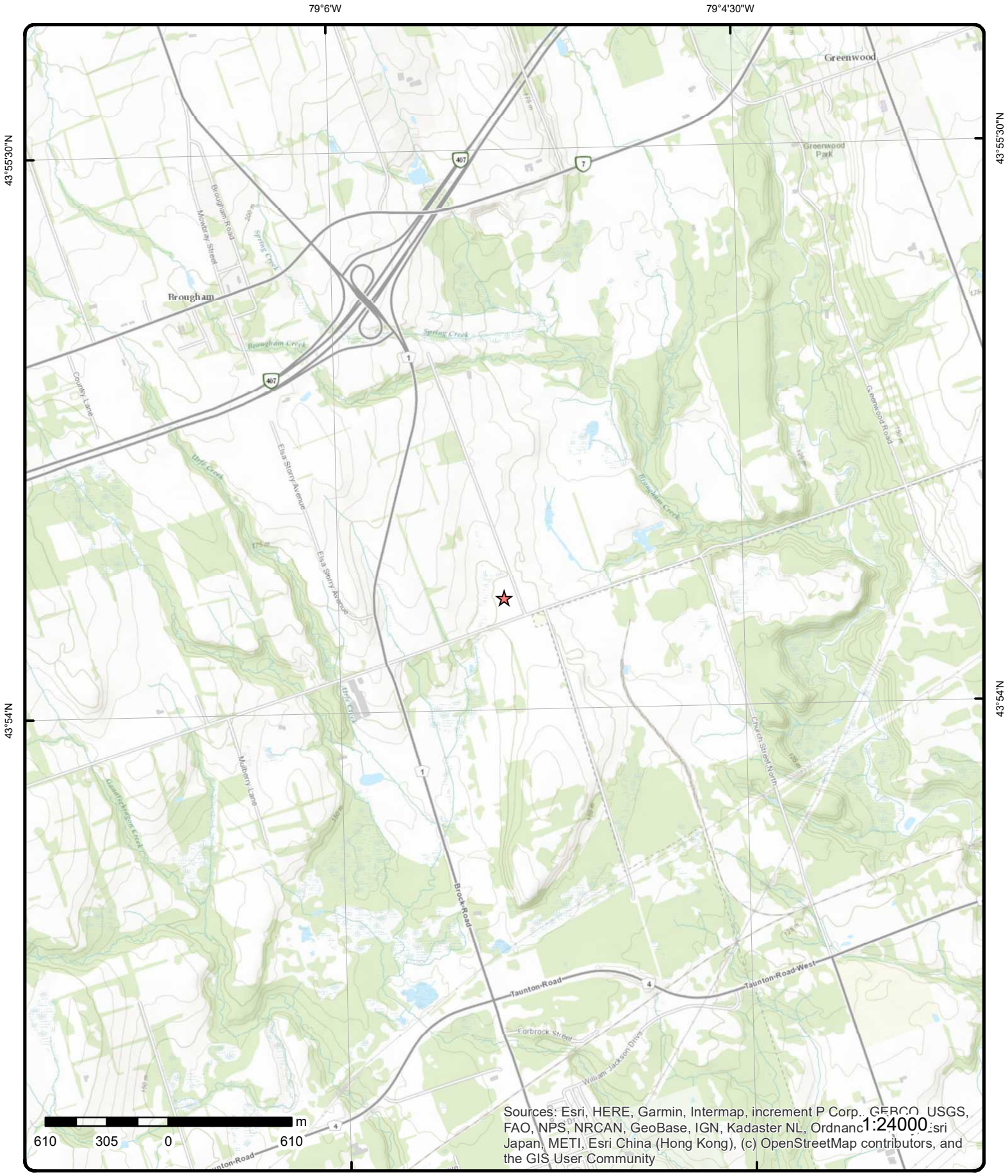

Topographic Map

Order Number: 21032900899

Address: 1805 Concession Road 5, ON

Source: ESRI World Topographic Map

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Detail Report

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
1	1 of 1	SSE/22.0	150.9 / 0.33	1805 Concession Road 5 Pickering ON L1V 2P8	EHS

Order No:	20180716125	**Nearest Intersection:**	
Status:	C	**Municipality:**	Pickering, Ontario
Report Type:	Custom Report	**Client Prov/State:**	ON
Report Date:	23-JUL-18	**Search Radius (km):**	.25
Date Received:	16-JUL-18	**X:**	-79.089725
Previous Site Name:		**Y:**	43.904814
Lot/Building Size:	4.1 acres		
Additional Info Ordered:	Topographic Maps		

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
2	1 of 1	NNW/87.6	149.8 / -0.77	3280 Sideline 16 Pickering ON	EHS

Order No:	20101216010	**Nearest Intersection:**	
Status:	C	**Municipality:**	
Report Type:	Standard Report	**Client Prov/State:**	ON
Report Date:	12/28/2010	**Search Radius (km):**	0.25
Date Received:	12/16/2010 7:32:37 AM	**X:**	-79.09008
Previous Site Name:		**Y:**	43.905766
Lot/Building Size:			
Additional Info Ordered:	Aerial Photos		

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
3	1 of 1	E/124.7	149.8 / -0.77	lot 16 con 5 ON	WWIS

Well ID:	4603801	**Data Entry Status:**	
Construction Date:		**Data Src:**	1
Primary Water Use:	Domestic	**Date Received:**	12/30/1968
Sec. Water Use:	0	**Selected Flag:**	Yes
Final Well Status:	Water Supply	**Abandonment Rec:**	
Water Type:		**Contractor:**	2214
Casing Material:		**Form Version:**	1
Audit No:		**Owner:**	
Tag:		**Street Name:**	
Construction Method:		**County:**	DURHAM
Elevation (m):		**Municipality:**	PICKERING TOWN
Elevation Reliability:		**Site Info:**	
Depth to Bedrock:		**Lot:**	016
Well Depth:		**Concession:**	05
Overburden/Bedrock:		**Concession Name:**	CON
Pump Rate:		**Easting NAD83:**	
Static Water Level:		**Northing NAD83:**	
Flowing (Y/N):		**Zone:**	
Flow Rate:		**UTM Reliability:**	
Clear/Cloudy:			

PDF URL (Map): https://d2khazk8e83rdv.cloudfront.net/moe_mapping/downloads/2Water/Wells_pdfs/460\4603801.pdf

Bore Hole Information

Bore Hole ID:	10295151	***Elevation:***	150.95288
DP2BR:		***Elevrc:***	
Spatial Status:		***Zone:***	17
Code OB:	o	***East83:***	653514.8
Code OB Desc:	Overburden	***North83:***	4863123
Open Hole:		***Org CS:***	
Cluster Kind:		***UTMRC:***	4
Date Completed:	12/3/1968	***UTMRC Desc:***	margin of error : 30 m - 100 m
Remarks:		***Location Method:***	p4
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	931954177
Layer:	2
Color:	
General Color:	
Mat1:	05
Most Common Material:	CLAY
Mat2:	06
Mat2 Desc:	SILT
Mat3:	
Mat3 Desc:	
Formation Top Depth:	1
Formation End Depth:	15
Formation End Depth UOM:	ft

Overburden and Bedrock Materials Interval

Formation ID:	931954176
Layer:	1
Color:	
General Color:	
Mat1:	02
Most Common Material:	TOPSOIL
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	
Formation Top Depth:	0
Formation End Depth:	1
Formation End Depth UOM:	ft

Overburden and Bedrock Materials Interval

Formation ID:	931954179
Layer:	4
Color:	6
General Color:	BROWN
Mat1:	05
Most Common Material:	CLAY
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	

Formation Top Depth:	20
Formation End Depth:	35
Formation End Depth UOM:	ft

Overburden and Bedrock Materials Interval

Formation ID:	931954178
Layer:	3
Color:	
General Color:	
Mat1:	11
Most Common Material:	GRAVEL
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	
Formation Top Depth:	15
Formation End Depth:	20
Formation End Depth UOM:	ft

Method of Construction & Well Use

Method Construction ID:	964603801
Method Construction Code:	6
Method Construction:	Boring
Other Method Construction:	

Pipe Information

Pipe ID:	10843721
Casing No:	1
Comment:	
Alt Name:	

Construction Record - Casing

Casing ID:	930487347
Layer:	1
Material:	3
Open Hole or Material:	CONCRETE
Depth From:	
Depth To:	35
Casing Diameter:	30
Casing Diameter UOM:	inch
Casing Depth UOM:	ft

Results of Well Yield Testing

Pump Test ID:	994603801
Pump Set At:	
Static Level:	15
Final Level After Pumping:	20
Recommended Pump Depth:	33
Pumping Rate:	
Flowing Rate:	
Recommended Pump Rate:	5
Levels UOM:	ft
Rate UOM:	GPM
Water State After Test Code:	1
Water State After Test:	CLEAR

Pumping Test Method:
Pumping Duration HR:
Pumping Duration MIN:
Flowing: No

Water Details

Water ID: 933766078
Layer: 1
Kind Code: 1
Kind: FRESH
Water Found Depth: 15
Water Found Depth UOM: ft

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4 | **1 of 1** | **SSE/157.7** | **151.3 / 0.67** | **ON** | **WWIS**

Well ID:	7306399	**Data Entry Status:**	Yes
Construction Date:		**Data Src:**	
Primary Water Use:		**Date Received:**	2/26/2018
Sec. Water Use:		**Selected Flag:**	Yes
Final Well Status:		**Abandonment Rec:**	
Water Type:		**Contractor:**	7464
Casing Material:		**Form Version:**	8
Audit No:	C39871	**Owner:**	
Tag:	A235118	**Street Name:**	
Construction Method:		**County:**	DURHAM
Elevation (m):		**Municipality:**	PICKERING TOWN
Elevation Reliability:		**Site Info:**	
Depth to Bedrock:		**Lot:**	
Well Depth:		**Concession:**	
Overburden/Bedrock:		**Concession Name:**	
Pump Rate:		**Easting NAD83:**	
Static Water Level:		**Northing NAD83:**	
Flowing (Y/N):		**Zone:**	
Flow Rate:		**UTM Reliability:**	
Clear/Cloudy:			

PDF URL (Map):

Bore Hole Information

Bore Hole ID:	1006991681	**Elevation:**	
DP2BR:		**Elevrc:**	
Spatial Status:		**Zone:**	17
Code OB:		**East83:**	653421
Code OB Desc:		**North83:**	4862940
Open Hole:		**Org CS:**	UTM83
Cluster Kind:		**UTMRC:**	4
Date Completed:	1/10/2018	**UTMRC Desc:**	margin of error : 30 m - 100 m
Remarks:		**Location Method:**	wwr
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

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5 | **1 of 1** | **ENE/203.1** | **147.9 / -2.76** | **ON** | **BORE**

Borehole ID:	627137	**Inclin FLG:**	No
OGF ID:	215527572	**SP Status:**	Initial Entry

Status:		***Surv Elev:***	No
Type:	Borehole	***Piezometer:***	No
Use:	Geotechnical/Geological Investigation	***Primary Name:***	
Completion Date:	OCT-1968	***Municipality:***	
Static Water Level:	0.4	***Lot:***	
Primary Water Use:	Not Used	***Township:***	
Sec. Water Use:		***Latitude DD:***	43.905571
Total Depth m:	10.7	***Longitude DD:***	-79.087405
Depth Ref:	Ground Surface	***UTM Zone:***	17
Depth Elev:		***Easting:***	653585
Drill Method:	Power auger	***Northing:***	4863163
Orig Ground Elev m:	146	***Location Accuracy:***	
Elev Reliabil Note:		***Accuracy:***	Not Applicable
DEM Ground Elev m:	146		
Concession:			
Location D:			
Survey D:			
Comments:			

Borehole Geology Stratum

Geology Stratum ID:	218443085	***Mat Consistency:***	
Top Depth:	.3	***Material Moisture:***	
Bottom Depth:	2.4	***Material Texture:***	
Material Color:	Brown	***Non Geo Mat Type:***	
Material 1:	Sand	***Geologic Formation:***	
Material 2:	Silt	***Geologic Group:***	
Material 3:	Gravel	***Geologic Period:***	
Material 4:		***Depositional Gen:***	
Gsc Material Description:			
Stratum Description:	SAND,SILT,GRAVEL. BROWN,GRANULAR.		

Geology Stratum ID:	218443086	***Mat Consistency:***	Dense
Top Depth:	2.4	***Material Moisture:***	
Bottom Depth:	6.4	***Material Texture:***	
Material Color:	Green	***Non Geo Mat Type:***	
Material 1:	Till	***Geologic Formation:***	
Material 2:	Sand	***Geologic Group:***	
Material 3:	Silt	***Geologic Period:***	
Material 4:	Gravel	***Depositional Gen:***	glacial
Gsc Material Description:			
Stratum Description:	TILL,SAND,SILT, GRAVEL. GREEN,GLACIAL,VERY DENSE, GRANULAR,AGE GLACIAL, WATER STABLE AT 478.8 FEET.		

Geology Stratum ID:	218443084	***Mat Consistency:***	
Top Depth:	0	***Material Moisture:***	
Bottom Depth:	.3	***Material Texture:***	
Material Color:	Black	***Non Geo Mat Type:***	
Material 1:	Soil	***Geologic Formation:***	
Material 2:	Silt	***Geologic Group:***	
Material 3:		***Geologic Period:***	
Material 4:		***Depositional Gen:***	
Gsc Material Description:			
Stratum Description:	SOIL,SILT. BLACK.		

Geology Stratum ID:	218443087	***Mat Consistency:***	
Top Depth:	6.4	***Material Moisture:***	
Bottom Depth:	10.7	***Material Texture:***	
Material Color:	Green	***Non Geo Mat Type:***	
Material 1:	Silt	***Geologic Formation:***	
Material 2:	Sand	***Geologic Group:***	
Material 3:		***Geologic Period:***	
Material 4:		***Depositional Gen:***	
Gsc Material Description:			
Stratum Description:	SILT,SAND. GREEN. 00080100 **Note: Many records provided by the department have a truncated [Stratum		

Description] field.

Source

Source Type:	Data Survey	***Source Appl:***	Spatial/Tabular
Source Orig:	Geological Survey of Canada	***Source Iden:***	1
Source Date:	1956-1972	***Scale or Res:***	Varies
Confidence:	H	***Horizontal:***	NAD27
Observatio:		***Verticalda:***	Mean Average Sea Level
Source Name:	Urban Geology Automated Information System (UGAIS)		
Source Details:	File: OSHAWA.txt RecordID: 009020 NTS_Sheet: 30M14H		
Confiden 1:	Logged by professional. Exact and complete description of material and properties.		

Source List

Source Identifier:	1	***Horizontal Datum:***	NAD27
Source Type:	Data Survey	***Vertical Datum:***	Mean Average Sea Level
Source Date:	1956-1972	***Projection Name:***	Universal Transverse Mercator
Scale or Resolution:	Varies		
Source Name:	Urban Geology Automated Information System (UGAIS)		
Source Originators:	Geological Survey of Canada		

6	*1 of 2*	*N/250.0*	*153.2 / 2.61*	***Del Management Solutions Inc.*** ***3280 Sideline Road 16*** ***Pickering ON***	***SPL***

Ref No:	6401-5TELZN	***Discharger Report:***	
Site No:		***Material Group:***	Oil
Incident Dt:	11/14/2003	***Health/Env Conseq:***	
Year:		***Client Type:***	
Incident Cause:	Tank (Above Ground) Leak	***Sector Type:***	
Incident Event:		***Agency Involved:***	
Contaminant Code:	13	***Nearest Watercourse:***	
Contaminant Name:	FURNACE OIL	***Site Address:***	
Contaminant Limit 1:		***Site District Office:***	York-Durham
Contam Limit Freq 1:		***Site Postal Code:***	
Contaminant UN No 1:		***Site Region:***	Central
Environment Impact:	Not Anticipated	***Site Municipality:***	Pickering
Nature of Impact:	Soil Contamination	***Site Lot:***	
Receiving Medium:	Land	***Site Conc:***	
Receiving Env:		***Northing:***	NA
MOE Response:		***Easting:***	NA
Dt MOE Arvl on Scn:		***Site Geo Ref Accu:***	
MOE Reported Dt:	11/18/2003	***Site Map Datum:***	
Dt Document Closed:		***SAC Action Class:***	Spills
Incident Reason:	Corrosion - All forms of internal/external corrosion	***Source Type:***	
Site Name:	3280 SIDELINE ROAD 16		
Site County/District:			
Site Geo Ref Meth:			
Incident Summary:	1/2 L Furnace oil, contained/cleaned		
Contaminant Qty:	0.5 L		

6	*2 of 2*	*N/250.0*	*153.2 / 2.61*	***3280 Sideline 16*** ***Pickering ON L0H1A0***	***EHS***

Order No:	20140730077	***Nearest Intersection:***	
Status:	C	***Municipality:***	
Report Type:	Standard Report	***Client Prov/State:***	ON
Report Date:	07-AUG-14	***Search Radius (km):***	.25
Date Received:	30-JUL-14	***X:***	-79.090168
Previous Site Name:		***Y:***	43.906145

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

Lot/Building Size:
Additional Info Ordered: Fire Insur. Maps and/or Site Plans; Title Searches; Topographic Maps; Aerial Photos

Unplottable Summary

Total: 13 Unplottable sites

DB	Company Name/Site Name	Address	City	Postal
DTNK	STANDARD AGGREGATES INC ATTN: MARK WORTON	LOT 16 CON 5	PICKERING ON	L2R 1R5
GEN	Strabag Inc.	Concession 5 South Side East of Sideline 16	Ajax ON	
GEN	LAFARGE CANADA INC.	NORTH HALF OF LOT 16, CONCESSION 4	PICKERING ON	
GEN	STANDARD AGGREGATES INC.	NORTH HALF OF LOT 16, CON. 4-PICKERING C/O BOX 98	PICKERING ON	L1V 2R2
GEN	LAFARGE CANADA INC. 36-209	NORTH HALF OF LOT 16, CONC. 4	PICKERING ON	L1V 2R2
GEN	Strabag Inc. SeC Sewer Project	Concession 5 South Side East of Sideline 16	Ajax ON	L1V 2R2
PRT	STANDARD AGGREGATES DIV OF STANDARD INDSTRL LTD	LOT 16 CON 5	PICKERING ON	L1V2P8
WWIS		lot 16 con 4	ON	
WWIS		lot 16 con 5	ON	
WWIS		lot 17	ON	
WWIS		lot 16 con 4	ON	
WWIS		lot 17	ON	
WWIS		lot 17 con 4	ON	

Unplottable Report

Site: ***STANDARD AGGREGATES INC ATTN: MARK WORTON***
LOT 16 CON 5 PICKERING ON L2R 1R5

Database: ***DTNK***

Delisted Expired Fuel Safety Facilities

Instance No:	9471988
Status:	EXPIRED
Instance ID:	
Instance Type:	FS Facility
Description:	
TSSA Program Area:	
Maximum Hazard Rank:	
Facility Type:	
Expired Date:	3/1/1990
Original Source:	EXP
Record Date:	Up to May 2013

Site: ***Strabag Inc.***
Concession 5 South Side East of Sideline 16 Ajax ON

Database: ***GEN***

Generator No:	ON7021349	***PO Box No:***	
Status:		***Country:***	
Approval Years:	2012	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:	237990		
SIC Description:	Other Heavy and Civil Engineering Construction		

Site: ***LAFARGE CANADA INC.***
NORTH HALF OF LOT 16, CONCESSION 4 PICKERING ON

Database: ***GEN***

Generator No:	ON0424202	***PO Box No:***	
Status:		***Country:***	
Approval Years:	99,00,01	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:	0821		
SIC Description:	SAND & GRAVEL PITS		

Detail(s)

Waste Class:	221
Waste Class Desc:	LIGHT FUELS
Waste Class:	243
Waste Class Desc:	PCB'S
Waste Class:	252
Waste Class Desc:	WASTE OILS & LUBRICANTS

Site: ***STANDARD AGGREGATES INC.***
NORTH HALF OF LOT 16, CON. 4-PICKERING C/O BOX 98 PICKERING ON L1V 2R2

Database: ***GEN***

Generator No:	ON0424202	***PO Box No:***	
Status:		***Country:***	

Approval Years:	86,87,88,89,90	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:	0821		
SIC Description:	SAND & GRAVEL PITS		

Detail(s)

Waste Class: 252
Waste Class Desc: WASTE OILS & LUBRICANTS

Site: ***LAFARGE CANADA INC. 36-209***
NORTH HALF OF LOT 16, CONC. 4 PICKERING ON L1V 2R2

Database: ***GEN***

Generator No:	ON0424202	***PO Box No:***	
Status:		***Country:***	
Approval Years:	92,93,95,96,97,98	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:	0821		
SIC Description:	SAND & GRAVEL PITS		

Detail(s)

Waste Class: 221
Waste Class Desc: LIGHT FUELS

Waste Class: 243
Waste Class Desc: PCB'S

Waste Class: 252
Waste Class Desc: WASTE OILS & LUBRICANTS

Site: ***Strabag Inc. SeC Sewer Project***
Concession 5 South Side East of Sideline 16 Ajax ON L1V 2R2

Database: ***GEN***

Generator No:	ON7021349	***PO Box No:***	
Status:	Registered	***Country:***	Canada
Approval Years:	As of Jan 2021	***Choice of Contact:***	
Contam. Facility:		***Co Admin:***	
MHSW Facility:		***Phone No Admin:***	
SIC Code:			
SIC Description:			

Detail(s)

Waste Class: 150 L
Waste Class Desc: Inert organic wastes

Site: ***STANDARD AGGREGATES DIV OF STANDARD INDSTRL LTD***
LOT 16 CON 5 PICKERING ON L1V2P8

Database: ***PRT***

Location ID: 11779
Type: retail
Expiry Date: 1991-02-28
Capacity (L): 0
Licence #: 0012851001

Site:
lot 16 con 4 ON

Database: ***WWIS***

Well ID:	1915265	***Data Entry Status:***	
Construction Date:		***Data Src:***	1
Primary Water Use:	Domestic	***Date Received:***	9/18/2001

Sec. Water Use:		***Selected Flag:***	Yes
Final Well Status:	Water Supply	***Abandonment Rec:***	
Water Type:		***Contractor:***	2662
Casing Material:		***Form Version:***	1
Audit No:	228263	***Owner:***	
Tag:		***Street Name:***	
Construction Method:		***County:***	DURHAM
Elevation (m):		***Municipality:***	PICKERING TOWN
Elevation Reliability:		***Site Info:***	
Depth to Bedrock:		***Lot:***	016
Well Depth:		***Concession:***	04
Overburden/Bedrock:		***Concession Name:***	CON
Pump Rate:		***Easting NAD83:***	
Static Water Level:		***Northing NAD83:***	
Flowing (Y/N):		***Zone:***	
Flow Rate:		***UTM Reliability:***	
Clear/Cloudy:			

Bore Hole Information

Bore Hole ID:	10517238	***Elevation:***	
DP2BR:		***Elevrc:***	
Spatial Status:		***Zone:***	17
Code OB:	o	***East83:***	
Code OB Desc:	Overburden	***North83:***	
Open Hole:		***Org CS:***	
Cluster Kind:		***UTMRC:***	9
Date Completed:	3/5/2001	***UTMRC Desc:***	unknown UTM
Remarks:		***Location Method:***	na
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	932834160
Layer:	3
Color:	6
General Color:	BROWN
Mat1:	28
Most Common Material:	SAND
Mat2:	11
Mat2 Desc:	GRAVEL
Mat3:	79
Mat3 Desc:	PACKED
Formation Top Depth:	10
Formation End Depth:	15
Formation End Depth UOM:	ft

Overburden and Bedrock Materials Interval

Formation ID:	932834162
Layer:	5
Color:	2
General Color:	GREY
Mat1:	08
Most Common Material:	FINE SAND
Mat2:	29
Mat2 Desc:	FINE GRAVEL
Mat3:	84
Mat3 Desc:	SILTY
Formation Top Depth:	30

Formation End Depth: 54
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 932834158
Layer: 1
Color: 6
General Color: BROWN
Mat1: 02
Most Common Material: TOPSOIL
Mat2: 85
Mat2 Desc: SOFT
Mat3:
Mat3 Desc:
Formation Top Depth: 0
Formation End Depth: 2
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 932834163
Layer: 6
Color: 2
General Color: GREY
Mat1: 05
Most Common Material: CLAY
Mat2: 11
Mat2 Desc: GRAVEL
Mat3: 79
Mat3 Desc: PACKED
Formation Top Depth: 54
Formation End Depth: 60
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 932834164
Layer: 7
Color: 2
General Color: GREY
Mat1: 08
Most Common Material: FINE SAND
Mat2: 77
Mat2 Desc: LOOSE
Mat3: 91
Mat3 Desc: WATER-BEARING
Formation Top Depth: 60
Formation End Depth: 68
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 932834161
Layer: 4
Color: 2
General Color: GREY
Mat1: 05
Most Common Material: CLAY
Mat2: 11
Mat2 Desc: GRAVEL
Mat3: 79

Mat3 Desc: PACKED
Formation Top Depth: 15
Formation End Depth: 30
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 932834159
Layer: 2
Color: 6
General Color: BROWN
Mat1: 05
Most Common Material: CLAY
Mat2: 11
Mat2 Desc: GRAVEL
Mat3: 12
Mat3 Desc: STONES
Formation Top Depth: 2
Formation End Depth: 10
Formation End Depth UOM: ft

Annular Space/Abandonment Sealing Record

Plug ID: 933220181
Layer: 1
Plug From: 0
Plug To: 15
Plug Depth UOM: ft

Method of Construction & Well Use

Method Construction ID: 961915265
Method Construction Code: 1
Method Construction: Cable Tool
Other Method Construction:

Pipe Information

Pipe ID: 11065808
Casing No: 1
Comment:
Alt Name:

Construction Record - Casing

Casing ID: 930141837
Layer: 2
Material: 4
Open Hole or Material: OPEN HOLE
Depth From:
Depth To:
Casing Diameter: 6
Casing Diameter UOM: inch
Casing Depth UOM: ft

Construction Record - Casing

Casing ID: 930141836
Layer: 1
Material: 1
Open Hole or Material: STEEL
Depth From:

Depth To:
Casing Diameter: 6
Casing Diameter UOM: inch
Casing Depth UOM: ft

Construction Record - Screen

Screen ID: 933400715
Layer: 1
Slot: 012
Screen Top Depth: 65
Screen End Depth: 68
Screen Material:
Screen Depth UOM: ft
Screen Diameter UOM: inch
Screen Diameter: 6

Results of Well Yield Testing

Pump Test ID: 991915265
Pump Set At:
Static Level: 9
Final Level After Pumping: 26
Recommended Pump Depth: 60
Pumping Rate: 10
Flowing Rate:
Recommended Pump Rate: 10
Levels UOM: ft
Rate UOM: GPM
Water State After Test Code: 1
Water State After Test: CLEAR
Pumping Test Method: 1
Pumping Duration HR: 2
Pumping Duration MIN: 0
Flowing: No

Draw Down & Recovery

Pump Test Detail ID: 934137185
Test Type: Draw Down
Test Duration: 15
Test Level: 26
Test Level UOM: ft

Draw Down & Recovery

Pump Test Detail ID: 934417422
Test Type: Draw Down
Test Duration: 30
Test Level: 26
Test Level UOM: ft

Draw Down & Recovery

Pump Test Detail ID: 934930547
Test Type: Draw Down
Test Duration: 60
Test Level: 26
Test Level UOM: ft

Draw Down & Recovery

Pump Test Detail ID: 934676767
Test Type: Draw Down
Test Duration: 45

Test Level:	26
Test Level UOM:	ft

Water Details

Water ID:	934009061
Layer:	1
Kind Code:	1
Kind:	FRESH
Water Found Depth:	68
Water Found Depth UOM:	ft

Site:
lot 16 con 5 ON

Database:
WWIS

Well ID:	1906274	***Data Entry Status:***	
Construction Date:		***Data Src:***	1
Primary Water Use:	Domestic	***Date Received:***	1/29/1982
Sec. Water Use:		***Selected Flag:***	Yes
Final Well Status:	Water Supply	***Abandonment Rec:***	
Water Type:		***Contractor:***	5415
Casing Material:		***Form Version:***	1
Audit No:		***Owner:***	
Tag:		***Street Name:***	
Construction Method:		***County:***	DURHAM
Elevation (m):		***Municipality:***	19000
Elevation Reliability:		***Site Info:***	
Depth to Bedrock:		***Lot:***	016
Well Depth:		***Concession:***	05
Overburden/Bedrock:		***Concession Name:***	
Pump Rate:		***Easting NAD83:***	
Static Water Level:		***Northing NAD83:***	
Flowing (Y/N):		***Zone:***	
Flow Rate:		***UTM Reliability:***	
Clear/Cloudy:			

Bore Hole Information

Bore Hole ID:	10075052	***Elevation:***	
DP2BR:	7	***Elevrc:***	
Spatial Status:		***Zone:***	17
Code OB:	r	***East83:***	
Code OB Desc:	Bedrock	***North83:***	
Open Hole:		***Org CS:***	
Cluster Kind:		***UTMRC:***	9
Date Completed:	4/15/1981	***UTMRC Desc:***	unknown UTM
Remarks:		***Location Method:***	na
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	931160588
Layer:	2
Color:	2
General Color:	GREY
Mat1:	05
Most Common Material:	CLAY
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	

Formation Top Depth: 1
Formation End Depth: 7
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 931160587
Layer: 1
Color: 8
General Color: BLACK
Mat1: 02
Most Common Material: TOPSOIL
Mat2:
Mat2 Desc:
Mat3:
Mat3 Desc:
Formation Top Depth: 0
Formation End Depth: 1
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 931160589
Layer: 3
Color: 2
General Color: GREY
Mat1: 15
Most Common Material: LIMESTONE
Mat2:
Mat2 Desc:
Mat3:
Mat3 Desc:
Formation Top Depth: 7
Formation End Depth: 50
Formation End Depth UOM: ft

Method of Construction & Well Use

Method Construction ID: 961906274
Method Construction Code: 1
Method Construction: Cable Tool
Other Method Construction:

Pipe Information

Pipe ID: 10623622
Casing No: 1
Comment:
Alt Name:

Construction Record - Casing

Casing ID: 930132826
Layer: 1
Material: 1
Open Hole or Material: STEEL
Depth From:
Depth To: 10
Casing Diameter: 6
Casing Diameter UOM: inch
Casing Depth UOM: ft

Results of Well Yield Testing

Pump Test ID:	991906274
Pump Set At:	
Static Level:	5
Final Level After Pumping:	45
Recommended Pump Depth:	48
Pumping Rate:	2
Flowing Rate:	
Recommended Pump Rate:	1
Levels UOM:	ft
Rate UOM:	GPM
Water State After Test Code:	1
Water State After Test:	CLEAR
Pumping Test Method:	2
Pumping Duration HR:	2
Pumping Duration MIN:	0
Flowing:	No

Draw Down & Recovery

Pump Test Detail ID:	934129165
Test Type:	
Test Duration:	15
Test Level:	20
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934402358
Test Type:	
Test Duration:	30
Test Level:	30
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934670584
Test Type:	
Test Duration:	45
Test Level:	45
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934922285
Test Type:	
Test Duration:	60
Test Level:	45
Test Level UOM:	ft

Water Details

Water ID:	933516865
Layer:	1
Kind Code:	1
Kind:	FRESH
Water Found Depth:	50
Water Found Depth UOM:	ft

Site: ***lot 17 ON***

Database: ***WWIS***

Well ID: 1915181

Construction Date:

Data Entry Status:

Data Src: 1

Primary Water Use:	Domestic	***Date Received:***	7/18/2001
Sec. Water Use:		***Selected Flag:***	Yes
Final Well Status:	Water Supply	***Abandonment Rec:***	
Water Type:		***Contractor:***	6874
Casing Material:		***Form Version:***	1
Audit No:	229226	***Owner:***	
Tag:		***Street Name:***	
Construction Method:		***County:***	DURHAM
Elevation (m):		***Municipality:***	PICKERING TOWN
Elevation Reliability:		***Site Info:***	
Depth to Bedrock:		***Lot:***	017
Well Depth:		***Concession:***	
Overburden/Bedrock:		***Concession Name:***	
Pump Rate:		***Easting NAD83:***	
Static Water Level:		***Northing NAD83:***	
Flowing (Y/N):		***Zone:***	
Flow Rate:		***UTM Reliability:***	
Clear/Cloudy:			

Bore Hole Information

Bore Hole ID:	10517157	***Elevation:***	
DP2BR:		***Elevrc:***	
Spatial Status:		***Zone:***	17
Code OB:	o	***East83:***	
Code OB Desc:	Overburden	***North83:***	
Open Hole:		***Org CS:***	
Cluster Kind:		***UTMRC:***	9
Date Completed:	7/10/2001	***UTMRC Desc:***	unknown UTM
Remarks:		***Location Method:***	na
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	932833796
Layer:	1
Color:	6
General Color:	BROWN
Mat1:	05
Most Common Material:	CLAY
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	
Formation Top Depth:	0
Formation End Depth:	23
Formation End Depth UOM:	ft

Method of Construction & Well Use

Method Construction ID:	961915181
Method Construction Code:	1
Method Construction:	Cable Tool
Other Method Construction:	

Pipe Information

Pipe ID:	11065727
Casing No:	1

Comment:
Alt Name:

Construction Record - Casing

Casing ID:	930141737
Layer:	1
Material:	3
Open Hole or Material:	CONCRETE
Depth From:	
Depth To:	
Casing Diameter:	30
Casing Diameter UOM:	inch
Casing Depth UOM:	ft

Results of Well Yield Testing

Pump Test ID:	991915181
Pump Set At:	
Static Level:	8
Final Level After Pumping:	23
Recommended Pump Depth:	23
Pumping Rate:	25
Flowing Rate:	
Recommended Pump Rate:	1
Levels UOM:	ft
Rate UOM:	GPM
Water State After Test Code:	1
Water State After Test:	CLEAR
Pumping Test Method:	1
Pumping Duration HR:	2
Pumping Duration MIN:	0
Flowing:	No

Draw Down & Recovery

Pump Test Detail ID:	934676285
Test Type:	Recovery
Test Duration:	45
Test Level:	22
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934930478
Test Type:	Recovery
Test Duration:	60
Test Level:	21
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934416940
Test Type:	Recovery
Test Duration:	30
Test Level:	22
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934137120
Test Type:	Recovery
Test Duration:	15
Test Level:	23
Test Level UOM:	ft

Water Details

Water ID:	934008990
Layer:	1
Kind Code:	1
Kind:	FRESH
Water Found Depth:	18
Water Found Depth UOM:	ft

Site:
lot 16 con 4 ON

Database:
WWIS

Well ID:	1915299	***Data Entry Status:***	
Construction Date:		***Data Src:***	1
Primary Water Use:		***Date Received:***	9/24/2001
Sec. Water Use:		***Selected Flag:***	Yes
Final Well Status:	Abandoned-Quality	***Abandonment Rec:***	
Water Type:		***Contractor:***	2662
Casing Material:		***Form Version:***	1
Audit No:	228799	***Owner:***	
Tag:		***Street Name:***	
Construction Method:		***County:***	DURHAM
Elevation (m):		***Municipality:***	PICKERING TOWN
Elevation Reliability:		***Site Info:***	
Depth to Bedrock:		***Lot:***	016
Well Depth:		***Concession:***	04
Overburden/Bedrock:		***Concession Name:***	CON
Pump Rate:		***Easting NAD83:***	
Static Water Level:		***Northing NAD83:***	
Flowing (Y/N):		***Zone:***	
Flow Rate:		***UTM Reliability:***	
Clear/Cloudy:			

Bore Hole Information

Bore Hole ID:	10517272	***Elevation:***	
DP2BR:		***Elevrc:***	
Spatial Status:		***Zone:***	17
Code OB:	_	***East83:***	
Code OB Desc:	No formation data	***North83:***	
Open Hole:		***Org CS:***	
Cluster Kind:		***UTMRC:***	9
Date Completed:	5/18/2001	***UTMRC Desc:***	unknown UTM
Remarks:		***Location Method:***	na
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Method of Construction & Well Use

Method Construction ID:	961915299
Method Construction Code:	0
Method Construction:	Not Known
Other Method Construction:	

Pipe Information

Pipe ID:	11065842
Casing No:	1
Comment:	
Alt Name:	

Site:
lot 17 ON

Database:
WWIS

Well ID:	1915776	***Data Entry Status:***	
Construction Date:		***Data Src:***	1
Primary Water Use:	Domestic	***Date Received:***	5/6/2002
Sec. Water Use:		***Selected Flag:***	Yes
Final Well Status:	Water Supply	***Abandonment Rec:***	
Water Type:		***Contractor:***	6874
Casing Material:		***Form Version:***	1
Audit No:	229313	***Owner:***	
Tag:		***Street Name:***	
Construction Method:		***County:***	DURHAM
Elevation (m):		***Municipality:***	AJAX TOWN
Elevation Reliability:		***Site Info:***	
Depth to Bedrock:		***Lot:***	017
Well Depth:		***Concession:***	
Overburden/Bedrock:		***Concession Name:***	
Pump Rate:		***Easting NAD83:***	
Static Water Level:		***Northing NAD83:***	
Flowing (Y/N):		***Zone:***	
Flow Rate:		***UTM Reliability:***	
Clear/Cloudy:			

Bore Hole Information

Bore Hole ID:	10524438	***Elevation:***	
DP2BR:		***Elevrc:***	
Spatial Status:		***Zone:***	17
Code OB:	o	***East83:***	
Code OB Desc:	Overburden	***North83:***	
Open Hole:		***Org CS:***	
Cluster Kind:		***UTMRC:***	9
Date Completed:	4/24/2002	***UTMRC Desc:***	unknown UTM
Remarks:		***Location Method:***	na
Elevrc Desc:			
Location Source Date:			
Improvement Location Source:			
Improvement Location Method:			
Source Revision Comment:			
Supplier Comment:			

Overburden and Bedrock Materials Interval

Formation ID:	932859665
Layer:	2
Color:	6
General Color:	BROWN
Mat1:	28
Most Common Material:	SAND
Mat2:	
Mat2 Desc:	
Mat3:	
Mat3 Desc:	
Formation Top Depth:	10
Formation End Depth:	28
Formation End Depth UOM:	ft

Overburden and Bedrock Materials Interval

Formation ID:	932859664
Layer:	1
Color:	
General Color:	

Mat1:	00
Most Common Material:	UNKNOWN TYPE
Mat2:	60
Mat2 Desc:	CEMENTED
Mat3:	
Mat3 Desc:	
Formation Top Depth:	0
Formation End Depth:	10
Formation End Depth UOM:	ft

Method of Construction & Well Use

Method Construction ID:	961915776
Method Construction Code:	1
Method Construction:	Cable Tool
Other Method Construction:	

Pipe Information

Pipe ID:	11073008
Casing No:	1
Comment:	
Alt Name:	

Construction Record - Casing

Casing ID:	930142276
Layer:	1
Material:	3
Open Hole or Material:	CONCRETE
Depth From:	
Depth To:	
Casing Diameter:	30
Casing Diameter UOM:	inch
Casing Depth UOM:	ft

Results of Well Yield Testing

Pump Test ID:	991915776
Pump Set At:	
Static Level:	17
Final Level After Pumping:	28
Recommended Pump Depth:	27
Pumping Rate:	25
Flowing Rate:	
Recommended Pump Rate:	6
Levels UOM:	ft
Rate UOM:	GPM
Water State After Test Code:	1
Water State After Test:	CLEAR
Pumping Test Method:	1
Pumping Duration HR:	2
Pumping Duration MIN:	30
Flowing:	No

Draw Down & Recovery

Pump Test Detail ID:	934138297
Test Type:	Recovery
Test Duration:	15
Test Level:	25
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934932115
Test Type:	Recovery
Test Duration:	60
Test Level:	18
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934417973
Test Type:	Recovery
Test Duration:	30
Test Level:	22
Test Level UOM:	ft

Draw Down & Recovery

Pump Test Detail ID:	934677877
Test Type:	Recovery
Test Duration:	45
Test Level:	20
Test Level UOM:	ft

Water Details

Water ID:	934017070
Layer:	1
Kind Code:	1
Kind:	FRESH
Water Found Depth:	28
Water Found Depth UOM:	ft

Site: ***Database:***
lot 17 con 4 ON ***WWIS***

Well ID:	1916327	***Data Entry Status:***	
Construction Date:		***Data Src:***	1
Primary Water Use:	Domestic	***Date Received:***	2/19/2003
Sec. Water Use:		***Selected Flag:***	Yes
Final Well Status:	Water Supply	***Abandonment Rec:***	
Water Type:		***Contractor:***	2662
Casing Material:		***Form Version:***	1
Audit No:	243827	***Owner:***	
Tag:		***Street Name:***	
Construction Method:		***County:***	DURHAM
Elevation (m):		***Municipality:***	AJAX TOWN
Elevation Reliability:		***Site Info:***	
Depth to Bedrock:		***Lot:***	017
Well Depth:		***Concession:***	04
Overburden/Bedrock:		***Concession Name:***	CON
Pump Rate:		***Easting NAD83:***	
Static Water Level:		***Northing NAD83:***	
Flowing (Y/N):		***Zone:***	
Flow Rate:		***UTM Reliability:***	
Clear/Cloudy:			

Bore Hole Information

Bore Hole ID:	10537898	***Elevation:***	
DP2BR:	105	***Elevrc:***	
Spatial Status:		***Zone:***	17
Code OB:	r	***East83:***	
Code OB Desc:	Bedrock	***North83:***	
Open Hole:		***Org CS:***	
Cluster Kind:		***UTMRC:***	9
Date Completed:	6/25/2002	***UTMRC Desc:***	unknown UTM

Remarks:
Elevrc Desc:
Location Source Date:
Improvement Location Source:
Improvement Location Method:
Source Revision Comment:
Supplier Comment:

Location Method: na

Overburden and Bedrock Materials Interval

Formation ID: 932906963
Layer: 2
Color: 6
General Color: BROWN
Mat1: 14
Most Common Material: HARDPAN
Mat2:
Mat2 Desc:
Mat3:
Mat3 Desc:
Formation Top Depth: 24
Formation End Depth: 105
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 932906964
Layer: 3
Color: 8
General Color: BLACK
Mat1: 17
Most Common Material: SHALE
Mat2: 26
Mat2 Desc: ROCK
Mat3:
Mat3 Desc:
Formation Top Depth: 105
Formation End Depth: 120
Formation End Depth UOM: ft

Overburden and Bedrock Materials Interval

Formation ID: 932906962
Layer: 1
Color: 6
General Color: BROWN
Mat1: 05
Most Common Material: CLAY
Mat2: 11
Mat2 Desc: GRAVEL
Mat3: 12
Mat3 Desc: STONES
Formation Top Depth: 0
Formation End Depth: 24
Formation End Depth UOM: ft

Annular Space/Abandonment Sealing Record

Plug ID: 933236607
Layer: 1
Plug From: 0
Plug To: 20

Plug Depth UOM: ft

Method of Construction & Well Use

Method Construction ID: 961916327
Method Construction Code: 1
Method Construction: Cable Tool
Other Method Construction:

Pipe Information

Pipe ID: 11086468
Casing No: 1
Comment:
Alt Name:

Construction Record - Casing

Casing ID: 930142767
Layer: 2
Material: 4
Open Hole or Material: OPEN HOLE
Depth From:
Depth To: 120
Casing Diameter: 6
Casing Diameter UOM: inch
Casing Depth UOM: ft

Construction Record - Casing

Casing ID: 930142766
Layer: 1
Material: 1
Open Hole or Material: STEEL
Depth From:
Depth To: 105
Casing Diameter: 6
Casing Diameter UOM: inch
Casing Depth UOM: ft

Results of Well Yield Testing

Pump Test ID: 991916327
Pump Set At:
Static Level: 41
Final Level After Pumping: 51
Recommended Pump Depth: 118
Pumping Rate: 7
Flowing Rate:
Recommended Pump Rate: 5
Levels UOM: ft
Rate UOM: GPM
Water State After Test Code: 1
Water State After Test: CLEAR
Pumping Test Method: 1
Pumping Duration HR: 2
Pumping Duration MIN: 0
Flowing: No

Draw Down & Recovery

Pump Test Detail ID: 934131111
Test Type: Draw Down
Test Duration: 15

Test Level: 49
Test Level UOM: ft

Draw Down & Recovery

Pump Test Detail ID: 934933314
Test Type: Draw Down
Test Duration: 60
Test Level: 50
Test Level UOM: ft

Draw Down & Recovery

Pump Test Detail ID: 934679038
Test Type: Draw Down
Test Duration: 45
Test Level: 49
Test Level UOM: ft

Draw Down & Recovery

Pump Test Detail ID: 934419692
Test Type: Draw Down
Test Duration: 30
Test Level: 49
Test Level UOM: ft

Water Details

Water ID: 934031506
Layer: 1
Kind Code: 5
Kind: Not stated
Water Found Depth: 109
Water Found Depth UOM: ft

Appendix: Database Descriptions

Environmental Risk Information Services (ERIS) can search the following databases. The extent of historical information varies with each database and current information is determined by what is publicly available to ERIS at the time of update. ***Note:*** *Databases denoted with " * " indicates that the database will no longer be updated. See the individual database description for more information.*

Abandoned Aggregate Inventory: Provincial AAGR

The MAAP Program maintains a database of abandoned pits and quarries. Please note that the database is only referenced by lot and concession and city/town location. The database provides information regarding the location, type, size, land use, status and general comments.*

Government Publication Date: Sept 2002*

Aggregate Inventory: Provincial AGR

The Ontario Ministry of Natural Resources maintains a database of all active pits and quarries. The database provides information regarding the registered owner/operator, location name, operation type, approval type, and maximum annual tonnage.

Government Publication Date: Up to Sep 2020

Abandoned Mine Information System: Provincial AMIS

The Abandoned Mines Information System contains data on known abandoned and inactive mines located on both Crown and privately held lands. The information was provided by the Ministry of Northern Development and Mines (MNDM), with the following disclaimer: "the database provided has been compiled from various sources, and the Ministry of Northern Development and Mines makes no representation and takes no responsibility that such information is accurate, current or complete". Reported information includes official mine name, status, background information, mine start/end date, primary commodity, mine features, hazards and remediation.

Government Publication Date: 1800-Oct 2018

Anderson's Waste Disposal Sites: Private ANDR

The information provided in this database was collected by examining various historical documents which aimed to characterize the likely position of former waste disposal sites from 1860 to present. The research initiative behind the creation of this database was to identify those sites that are missing from the Ontario MOE Waste Disposal Site Inventory, as well as to provide revisions and corrections to the positions and descriptions of sites currently listed in the MOE inventory. In addition to historic waste disposal facilities, the database also identifies certain auto wreckers and scrap yards that have been extrapolated from documentary sources. Please note that the data is not warranted to be complete, exhaustive or authoritative. The information was collected for research purposes only.

Government Publication Date: 1860s-Present

Aboveground Storage Tanks: Provincial AST

Historical listing of aboveground storage tanks made available by the Department of Natural Resources and Forestry. Includes tanks used to hold water or petroleum. This dataset has been retired as of September 25, 2014 and will no longer be updated.

Government Publication Date: May 31, 2014

Automobile Wrecking & Supplies: Private AUWR

This database provides an inventory of known locations that are involved in the scrap metal, automobile wrecking/recycling, and automobile parts & supplies industry. Information is provided on the company name, location and business type.

Government Publication Date: 1999-Dec 31, 2020

Borehole: Provincial BORE

A borehole is the generalized term for any narrow shaft drilled in the ground, either vertically or horizontally. The information here includes geotechnical investigations or environmental site assessments, mineral exploration, or as a pilot hole for installing piers or underground utilities. Information is from many sources such as the Ministry of Transportation (MTO) boreholes from engineering reports and projects from the 1950 to 1990's in Southern Ontario. Boreholes from the Ontario Geological Survey (OGS) including The Urban Geology Analysis Information System (UGAIS) and the York Peel Durham Toronto (YPDT) database of the Conservation Authority Moraine Coalition. This database will include fields such as location, stratigraphy, depth, elevation, year drilled, etc. For all water well data or oil and gas well data for Ontario please refer to WWIS and OOGW.

Government Publication Date: 1875-Jul 2018

Certificates of Approval: Provincial CA

This database contains the following types of approvals: Air & Noise, Industrial Sewage, Municipal & Private Sewage, Waste Management Systems and Renewable Energy Approvals. The MOE in Ontario states that any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste, must have a Certificate of Approval before it can operate lawfully. Fields include approval number, business name, address, approval date, approval type and status. This database will no longer be updated, as CofA's have been replaced by either Environmental Activity and Sector Registry (EASR) or Environmental Compliance Approval (ECA). Please refer to those individual databases for any information after Oct.31, 2011.

Government Publication Date: 1985-Oct 30, 2011*

Dry Cleaning Facilities: Federal CDRY

List of dry cleaning facilities made available by Environment and Climate Change Canada. Environment and Climate Change Canada's Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations (SOR/2003-79) are intended to reduce releases of tetrachloroethylene to the environment from dry cleaning facilities.

Government Publication Date: Jan 2004-Dec 2018

Commercial Fuel Oil Tanks: Provincial CFOT

Locations of commercial underground fuel oil tanks. This is not a comprehensive or complete inventory of commercial fuel tanks in the province; this listing is a copy of records of registered commercial underground fuel oil tanks obtained under Access to Public Information.
Note that the following types of tanks do not require registration: waste oil tanks in apartments, office buildings, residences, etc.; aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Chemical Manufacturers and Distributors: Private CHEM

This database includes information from both a one time study conducted in 1992 and private source and is a listing of facilities that manufacture or distribute chemicals. The production of these chemical substances may involve one or more chemical reactions and/or chemical separation processes (i.e. fractionation, solvent extraction, crystallization, etc.).

Government Publication Date: 1999-Jan 31, 2020

Chemical Register: Private CHM

This database includes a listing of locations of facilities within the Province or Territory that either manufacture and/or distributes chemicals.

Government Publication Date: 1999-Dec 31, 2020

Compressed Natural Gas Stations: Private CNG

Canada has a network of public access compressed natural gas (CNG) refuelling stations. These stations dispense natural gas in compressed form at 3,000 pounds per square inch (psi), the pressure which is allowed within the current Canadian codes and standards. The majority of natural gas refuelling is located at existing retail gasoline that have a separate refuelling island for natural gas. This list of stations is made available by the Canadian Natural Gas Vehicle Alliance.

Government Publication Date: Dec 2012 -Dec 2020

Inventory of Coal Gasification Plants and Coal Tar Sites: Provincial COAL

This inventory includes both the "Inventory of Coal Gasification Plant Waste Sites in Ontario-April 1987" and the Inventory of Industrial Sites Producing or Using Coal Tar and Related Tars in Ontario-November 1988) collected by the MOE. It identifies industrial sites that produced and continue to produce or use coal tar and other related tars. Detailed information is available and includes: facility type, size, land use, information on adjoining properties, soil condition, site operators/occupants, site description, potential environmental impacts and historic maps available. This was a one-time inventory.*

Government Publication Date: Apr 1987 and Nov 1988*

Compliance and Convictions: Provincial CONV

This database summarizes the fines and convictions handed down by the Ontario courts beginning in 1989. Companies and individuals named here have been found guilty of environmental offenses in Ontario courts of law.

Government Publication Date: 1989-Nov 2020

Certificates of Property Use: Provincial CPU

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include all CPU's on the registry such as (EPA s. 168.6) - Certificate of Property Use.

Government Publication Date: 1994-Feb 28, 2021

Drill Hole Database: Provincial DRL

The Ontario Drill Hole Database contains information on more than 113,000 percussion, overburden, sonic and diamond drill holes from assessment files on record with the department of Mines and Minerals. Please note that limited data is available for southern Ontario, as it was the last area to be completed. The database was created when surveys submitted to the Ministry were converted in the Assessment File Research Image Database (AFRI) project. However, the degree of accuracy (coordinates) as to the exact location of drill holes is dependent upon the source document submitted to the MNDM. Levels of accuracy used to locate holes are: centering on the mining claim; a sketch of the mining claim; a 1:50,000 map; a detailed company map; or from submitted a "Report of Work".

Government Publication Date: 1886 - Sep 2020

Delisted Fuel Tanks: Provincial DTNK

List of fuel storage tank sites that were once found in - and have since been removed from - the list of fuel storage tanks made available by the regulatory agency under Access to Public Information.

Government Publication Date: Jul 31, 2020

Environmental Activity and Sector Registry: Provincial EASR

On October 31, 2011, a smarter, faster environmental approvals system came into effect in Ontario. The EASR allows businesses to register certain activities with the ministry, rather than apply for an approval. The registry is available for common systems and processes, to which preset rules of operation can be applied. The EASR is currently available for: heating systems, standby power systems and automotive refinishing. Businesses whose activities aren't subject to the EASR may apply for an ECA (Environmental Compliance Approval), Please see our ECA database.

Government Publication Date: Oct 2011-Jan 31, 2021

Environmental Registry: Provincial EBR

The Environmental Registry lists proposals, decisions and exceptions regarding policies, Acts, instruments, or regulations that could significantly affect the environment. Through the Registry, thirteen provincial ministries notify the public of upcoming proposals and invite their comments. For example, if a local business is requesting a permit, license, or certificate of approval to release substances into the air or water; these are notified on the registry. Data includes: Approval for discharge into the natural environment other than water (i.e. Air) - EPA s. 9, Approval for sewage works - OWRA s. 53(1), and EPA s. 27 - Approval for a waste disposal site. For information regarding Permit to Take Water (PTTW), Certificate of Property Use (CPU) and (ORD) Orders please refer to those individual databases.

Government Publication Date: 1994-Feb 28, 2021

Environmental Compliance Approval: Provincial ECA

On October 31, 2011, a smarter, faster environmental approvals system came into effect in Ontario. In the past, a business had to apply for multiple approvals (known as certificates of approval) for individual processes and pieces of equipment. Today, a business either registers itself, or applies for a single approval, depending on the types of activities it conducts. Businesses whose activities aren't subject to the EASR may apply for an ECA. A single ECA addresses all of a business's emissions, discharges and wastes. Separate approvals for air, noise and waste are no longer required. This database will also include Renewable Energy Approvals. For certificates of approval prior to Nov 1st, 2011, please refer to the CA database. For all Waste Disposal Sites please refer to the WDS database.

Government Publication Date: Oct 2011- Jan 31, 2021

Environmental Effects Monitoring: Federal EEM

The Environmental Effects Monitoring program assesses the effects of effluent from industrial or other sources on fish, fish habitat and human usage of fisheries resources. Since 1992, pulp and paper mills have been required to conduct EEM studies under the Pulp and Paper Effluent Regulations. This database provides information on the mill name, geographical location and sub-lethal toxicity data.

Government Publication Date: 1992-2007*

ERIS Historical Searches: Private EHS

ERIS has compiled a database of all environmental risk reports completed since March 1999. Available fields for this database include: site location, date of report, type of report, and search radius. As per all other databases, the ERIS database can be referenced on both the map and "Statistical Profile" page.

Government Publication Date: 1999-Jan 31, 2021

Environmental Issues Inventory System: Federal EIIS

The Environmental Issues Inventory System was developed through the implementation of the Environmental Issues and Remediation Plan. This plan was established to determine the location and severity of contaminated sites on inhabited First Nation reserves, and where necessary, to remediate those that posed a risk to health and safety; and to prevent future environmental problems. The EIIS provides information on the reserve under investigation, inventory number, name of site, environmental issue, site action (Remediation, Site Assessment), and date investigation completed.

Government Publication Date: 1992-2001*

Emergency Management Historical Event: Provincial EMHE

List of locations of historical occurrences of emergency events, including those assigned to the Ministry of Natural Resources by Order-In-Council (OIC) under the Emergency Management and Civil Protection Act, as well as events where MNR provided requested emergency response assistance. Many of these events will have involved community evacuations, significant structural loss, and/or involvement of MNR emergency response staff. These events fall into one of ten (10) type categories: Dam Failure; Drought / Low Water; Erosion; Flood; Forest Fire; Soil and Bedrock Instability; Petroleum Resource Center Event, EMO Requested Assistance, Continuity of Operations Event, Other Requested Assistance. EMHE record details are reproduced by ERIS under License with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2017.

Government Publication Date: Dec 31, 2016

Environmental Penalty Annual Report: Provincial EPAR

This database contains data from Ontario's annual environmental penalty report published by the Ministry of the Environment and Climate Change. These reports provide information on environmental penalties for land or water violations issued to companies in one of the nine industrial sectors covered by the Municipal Industrial Strategy for Abatement (MISA) regulations.

Government Publication Date: Jan 1, 2011 - Dec 31, 2019

List of Expired Fuels Safety Facilities: Provincial EXP

List of facilities and tanks for which there was once a fuel registration. This is not a comprehensive or complete inventory of expired tanks/tank facilities in the province; this listing is a copy of previously registered tanks and facilities obtained under Access to Public Information. Includes private fuel outlets, bulk plants, fuel oil tanks, gasoline stations, marinas, propane filling stations, liquid fuel tanks, piping systems, etc; includes tanks which have been removed from the ground.
Notes: registration was not required for private fuel underground/aboveground storage tanks prior to January 1990, nor for furnace oil tanks prior to May 1, 2002; registration is not required for waste oil tanks in apartments, office buildings, residences, etc., or aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Federal Convictions: Federal FCON

Environment Canada maintains a database referred to as the "Environmental Registry" that details prosecutions under the Canadian Environmental Protection Act (CEPA) and the Fisheries Act (FA). Information is provided on the company name, location, charge date, offence and penalty.

Government Publication Date: 1988-Jun 2007*

Contaminated Sites on Federal Land: Federal FCS

The Federal Contaminated Sites Inventory includes information on known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government. Includes fire training sites and sites at which Per- and Polyfluoroalkyl Substances (PFAS) are a concern.

Government Publication Date: Jun 2000-Jan 2021

Fisheries & Oceans Fuel Tanks: Federal FOFT

Fisheries & Oceans Canada maintains an inventory of aboveground & underground fuel storage tanks located on Fisheries & Oceans property or controlled by DFO. Our inventory provides information on the site name, location, tank owner, tank operator, facility type, storage tank location, tank contents & capacity, and date of tank installation.

Government Publication Date: 1964-Sep 2019

Federal Identification Registry for Storage Tank Systems (FIRSTS): Federal FRST

A list of federally regulated Storage tanks from the Federal Identification Registry for Storage Tank Systems (FIRSTS). FIRSTS is Environment and Climate Change Canada's database of storage tank systems subject to the Storage Tank for Petroleum Products and Allied Petroleum Products Regulations. The main objective of the Regulations is to prevent soil and groundwater contamination from storage tank systems located on federal and aboriginal lands. Storage tank systems that do not have a valid identification number displayed in a readily visible location on or near the storage tank system may be refused product delivery.

Government Publication Date: May 31, 2018

Fuel Storage Tank: Provincial FST

List of registered private and retail fuel storage tanks. This is not a comprehensive or complete inventory of private and retail fuel storage tanks in the province; this listing is a copy of registered private and retail fuel storage tanks, obtained under Access to Public Information.
Notes: registration was not required for private fuel underground/aboveground storage tanks prior to January 1990, nor for furnace oil tanks prior to May 1, 2002; registration is not required for waste oil tanks in apartments, office buildings, residences, etc., or aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Fuel Storage Tank - Historic: Provincial FSTH

The Fuels Safety Branch of the Ontario Ministry of Consumer and Commercial Relations maintained a database of all registered private fuel storage tanks. Public records of private fuel storage tanks are only available since the registration became effective in September 1989. This information is now collected by the Technical Standards and Safety Authority.

Government Publication Date: Pre-Jan 2010*

Ontario Regulation 347 Waste Generators Summary: Provincial GEN

Regulation 347 of the Ontario EPA defines a waste generation site as any site, equipment and/or operation involved in the production, collection, handling and/or storage of regulated wastes. A generator of regulated waste is required to register the waste generation site and each waste produced, collected, handled, or stored at the site. This database contains the registration number, company name and address of registered generators including the types of hazardous wastes generated. It includes data on waste generating facilities such as: drycleaners, waste treatment and disposal facilities, machine shops, electric power distribution etc. This information is a summary of all years from 1986 including the most currently available data. Some records may contain, within the company name, the phrase "See & Use..." followed by a series of letters and numbers. This occurs when one company is amalgamated with or taken over by another registered company. The number listed as "See & Use", refers to the new ownership and the other identification number refers to the original ownership. This phrase serves as a link between the 2 companies until operations have been fully transferred.

Government Publication Date: 1986-Jan 31, 2021

Greenhouse Gas Emissions from Large Facilities: Federal GHG

List of greenhouse gas emissions from large facilities made available by Environment Canada. Greenhouse gas emissions in kilotonnes of carbon dioxide equivalents (kt CO2 eq).

Government Publication Date: 2013-Dec 2018

TSSA Historic Incidents: Provincial HINC

List of historic incidences of spills and leaks of diesel, fuel oil, gasoline, natural gas, propane, and hydrogen recorded by the TSSA in their previous incident tracking system. The TSSA's Fuels Safety Program administers the Technical Standards & Safety Act 2000, providing fuel-related safety services associated with the safe transportation, storage, handling and use of fuels such as gasoline, diesel, propane, natural gas and hydrogen. Under this Act, the TSSA regulates fuel suppliers, storage facilities, transport trucks, pipelines, contractors and equipment or appliances that use fuels. Records are not verified for accuracy or completeness. This is not a comprehensive or complete inventory of historical fuel spills and leaks in the province. This listing is a copy of the data captured at one moment in time and is hence limited by the record date provided here.

Government Publication Date: 2006-June 2009*

Indian & Northern Affairs Fuel Tanks: Federal IAFT

The Department of Indian & Northern Affairs Canada (INAC) maintains an inventory of aboveground & underground fuel storage tanks located on both federal and crown land. Our inventory provides information on the reserve name, location, facility type, site/facility name, tank type, material & ID number, tank contents & capacity, and date of tank installation.

Government Publication Date: 1950-Aug 2003*

Fuel Oil Spills and Leaks: Provincial INC

Listing of spills and leaks of diesel, fuel oil, gasoline, natural gas, propane, and hydrogen reported to the Spills Action Centre (SAC). This is not a comprehensive or complete inventory of fuel-related leaks, spills, and incidents in the province; this listing in a copy of incidents reported to the SAC, obtained under Access to Public Information. Includes incidents from fuel-related hazards such as spills, fires, and explosions. Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Landfill Inventory Management Ontario: Provincial LIMO

The Landfill Inventory Management Ontario (LIMO) database is updated every year, as the Ministry of the Environment, Conservation and Parks compiles new and updated information. Includes small and large landfills currently operating as well as those which are closed and historic. Operators of larger landfills provide landfill information for the previous operating year to the ministry for LIMO including: estimated amount of total waste received, landfill capacity, estimated total remaining landfill capacity, fill rates, engineering designs, reporting and monitoring details, size of location, service area, approved waste types, leachate of site treatment, contaminant attenuation zone and more. The small landfills include information such as site owner, site location and certificate of approval # and status.

Government Publication Date: Feb 28, 2019

Canadian Mine Locations: Private MINE

This information is collected from the Canadian & American Mines Handbook. The Mines database is a national database that provides over 290 listings on mines (listed as public companies) dealing primarily with precious metals and hard rocks. Listed are mines that are currently in operation, closed, suspended, or are still being developed (advanced projects). Their locations are provided as geographic coordinates (x, y and/or longitude, latitude). As of 2002, data pertaining to Canadian smelters and refineries has been appended to this database.

Government Publication Date: 1998-2009*

Mineral Occurrences: Provincial MNR

In the early 70's, the Ministry of Northern Development and Mines created an inventory of approximately 19,000 mineral occurrences in Ontario, in regard to metallic and industrial minerals, as well as some information on building stones and aggregate deposits. Please note that the "Horizontal Positional Accuracy" is approximately +/- 200 m. Many reference elements for each record were derived from field sketches using pace or chain/tape measurements against claim posts or topographic features in the area. The primary limiting factor for the level of positional accuracy is the scale of the source material. The testing of horizontal accuracy of the source materials was accomplished by comparing the plan metric (X and Y) coordinates of that point with the coordinates of the same point as defined from a source of higher accuracy.

Government Publication Date: 1846-Dec 2020

National Analysis of Trends in Emergencies System (NATES): Federal NATE

In 1974 Environment Canada established the National Analysis of Trends in Emergencies System (NATES) database, for the voluntary reporting of significant spill incidents. The data was to be used to assist in directing the work of the emergencies program. NATES ran from 1974 to 1994. Extensive information is available within this database including company names, place where the spill occurred, date of spill, cause, reason and source of spill, damage incurred, and amount, concentration, and volume of materials released.

Government Publication Date: 1974-1994*

Non-Compliance Reports: Provincial NCPL

The Ministry of the Environment provides information about non-compliant discharges of contaminants to air and water that exceed legal allowable limits, from regulated industrial and municipal facilities. A reported non-compliance failure may be in regard to a Control Order, Certificate of Approval, Sectoral Regulation or specific regulation/act.

Government Publication Date: Dec 31, 2018

National Defense & Canadian Forces Fuel Tanks: Federal NDFT

The Department of National Defense and the Canadian Forces maintains an inventory of all aboveground & underground fuel storage tanks located on DND lands. Our inventory provides information on the base name, location, tank type & capacity, tank contents, tank class, date of tank installation, date tank last used, and status of tank as of May 2001. This database will no longer be updated due to the new National Security protocols which have prohibited any release of this database.

Government Publication Date: Up to May 2001*

National Defense & Canadian Forces Spills: Federal NDSP

The Department of National Defense and the Canadian Forces maintains an inventory of spills to land and water. All spill sites have been classified under the "Transportation of Dangerous Goods Act - 1992". Our inventory provides information on the facility name, location, spill ID #, spill date, type of spill, as well as the quantity of substance spilled & recovered.

Government Publication Date: Mar 1999-Apr 2018

National Defence & Canadian Forces Waste Disposal Sites: Federal NDWD

The Department of National Defence and the Canadian Forces maintains an inventory of waste disposal sites located on DND lands. Where available, our inventory provides information on the base name, location, type of waste received, area of site, depth of site, year site opened/closed and status.

Government Publication Date: 2001-Apr 2007*

National Energy Board Pipeline Incidents: Federal NEBI

Locations of pipeline incidents from 2008 to present, made available by the Canada Energy Regulator (CER) - previously the National Energy Board (NEB). Includes incidents reported under the Onshore Pipeline Regulations and the Processing Plant Regulations related to pipelines under federal jurisdiction, does not include incident data related to pipelines under provincial or territorial jurisdiction.

Government Publication Date: 2008-Dec 31, 2020

National Energy Board Wells: Federal NEBP

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Environmental Emergencies System (NEES): Federal NEES

In 2000, the Emergencies program implemented NEES, a reporting system for spills of hazardous substances. For the most part, this system only captured data from the Atlantic Provinces, some from Quebec and Ontario and a portion from British Columbia. Data for Alberta, Saskatchewan, Manitoba and the Territories was not captured. However, NEES is also a repository for previous Environment Canada spill datasets. NEES is composed of the historic datasets ' or Trends ' which dates from approximately 1974 to present. NEES Trends is a compilation of historic databases, which were merged and includes data from NATES (National Analysis of Trends in Emergencies System), ARTS (Atlantic Regional Trends System), and NEES. In 2001, the Emergencies Program determined that variations in reporting regimes and requirements between federal and provincial agencies made national spill reporting and trend analysis difficult to achieve. As a consequence, the department has focused efforts on capturing data on spills of substances which fall under its legislative authority only (CEPA and FA). As such, the NEES database will be decommissioned in December 2004.

Government Publication Date: 1974-2003*

National PCB Inventory: Federal NPCB

Environment Canada's National PCB inventory includes information on in-use PCB containing equipment in Canada including federal, provincial and private facilities. Federal out-of-service PCB containing equipment and PCB waste owned by the federal government or by federally regulated industries such as airlines, railway companies, broadcasting companies, telephone and telecommunications companies, pipeline companies, etc. are also listed. Although it is not Environment Canada's mandate to collect data on non-federal PCB waste, the National PCB inventory includes some information on provincial and private PCB waste and storage sites. Some addresses provided may be Head Office addresses and are not necessarily the location of where the waste is being used or stored.

Government Publication Date: 1988-2008*

National Pollutant Release Inventory: Federal NPRI

Environment Canada has defined the National Pollutant Release Inventory ("NPRI") as a federal government initiative designed to collect comprehensive national data regarding releases to air, water, or land, and waste transfers for recycling for more than 300 listed substances.

Government Publication Date: 1993-May 2017

Oil and Gas Wells: Private OGWE

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-Aug 31, 2020

Ontario Oil and Gas Wells: Provincial OOGW

In 1998, the MNR handed over to the Ontario Oil, Gas and Salt Resources Corporation, the responsibility of maintaining a database of oil and gas wells drilled in Ontario. The OGSR Library has over 20,000+ wells in their database. Information available for all wells in the ERIS database include well owner/operator, location, permit issue date, and well cap date, license No., status, depth and the primary target (rock unit) of the well being drilled. All geology/stratigraphy table information, plus all water table information is also provide for each well record.

Government Publication Date: 1800-Jun 2020

Inventory of PCB Storage Sites: Provincial OPCB

The Ontario Ministry of Environment, Waste Management Branch, maintains an inventory of PCB storage sites within the province. Ontario Regulation 11/82 (Waste Management - PCB) and Regulation 347 (Generator Waste Management) under the Ontario EPA requires the registration of inactive PCB storage equipment and/or disposal sites of PCB waste with the Ontario Ministry of Environment. This database contains information on: 1) waste quantities; 2) major and minor sites storing liquid or solid waste; and 3) a waste storage inventory.

Government Publication Date: 1987-Oct 2004; 2012-Dec 2013

Orders: Provincial ORD

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include all Orders on the registry such as (EPA s. 17) - Order for remedial work, (EPA s. 18) - Order for preventative measures, (EPA s. 43) - Order for removal of waste and restoration of site, (EPA s. 44) - Order for conformity with Act for waste disposal sites, (EPA s. 136) - Order for performance of environmental measures.

Government Publication Date: 1994-Feb 28, 2021

Canadian Pulp and Paper: Private PAP

This information is part of the Pulp and Paper Canada Directory. The Directory provides a comprehensive listing of the locations of pulp and paper mills and the products that they produce.

Government Publication Date: 1999, 2002, 2004, 2005, 2009-2014

Parks Canada Fuel Storage Tanks: Federal PCFT

Canadian Heritage maintains an inventory of known fuel storage tanks operated by Parks Canada, in both National Parks and at National Historic Sites. The database details information on site name, location, tank install/removal date, capacity, fuel type, facility type, tank design and owner/operator.

Government Publication Date: 1920-Jan 2005*

Pesticide Register: Provincial PES

The Ontario Ministry of the Environment and Climate Change maintains a database of licensed operators and vendors of registered pesticides.

Government Publication Date: Oct 2011-Jan 31, 2021

Pipeline Incidents: Provincial PINC

List of pipeline incidents (strikes, leaks, spills). This is not a comprehensive or complete inventory of pipeline incidents in the province; this listing in an historical copy of records previously obtained under Access to Public Information. Records are not verified for accuracy or completeness.

Government Publication Date: Oct 31, 2020

Private and Retail Fuel Storage Tanks: Provincial PRT

The Fuels Safety Branch of the Ontario Ministry of Consumer and Commercial Relations maintained a database of all registered private fuel storage tanks and licensed retail fuel outlets. This database includes an inventory of locations that have gasoline, oil, waste oil, natural gas and/or propane storage tanks on their property. The MCCR no longer collects this information. This information is now collected by the Technical Standards and Safety Authority (TSSA).

Government Publication Date: 1989-1996*

Permit to Take Water: Provincial PTTW

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include all PTTW's on the registry such as OWRA s. 34 - Permit to take water.

Government Publication Date: 1994-Feb 28, 2021

Ontario Regulation 347 Waste Receivers Summary: Provincial REC

Part V of the Ontario Environmental Protection Act ("EPA") regulates the disposal of regulated waste through an operating waste management system or a waste disposal site operated or used pursuant to the terms and conditions of a Certificate of Approval or a Provisional Certificate of Approval. Regulation 347 of the Ontario EPA defines a waste receiving site as any site or facility to which waste is transferred by a waste carrier. A receiver of regulated waste is required to register the waste receiving facility. This database represents registered receivers of regulated wastes, identified by registration number, company name and address, and includes receivers of waste such as: landfills, incinerators, transfer stations, PCB storage sites, sludge farms and water pollution control plants. This information is a summary of all years from 1986 including the most currently available data.

Government Publication Date: 1986-2016

Record of Site Condition: Provincial RSC

The Record of Site Condition (RSC) is part of the Ministry of the Environment's Brownfields Environmental Site Registry. Protection from environmental cleanup orders for property owners is contingent upon documentation known as a record of site condition (RSC) being filed in the Environmental Site Registry. In order to file an RSC, the property must have been properly assessed and shown to meet the soil, sediment and groundwater standards appropriate for the use (such as residential) proposed to take place on the property. The Record of Site Condition Regulation (O. Reg. 153/04) details requirements related to site assessment and clean up.
RSCs filed after July 1, 2011 will also be included as part of the new (O.Reg. 511/09).

Government Publication Date: 1997-Sept 2001, Oct 2004-Jan 2021

Retail Fuel Storage Tanks: Private RST

This database includes an inventory of retail fuel outlet locations (including marinas) that have on their property gasoline, oil, waste oil, natural gas and / or propane storage tanks.

Government Publication Date: 1999-Dec 31, 2020

Scott's Manufacturing Directory: Private SCT

Scott's Directories is a data bank containing information on over 200,000 manufacturers across Canada. Even though Scott's listings are voluntary, it is the most comprehensive database of Canadian manufacturers available. Information concerning a company's address, plant size, and main products are included in this database.

Government Publication Date: 1992-Mar 2011*

Ontario Spills: Provincial SPL

List of spills and incidents made available the Ministry of the Environment, Conservation and Parks. This database identifies information such as location (approximate), type and quantity of contaminant, date of spill, environmental impact, cause, nature of impact, etc. Information from 1988-2002 was part of the ORIS (Occurrence Reporting Information System). The SAC (Spills Action Centre) handles all spills reported in Ontario. Regulations for spills in Ontario are part of the MOE's Environmental Protection Act, Part X.

Government Publication Date: 1988-Mar 2020; Jul 2020 - Aug 2020

Wastewater Discharger Registration Database: Provincial SRDS

Information under this heading is combination of the following 2 programs. The Municipal/Industrial Strategy for Abatement (MISA) division of the Ontario Ministry of Environment maintained a database of all direct dischargers of toxic pollutants within nine sectors including: Electric Power Generation; Mining; Petroleum Refining; Organic Chemicals; Inorganic Chemicals; Pulp & Paper; Metal Casting; Iron & Steel; and Quarries. All sampling information is now collected and stored within the Sample Result Data Store (SRDS).

Government Publication Date: 1990-Dec 31, 2017

Anderson's Storage Tanks: Private TANK

The information provided in this database was collected by examining various historical documents, which identified the location of former storage tanks, containing substances such as fuel, water, gas, oil, and other various types of miscellaneous products. Information is available in regard to business operating at tank site, tank location, permit year, permit & installation type, no. of tanks installed & configuration and tank capacity. Data contained within this database pertains only to the city of Toronto and is not warranted to be complete, exhaustive or authoritative. The information was collected for research purposes only.

Government Publication Date: 1915-1953*

Transport Canada Fuel Storage Tanks: Federal TCFT

List of fuel storage tanks currently or previously owned or operated by Transport Canada. This inventory also includes tanks on The Pickering Lands, which refers to 7,530 hectares (18,600 acres) of land in Pickering, Markham, and Uxbridge owned by the Government of Canada since 1972; properties on this land has been leased by the government since 1975, and falls under the Site Management Policy of Transport Canada, but is administered by Public Works and Government Services Canada. This inventory provides information on the site name, location, tank age, capacity and fuel type.

Government Publication Date: 1970 - Dec 2020

Variances for Abandonment of Underground Storage Tanks: Provincial VAR

Listing of variances granted for storage tank abandonment. This is not a comprehensive or complete inventory of tank abandonment variances in the province; this listing is a copy of tank abandonment variance records previously obtained under Access to Public Information. In Ontario, registered underground storage tanks must be removed within two years of disuse; if removal of a tank is not feasible, an application may be sought for a variance from this code requirement.
Records are not verified for accuracy or completeness.

Government Publication Date: Jul 31, 2020

Waste Disposal Sites - MOE CA Inventory: Provincial WDS

The Ontario Ministry of Environment, Waste Management Branch, maintains an inventory of known open (active or inactive) and closed disposal sites in the Province of Ontario. Active sites maintain a Certificate of Approval, are approved to receive and are receiving waste. Inactive sites maintain Certificate(s) of Approval but are not receiving waste. Closed sites are not receiving waste. The data contained within this database was compiled from the MOE's Certificate of Approval database. Locations of these sites may be cross-referenced to the Anderson database described under ERIS's Private Source Database section, by the CA number. All new Environmental Compliance Approvals handed out after Oct 31, 2011 for Waste Disposal Sites will still be found in this database.

Government Publication Date: Oct 2011-Jan 31, 2021

Waste Disposal Sites - MOE 1991 Historical Approval Inventory: Provincial WDSH

In June 1991, the Ontario Ministry of Environment, Waste Management Branch, published the "June 1991 Waste Disposal Site Inventory", of all known active and closed waste disposal sites as of October 30st, 1990. For each "active" site as of October 31st 1990, information is provided on site location, site/CA number, waste type, site status and site classification. For each "closed" site as of October 31st 1990, information is provided on site location, site/CA number, closure date and site classification. Locations of these sites may be cross-referenced to the Anderson database described under ERIS's Private Source Database section, by the CA number.

Government Publication Date: Up to Oct 1990*

Water Well Information System: Provincial WWIS

This database describes locations and characteristics of water wells found within Ontario in accordance with Regulation 903. It includes such information as coordinates, construction date, well depth, primary and secondary use, pump rate, static water level, well status, etc. Also included are detailed stratigraphy information, approximate depth to bedrock and the approximate depth to the water table.

Government Publication Date: Apr 30, 2020

Definitions

Database Descriptions: This section provides a detailed explanation for each database including: source, information available, time coverage, and acronyms used. They are listed in alphabetic order.

Detail Report: This is the section of the report which provides the most detail for each individual record. Records are summarized by location, starting with the project property followed by records in closest proximity.

Distance: The distance value is the distance between plotted points, not necessarily the distance between the sites' boundaries. All values are an approximation.

Direction: The direction value is the compass direction of the site in respect to the project property and/or center point of the report.

Elevation: The elevation value is taken from the location at which the records for the site address have been plotted. All values are an approximation. Source: Google Elevation API.

Executive Summary: This portion of the report is divided into 3 sections:

'Report Summary'- Displays a chart indicating how many records fall on the project property and, within the report search radii.

'Site Report Summary'-Project Property'- This section lists all the records which fall on the project property. For more details, see the 'Detail Report' section.

'Site Report Summary-Surrounding Properties'- This section summarizes all records on adjacent properties, listing them in order of proximity from the project property. For more details, see the 'Detail Report' section.

Map Key: The map key number is assigned according to closest proximity from the project property. Map Key numbers always start at #1. The project property will always have a map key of '1' if records are available. If there is a number in brackets beside the main number, this will indicate the number of records on that specific property. If there is no number in brackets, there is only one record for that property.

The symbol and colour used indicates 'elevation': the red inverted triangle will dictate 'ERIS Sites with Lower Elevation', the yellow triangle will dictate 'ERIS Sites with Higher Elevation' and the orange square will dictate 'ERIS Sites with Same Elevation.'

Unplottables: These are records that could not be mapped due to various reasons, including limited geographic information. These records may or may not be in your study area, and are included as reference.

APPENDIX B

Transmission Report

Date/Time	03-30-2021	02:41:05 p.m.	Transmit Header Text
Local ID 1	01		Local Name 1

This document : Confirmed
(reduced sample and details below)
Document size : 8.5"x11"

Ministry of the Environment
Freedom of Information and Protection of Privacy Office
40 St. Clair Avenue West, 12th Floor
Toronto, ON M4V 1M2
Tel: 416-314-4075
Fax: 416-314-4285

Ontario

Use this form to request records that are in the Ministry's files on environmental concerns related to properties. Please refer to the guide on the completion and use of this form. Our fax no. is 416- 314-4285.

Requester Data			For Ministry Use Only	
Name, Title, Company Name and Mailing Address of Requester Rachel Baldwin, Geo-Environmental Scientist EXP Service Inc., Suite 110 220 Commerce Valley Drive West Markham, Ontario L3T 0A8 Email Address: rachel.baldwin@exp.com			FOI Request No	Date Request Received
			Fee Paid ☐ CHQ ☐ VISA/MC/AMEX ☐ CASH/MONEY ORDER	
Tel: 437-214-9754 Fax: 905-695-0169	Your Project/ Reference No. BRM-00804892-B0	Signature of Requester RBaldwin	CNR ☐ ER ☐ NOR ☐ SWR ☐ WCR IEB ☐ EAA ☐ EMR ☐ SCB ☐ SDW	

Request Parameters

Municipal Address/Lot, Concession, Geographic Township (Municipal address mandatory for cities, towns or regions)

Part of Lot 17, Concession 5, Pickering, Ontario, designated as Part 8 PL 40R-24623

Present Property Owner(s) and Date(s) of Ownership

The Regional Municipality of Durham acquired on 2016/03/31

Previous Property Owner(s) and Date(s) of Ownership

Present/Previous Tenant(s) (if applicable)

Search Parameters Files older than 2 years may require $60.00 retrieval cost. There is no guarantee that records responsive to your request will be located.	**Specify Year(s) Requested**
Environmental concerns (General correspondence, occurrence reports, abatement)	2018 to Present
Orders	2018 to Present
Spills	2018 to Present
Investigations/prosecutions ▸ *Owner and tenant information must be provided*	2018 to Present
Waste Generator number/classes	2018 to Present

Certificates of Approval ▸ Proponent information must be provided and Certificates of Approval number(s) (if known). 1985 and prior records are searched manually. Search fees in excess of $300.00 may be incurred, depending on the types and years of records to be searched. If supporting documents are also required, mark SD box.

		SD	Specify Year(s) Requested
Air - *emissions*			2018 to Present
Renewable Energy			2018 to Present
Water - *mains, treatment, ground level, standpipes & elevated storage, pumping stations (local & booster)*			2018 to Present
Sewage - *sanitary, storm, treatment, stormwater, leachate & leachate treatment & sewage pump stations*			2018 to Present
Waste water - *industrial discharge*			2018 to Present
Waste sites - *disposal, landfill sites, transfer stations, processing sites, incinerator sites*			2018 to Present
Waste systems	- *haulers: sewage, non-hazardous & hazardous waste, mobile waste processing units, PCB destruction*		2018 to Present

0026 (02/00)

Total Pages Scanned : 3 Total Pages Confirmed : 3

No.	Job	Remote Station	Start Time	Duration	Pages	Line	Mode	Job Type	Results
001	320	4163144285	02:39:11 p.m. 03-30-2021	00:01:16	3/3	1	EC	HS	CP24000

Abbreviations:

HS: Host send	PL: Polled local	MP: Mailbox print	CP: Completed	TS: Terminated by system
HR: Host receive	PR: Polled remote	RP: Report	FA: Fail	G3: Group 3
WS: Waiting send	MS: Mailbox save	FF: Fax Forward	TU: Terminated by user	EC: Error Correct

Rachel Baldwin

From: Public Information Services <publicinformationservices@tssa.org>
Sent: Monday, March 29, 2021 3:00 PM
To: Rachel Baldwin
Subject: RE: Fuel Storage Record - Northwest Corner of Concession Road 5 and Sideline 16, Pickering

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Please refrain from sending documents to head office and only submit your requests electronically via email along with credit card payment. We are all working remotely and mailing in applications with cheques will lengthen the overall processing time.

NO RECORD FOUND

Hello Rachel,

Thank you for your request for confirmation of public information.

- We confirm that there are no records in our database of any fuel storage tanks at the subject addresses:

For a further search in our archives please complete our release of public information form found at https://www.tssa.org/en/about-tssa/release-of-public-information.aspx?_mid_=392 and email the completed form to publicinformationservices@tssa.org along with a fee of $56.50 (including HST) per location. The fee is payable with credit card (Visa or MasterCard).

Although TSSA believes the information provided pursuant to your request is accurate, please note that TSSA does not warrant this information in any way whatsoever.

Kind regards,

Saara

Public Information Agent
Facilities and Business Services
345 Carlingview Drive
Toronto, Ontario M9W 6N9
Tel: +1-416-734-6222 | Fax: +1-416-734-3568 | E-Mail: publicinformationservices@tssa.org
www.tssa.org

From: Rachel Baldwin <Rachel.Baldwin@exp.com>
Sent: March 29, 2021 2:44 PM

To: Public Information Services <publicinformationservices@tssa.org>
Subject: Fuel Storage Record - Northwest Corner of Concession Road 5 and Sideline 16, Pickering

[CAUTION]: This email originated outside the organisation.
Please do not click links or open attachments unless you recognise the source of this email and know the content is safe.

Good Afternoon,

Could you please search the database for fuel storage records pertaining to a site located at the **northwest corner of Concession Road 5 and Sideline 16** (approximately 1805 Concession Road 5) in **Pickering, Ontario**?

The legal description is part of Lot 17, Concession 5, being further designated as Part 8 on Registered Plan 40R-24623.

Thank in you advance for your assistance.

Rachel Baldwin
EXP | Geo-Environmental Scientist
t : +1.905.695.3217, 3823 | m : +1.437.214.9754 | e : rachel.baldwin@exp.com
220 Commerce Valley Drive West, Suite 110
Markham, ON L3T 0A8
CANADA
exp.com | legal disclaimer
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APPENDIX C

Photograph No. 1
View of the Site (Looking north)

Photograph No. 2
View of the Site south portion (Looking west)

Photograph No. 3
View of the Site east portion (Looking south)

Photograph No. 4
View of the north adjacent property (Looking north)

Photograph No. 5
View of the west adjacent property (Looking west)

Photograph No. 6
View of the Site northwest corner (Looking northwest)

Photograph No. 7
View of the south adjacent property (Looking south)

Photograph No. 8
View of the driveway located east of the Site (Looking north)

Photograph No. 9
View of the container and equipment storage located east of the Site (Looking north)

Photograph No. 10
View of the cemetery located southeast of the Site (Looking south)

Photograph No. 11
View of the swale located west of the Site (Looking northwest)

Photograph No. 12
View of the residential dwelling located east of the Site (Looking southeast)

Soil Management Plan

Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario

Type of Document:
FINAL

Client:
The Regional Municipality of Durham
605 Rossland Road East, P.O. Box 710
Whitby, Ontario
L1N 6A3
Attention: Mr. Sameh George

Project Number:
BRM-604892-B0

Prepared By:
EXP Services Inc.
220 Commerce Valley Drive West, Suite 100
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Date Submitted:
August 31, 2021

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Appendix F: Existing Soil Data Compared to Table 1 and Table 2.1 Excess Soil Quality Standards

1 Introduction

This Soil Management Plan (SMP) has been prepared for the Regional Municipality of Durham (the Client) for implementation during the intended earthworks at the property located at the northwest corner of Concession Road 5 and Sideline 16, Pickering, Ontario (herein referred to as the "Site"). A Site Plan is provided as Figure 1.

This SMP is to be provided to all Client personnel, contractors and environmental consultants involved in the proposed redevelopment activities involving earthworks. A copy of the SMP shall remain on-site at all times and provided to contractors and environmental consultants in advance of any earthworks. This SMP should be read in conjunction with EXP's 2018 geotechnical study entitled, "*Preliminary Geotechnical Investigation, Proposed Pickering Emergency Medical Services (EMS) Facility, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario.*"

This SMP forms part of any contract with the Client for earthworks at the Site.

The SMP addresses:

1) Handling of soils, including potentially contaminated soils, during earthwork at the Site;
2) Export of excess soils from the Site;
3) Conditions for reuse of on-site soils at the Site; and
4) Import of soils to the Site.

This SMP uses capitalized terms to denote that they are defined within Ontario's *Environmental Protection Act*, O. Reg. 406/19 (On Site and Excess Soil Management), and the Rules for Soil Management and Excess Quality Standards (Soil Rules). This SMP is not intended to provide a detailed work plan for soil remediation or general earthwork. This SMP is intended as a procedural document for soil excavation, stockpiling, handling, on-site reuse, off-site export and import of clean fill.

Expected earthwork activities at the Site include but are not limited to:

- Site preparation, stripping and installation of erosion and sediment controls;
- Site grading;
- Utility trench installation; and
- Site restoration.

Soil management and off-site export of soil for disposal or reuse, as well as the import of soil, shall be managed in accordance with Ontario Regulation (O. Reg.) 153/04, as amended – Records of Site Condition (also referred to as RSC Regulations), Reg. 347, as amended – General Waste Management, O. Reg. 351/12, as amended – Waste Management Systems, and O. Reg. 406/19 – On-Site and Excess Soil Management (also referred to as Excess Soil Regulations) and other applicable Regulations.

The criteria used to assess the quality of soil remaining on-site shall be the applicable Site Condition Standards (SCS) established in the document "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the

Environmental Protection Act", dated April 15, 2011, issued by the Ontario Ministry of Environment, Conservation and Parks (MECP) and hereafter referred to as "SCS", as may be amended from time to time.

Soil testing results for export of excess soil off-site or the import of clean backfill soils shall be compared to the Excess Soil Quality Standards established in the MECP document "Rules for Soil Management and Excess Soil Quality Standards," dated November 19, 2019 and adopted by reference in O. Reg. 406/19, hereafter referred to as "Excess Soil Quality Standards." This SMP is intended for Sites where the earthwork contract is in place prior to the implementation of Excess Soil Planning Requirements and Tracking Requirements, which commence on January 1, 2022.

2 Anticipated Earthworks and Generation of Excess Soil

A discussion of the environmental and geotechnical conditions of the Site based on the information available to EXP appears in Section 3, below.

The Site is located at the northwest Corner of Concession Road 5 and Sideline 16 in Pickering, Ontario. The Site is irregular in shape with approximately 100 m of frontage along the Concession 5 Road and approximately 165 m of frontage along Sideline 16. The Site is approximately 1.67 hectares (~4.1 acres) in size. The legal description and Property Identification Numbers (PIN) of Site is Part of Lot 17, Concession 5, being further designated as Part 10 on Registered Plan 40R-29609, City of Pickering, Regional Municipality of Durham, Ontario (PIN 26402-0094). A Site Plan is provided as Figure 1, attached.

EXP understands that the proposed development will consist of the construction of a low-rise slab-on-grade basement-less structure to be used as an Emergency Medical Service (EMS) Station. It is understood the proposed development is to be constructed in two phases – Phase 1 and Phase 2. This SMP is applicable for the Phase 1 development.

It is anticipated that some cut and fill operations will be required at the Site. It is understood preliminary discussions have indicated both import and export of excess soils will be conducted. The SMP is intended to ensure the soil management activities during the development of the Site follow Ontario Regulation 153/04 (Record of Site Condition) and the recently implemented Ontario Regulation 406/19 (On-Site and Excess Soil Management) associated Excess Soil Rules and Ontario Regulation 347, where applicable.

The majority of the earthwork to be conducted at the Site includes the installation of storm water catch basins, grading, utility connections, paving and curbing construction, building construction and landscaping (refer to Appendix A and Appendix B).

Excess soil is expected to be generated as described below:

- Based on a review of the grading plan It is anticipated that excess soil will be generated within the proposed building area, paved parking areas, during Site servicing and the construction of the infiltration gallery at the Site.

- Shallow soils tested as part of the 2018 Geotechnical Investigation met applicable MECP Table 2 Site Condition Standards (see Section 3.0 below). No evidence of soil impacts were identified for the parameters tested.

- No liquid soil or sediment from a surface water body is expected to be excavated as part of the earthwork.

Excess soil is proposed to be managed as follows:

- Soil that is suitable for reuse within the Site shall be reused within the Site by the Client.

- Excess soil that is either unsuitable for reuse or that cannot be reused due to project-related constraints, shall be exported off-site to a suitable receiving site.

3 Summary of Previous Findings

Previous relevant reports prepared for the Site are listed below:

- *"Geotechnical Investigation – Chemical Analysis Summary, Proposed Pickering Emergency Medical Services (EMS) Facility, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario,"* prepared by EXP, dated October 12, 2018;
- *"Phase One Environmental Site Assessment, Proposed Pickering Emergency Medical Services (EMS) Facility, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario,"* prepared by EXP, dated October 15, 2018;
- *"Preliminary Geotechnical Investigation, Proposed Pickering Emergency Medical Services (EMS) Facility, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario*," prepared by EXP, dated November 18, 2018;
- "*Memorandum – Water Level Measurements, Proposed Pickering EMS Facility – Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario*," prepared by EXP, dated April 1, 2021; and
- "*Phase One Environmental Site Assessment Update, Northwest Corner of Concession Road 5 and Sideline 16, Pickering, Ontario*," prepared by EXP, dated April 7, 2021.

A summary of report findings pertaining to soil management conditions are described in the following sections.

3.1 Geotechnical Investigation - Chemical Analysis Summary

The Geotechnical Investigation - Chemical Analysis Summary (EXP, 2018) is summarized as follows:

- The geotechnical investigation (described in Section 3.3) included a limited chemical analysis program;
- The purpose of the analytical testing was to provide preliminary soil and groundwater characteristics at Site for future development activities at the Site;
- The fieldwork was carried out between September 4 and October 3, 2018;
- Four (4) soil samples, including one (1) duplicate soil sample, were recovered from Boreholes BH/MW101, BH/MW102 and BH/MW103 at the eastern portion of the Site and analyzed for organochlorine pesticides (OCPs), polychlorinated biphenyls (PCB), benzene, toluene, ethylbenzene and xylene (BTEX), petroleum hydrocarbons (PHCs), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals and inorganic parameters. The analyzed soil samples were found to have met the applicable Table 2 Site Condition Standards for industrial/commercial/community (ICC) property use from the Ministry of the Environment, Conservations and Parks (MECP) document, "Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act," dated April 15, 2011 ("MECP Standard") for all the tested parameters;
- In addition, four (4) near surface samples, including one (1) duplicate soil sample, were recovered from test pits TP1, TP2 and TP3, located in the vicinity of the area along the eastern property boundary of the Site which was previously approved for sludge spreading or organic soil conditioning operation. The soil samples were analyzed for PCBs, BTEX, PHCs, VOCs, PAHs, heavy metals and inorganic parameters. The analyzed soil samples were found to have met the MECP Table 1 Background Site Condition Standards

for all types of property use, for all the tested parameters. No evidence of former sludge or waste placement were noted in the test pits; and,

- Four (4) groundwater samples, including one (1) duplicate groundwater sample, were recovered from monitoring wells BH/MW101, BH/MW102 and BH/MW103 at the eastern portion of the Site and analyzed for OC pesticides, PCB, BTEX, PHCs, VOCs, PAHs, heavy metals and inorganic parameters. The analyzed groundwater samples were found to have met the MECP Table 1 Background Site Condition Standards for all types of property use.

The soil samples submitted from the boreholes on Site were collected from depths of approximately 1.5 to 5.2 mbgs and would generally be considered representative of the subsurface soil conditions anticipated to be encountered during the installation of Site services. Upon EXP's review of the current ground surface elevations and the proposed Site grading plan (Appendix A), the Site grading activities are not anticipated to be conducted at depths greater than 1.5 mbgs. Shallow soil samples (i.e. TP1, TP2, TP3) were collected to depths of 0.3 mbgs on the eastern portion of the Site and would be considered representative of the surficial soils proximate to the sample locations. Refer to Figure 2 for borehole and test pit locations.

3.2 Phase One Environmental Site Assessment

The Phase One Environmental Site Assessment (EXP, 2018) is summarized as follows:

- Four (4) potentially contaminating activities (PCAs) were identified within a 250 m radius of the Site; (i) a minor fuel oil spill approximately 20 m north/northeast of the Site, (ii) the former presence of Brock Landfill approximately 50 m east of the Site, (iii) a former fuel storage facility approximately 150 m east of the Site, and (iv) the placement of organic bio-solid sludge west on the northwest adjacent property. However, in view of the nature of the PCA, the distance and/or inferred groundwater flow the PCAs identified did not contribute to Areas of Potential Environmental Concern (APECs) on the Site; and
- A Phase Two ESA (i.e. sampling and analysis) was not required based on the findings at the time of the Site assessment.

3.3 Preliminary Geotechnical Investigation

The Preliminary Geotechnical Investigation (EXP, 2018) is summarized as follows:

- The Site was undeveloped and under agricultural use;
- The majority of the site was covered with rows of various tree types, leased and maintained by Dutchmaster Nurseries Limited;
- The Site was proposed to be developed with a new Emergency Medical Service (EMS) facility consisting of a low-rise structure that will either be of slab-on-grade construction or with up to one (1) level of basement;
- The purpose of the geotechnical study was to determine the subsurface soil and groundwater conditions at the Site and to provide general geotechnical engineering recommendations for site development planning;
- The fieldwork was carried out between August 30 and 31, 2018 as well as between September 4 and 6, 2018;
- A total of eighteen (18) boreholes were advanced to depths of about 5.2 to 11.1 m below existing grade;
- The ground surface elevation at the borehole locations ranged from 149.6 to 153.0 m;

- In general, the subsurface profile encountered at the site, as revealed in the boreholes, comprised surficial topsoil underlain by fill or disturbed materials over native deposits of sandy silt till, silt, silt till, sand and gravel, clayey silt and clayey silt till;
- Based on soil texture analyses, the soils consisted of fine to medium-texture soils; and
- Groundwater conditions were assessed in the open boreholes during the course of the fieldwork and in eight (8) groundwater monitoring wells installed in selected boreholes.

3.4 Water Level Measurements Memorandum

- Water levels were measured in the eight (8) monitoring wells present on the Site levels on several events over a period from September 5, 2018 to March 30, 2021; and
- Groundwater levels were found to be in the range of 146.67 to 150.68 masl.

3.5 Phase One Environmental Site Assessment Update

A Phase One ESA Update was completed for the Site and the pertinent findings are summarized below:

- The Phase One ESA update included a review of updated records since 2018 and a visual site assessment; and
- Based upon EXP's review of the available information, including Site observations, no new PCAs from those outlined in the 2018 Phase One ESA were identified.

4 Site Specific Conditions

A summary table outlining soil conditions for import and export, based on soil sampling data collected to-date, is presented in Table 1 below.

Table 1: Soil Conditions for Remaining On-Site, Export of Excess Soils and Import of Excess Soils

Description	Condition	Appropriate Site Condition Standard or Excess Soil Quality Standard
Criteria for Soil to Remain on Site	Unrestricted use on-site and within project area	Table 2 SCS for ICC property use and fine to medium textured soils. Soil samples analyzed to-date meet Table 2 SCS.
Criteria for Export	Unrestricted Export	Soils are suitable for unrestricted export as excess soils. Soil samples analyzed to-date meet Table 1 Full Depth Background Site Condition Standards to depths of 4.6 mbgs.
Criteria for Export	Export to Table 2.1 Receiving Facilities	Soil samples analyzed to-date meet Table 2.1 Excess Soil Quality Standards.
Sampling Data Gaps	Additional Sampling Required for Export	After January 1, 2022: Minimum three (3) samples for leachate testing for metals is required (volumes greater than 350 m^3). Additional sampling may be needed to meet the export sampling criteria set in this Soil Management Plan. Consult QP_{ESA}. Additional sampling required by receiving facility (if applicable).
Criteria for Import	Up to 350 m^3 (cumulative from all sources)	Table 2 SCS for ICC property use and fine to medium textured soils.
Criteria for Import	Greater than 350 m^3 (cumulative from all sources)	Table 2.1 Excess Soil Quality Standards and Table 2.1 Leachate Screening Levels.

4.1 Comparison of Soil Testing Results to SCS

As noted above in Section 3.2, all shallow soil samples analyzed during the 2018 EXP Geotechnical Chemical Analyses met the applicable MECP Table 2 Site Condition Standards (SCS) for industrial, commercial, community property use and fine to medium textured soils, for the parameters tested.

4.2 Comparison of Soil Testing Results to Excess Soil Quality Standards

For planning purposes, soil testing results from the Geotechnical Investigation (EXP, 2018) are compared to the Excess Soil Quality Standards below to assess soil quality for export purposes.

- Soil testing results from the Preliminary Geotechnical Investigation (EXP, 2018) were compared to Excess Soil Quality Standards for Table 1 Full Depth Background Site Condition Standards and Table 2.1 Full Depth Excess Soil Quality Standards in a Potable Groundwater Condition for residential, parkland and institutional (RPI) property use. The Excess Soil Quality Standards selected for comparison are two of the most stringent standards that represent the criteria for most receiving facilities. In other words, if excess soils meet Table 1 or Table 2.1 standards, it is anticipated that they may be reused without restrictions at most available receiving sites in Ontario. It should be noted that there are several additional Excess Soil Quality Standards available for reuse eligibility, along with the Beneficial Reuse Assessment Tool (BRAT), which calculates site-specific criteria based on the characteristics of a specific receiving site.

- Based on the Phase One ESA and Phase One ESA Update (EXP, 2018 and 2021), no potential contaminants of concern (PCOCs) were identified at the Site. However, for due-diligence purposes parameters analyzed in soil samples as part of the Geotechnical Investigation (EXP, 2018) included petroleum hydrocarbons (PHC F1 to F4), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), metals and inorganic parameters, organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs).
- Prior to the commencement of earthworks at the Site, the following soil samples (borehole and test pit locations shown on Figure 2) had been collected for analysis:

Table 2: Summary of Soil Samples Submitted for Chemical Analyses

Sample ID	Depth (mbgs)	Sample Date	Matrix	Analysis
TP1	0 – 0.3	2018/10/04	Soil	PHCs, VOCs, PAHs, PCBs, Metals & Inorganics
TP2	0 – 0.3	2018/10/04	Soil	PHCs, VOCs, PAHs, PCBs, Metals & Inorganics
TP2D (duplicate of TP2)	0 – 0.3	2018/10/04	Soil	PHCs, VOCs, PAHs, PCBs, Metals & Inorganics
TP3	0 – 0.3	2018/10/04	Soil	PHCs, VOCs, PAHs, PCBs, Metals & Inorganics
BH101 SS3	1.5 – 2.1	2018/09/05	Soil	PHCS,
BH101 SS5	3.0 – 3.7	2018/09/05	Soil	PAHs, PCBs
BH101 SS6	4.6 – 5.2	2018/09/05	Soil	PCBs, OCPs, Metals & Inorganics
BH101 SS6D (duplicate of BH101 SS6D)	4.6 – 5.2	2018/09/05	Soil	Metals & Inorganics
BH102 SS4	2.3 – 2.9	2018/09/05	Soil	PAHs, PCBs, Metals & Inorganics
BH102 SS5	3.0 – 3.7	2018/09/05	Soil	PHCs
BH102 SS5D (duplicate of BH102 SS5)	3.0 – 3.7	2018/09/05	Soil	PHCs
BH102 SS6	4.6 – 5.2	2018/09/05	Soil	OCPs, PCBs
BH102 SS6D (duplicate of BH102 SS6)	4.6 – 5.2	2018/09/05	Soil	OCPs, PCBs
BH103 SS6	4.6 – 5.2	2018/09/05	Soil	PHCs, PAHs, OCPs, PCBs, Metals & Inorganics
BH103 SS6D (duplicate of BH103 SS6)	4.6 – 5.2	2018/09/05	Soil	PAHs, PCBs

Notes: Metals & Inorganics = antimony, arsenic, selenium, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, silver, thallium, uranium, vanadium, zinc, hot water extractable boron, hexavalent chromium, free cyanide, electrical conductivity, sodium adsorption ratio and pH.

- Soil testing results met Table 1 Full Depth Background Site Condition Standards (SCS) for all parameters tested with the exception of PHC F2 in sample BH103 SS6 (however sample was collected at a depth of 4.6 to 5.2 mbgs, which is below the proposed grading plans for the Site) (refer to Appendix F).
- Soil testing results met Table 2.1 Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition for all parameters tested with the exception of PHC F2 in sample BH103 SS6. However, the sample was collected at a depth of 4.6 to 5.2 mbgs, which is below the intended Site grading depth and and not proximate to any new service trenches (refer to Appendix F). It should be noted that a surficial soil sample obtained from TP2 located within 2 m of BH103 and the concentrations of all parameters analyzed, including PHC (F1 to F4) was found to have met the Table 1 SCS for RPIICC property use. However, should subsurface soils be excavated proximate to BH103 it is recommended that EXP conduct additional sampling and analysis to further characterize the soils.
- Based on EXP's understanding of Site characteristics, no liquid soil or sediment from a surface body will be exported as excess soil during earthworks.
- Additional soil testing may be required to meet the volumes and sampling frequencies set by the intended receiving site.
    - After January 1, 2022, a minimum of three (3) leachate samples, plus 10% of the bulk samples analyzes are required to be assessed for leachate screening levels in soil prior to the export of excess soils (for volumes greater than 350 m^3) for soils contained within an identified APEC.
    - Depending on the volume of excess soil generated, location of origin of excess soils, date of export and requirements of the intended receiving site, additional soil testing may be required prior to export for bulk parameters if the soils represented by samples collected in Table 1 (i) are no longer present on-site; (ii) are not representative of excess soils; (iii) have not been sampled at the required frequency for export of excess soils to meet the Receiving Site's acceptance requirements.

4.3 Detailed Soil Management Activities During Redevelopment

For Excess Soil management purposes, the following earthwork activities are proposed at the Site:

- Topsoil was encountered in the majority of boreholes drilled on the Site and stripping is to occur during construction activities, or as designated by the Client.
- Fill or disturbed materials were encountered in several boreholes drilled on the Site and may be geotechnically unsuitable for the proposed development.
- Installation of erosion and sediment controls, final grading, preparation of walkways and curb construction, and landscaping plantings.
- Soil excavation is expected during building construction, utility trenching, catch basin and infiltration gallery installation activities. Soils that are not geotechnically suitable for reuse must be exported off-site or reviewed by EXP personnel for possible reuse options on Site.
- Dewatering is not anticipated during proposed construction activities based on measured groundwater elevations to-date.

5 Earthwork Best Management Practices

This section of the Plan pertains to any situation where soils are excavated or exposed, and workers or visitors are potentially in contact with soils.

5.1 Administrative Controls

Administrative controls during earthwork include measures to control hazards, vehicular traffic, site accessibility and minimize dust resulting from excavation, stockpiling and on-site transportation operations. Administrative controls include the following measures:

i) A Site-specific Health and Safety Plan (HASP) will be implemented during earthwork activities. The HASP will include emergency contact information, a hazard assessment for likely on-site activities and mitigation measures. Each contractor or sub-contractor performing earthwork activities is responsible for providing a HASP for on-site employees prior to construction;

ii) Restriction of employee vehicles to designated parking areas. Employee vehicles will not be permitted within the construction areas of the Site, except in the case of emergencies. The location of the designated parking areas shall be identified by the contractor responsible for the on-site work;

iii) Construction hoarding (e.g. fencing) around the construction area shall be present to prevent public access. Access to construction areas shall be provided only to authorized personnel.

iv) The Contractor shall prepare and implement a *Traffic and Transportation Management Plan* that specifies requirements for:
   a. Location and configuration of Site entrances
   b. Truck queueing and parking;
   c. Dust control and mud-tracking prevention/truck cleaning for trucks leaving the Site;
   d. Haul routes between source and receiving sites (including temporary storage or transfer sites, if applicable).

5.2 Dust Control and Storm Water Management

There is potential for nuisance dust from exposed soil to be carried off-site by vehicles and/or equipment, via airborne dust or in the form of surface runoff. Therefore, the following measures shall be implemented at the Site during earthworks:

i) Erosion and sediment control and installation of storm water management features shall be conducted in conformance with the site-specific plans;

ii) To minimize on-site traffic, workers' vehicles will be parked in a designated area (see Section 5.1);

iii) Vehicular speed shall be limited within the construction area to minimize excessive generation of dust;

iv) The Site Supervisor will ensure that off-site roadways used by construction-related vehicles are maintained such that debris, dust and dirt are minimized to the extent reasonably practicable.

Maintenance and control measures may include road sweeping, cleaning and wetting with potable water.

v) Construction entrances equipped with a decontamination pad and/or mud mat at the Site gate in conformance with site-specific erosion and sediment control plans.

vi) All equipment/vehicles shall be inspected prior to departure off-site.

vii) The Site Supervisor shall be responsible for control of dust emissions, generated from on-site vehicular traffic or other construction activities. Dust suppression techniques may include misting with potable water or use of dust suppressant.

viii) In the event of high wind conditions that cannot be addressed through the above measures, work shall be restricted in high wind areas until conditions are less likely to generate visible dust.

ix) Stockpiles shall be surrounded by erosion and sediment control barriers in accordance with site-specific plans to prevent storm water runoff. If necessary, soil stockpiles shall be covered to minimize dust production.

x) Trucks transporting soil off-site shall be covered prior to leaving the Site and during transport.

Dust emissions shall be monitored daily during site work by the Site Supervisor, or designated personnel, and observations should be recorded in the Daily Inspection Checklist as outlined in Appendix C.

5.3 Containment of Impacted Soil

To date, impacted soils have not been encountered at the Site. The Preliminary Geotechnical Investigation (EXP, 2018) did not identify impacted soils. In the event that impacted soils are encountered during construction and remediation is required, the following decontamination measures shall be implemented during remediation activities:

i) Trucks shall be positioned outside excavation areas, whenever possible.

ii) To prevent tracking of impacted soil outside excavation areas or off-site, vehicles and equipment used in areas of impacted soils shall be decontaminated at a tire/equipment washing station.

iii) To aid in decontamination, visual inspection of equipment and physical removal of solids prior to washing will be conducted.

iv) All equipment/vehicles shall be inspected prior to departure off-site.

v) Excavation equipment and/or hand tools shall be decontaminated over the stockpile or waste container when possible so that wash water and residues are co-managed with soil.

vi) Decontamination only requiring physical removal of solid residues and the use of clean water rinse, water may be allowed to drain back into like soils on-site or utilized for dust suppression.

vii) Solid or liquid decontamination residues that cannot be co-managed with like soils, shall be recovered and placed into appropriate containers for lawful off-site management.

viii) The condition of decontamination pads, tire/equipment washing stations, mud mats and roadway conditions shall be inspected and maintained to prevent deterioration.

ix) Recordkeeping shall include the completion of the Daily Inspection Checklist.

6 Soil Excavation, Stockpiling and Management

6.1 Soil Excavation and Stockpiling

The following procedures will be followed for the excavation, segregation, stockpiling of soils and in accordance with the Soil Storage Rules outlined in the Soil Rules.

i) Soil excavation, material handling and stockpiling shall be performed in a manner that limits mixing of different categories of soil. Excavated soils shall be reused on-site to the extent permissible.

ii) Excavations are anticipated to terminate above the water table. Dewatering is not anticipated during earthworks. Pumping of accumulated precipitation within excavations may be required.

iii) Soils shall be segregated based on the known soil category or field observations and stockpiled in discrete piles in a way that limits the potential for mixing of different soil types. Soils shall be visually examined for staining or olfactory evidence of contamination.

iv) To date, soil contamination has not been identified. If soil impacts are encountered during construction, an environmental technician shall be on-site to observe soils excavated within remediation areas and to assist with assigning appropriate soil categories. Soils within remediation areas shall be periodically screened in the field for volatile organic compounds (VOCs) using a photoionization detector (PID).

v) Any impacted soils or soils suspected to be impacted shall be stockpiled on an impermeable material (i.e. asphalt pavement, concrete, polyethylene sheeting or equivalent material) or within water-tight containers (i.e. roll-off containers) pending removal off-site.

vi) Soils shall be temporarily stockpiled in a clearly designated on-site stockpile area pending export off-site.

vii) Stockpiles shall be surrounded by erosion and sediment control barriers in accordance with site-specific plans. When not in use, stockpiled soils or containers shall be covered by an impermeable material and secured. The Contractor shall periodically inspect and repair or replace damaged or dislodged covers and/or erosion controls.

viii) Soils suitable for reuse on-site, as determined by the Qualified Person in Environmental Site Assessment (QP_{ESA}), may be reused to the extent possible, in accordance with the Excess Soil Regulations. Soils exhibiting staining or olfactory evidence of contamination shall not be reused on-site without the approval of the QP_{ESA}.

ix) The maximum size of soil stockpiles shall not exceed 2,500 m^3 and not situated within 10 m of the property boundary (with exemptions) and more than 30 m of a waterbody.

6.2 Suspected Environmental Impacts

If the Contractor encounters buried drums, tanks, containers, previously unidentified visibly contaminated soil or groundwater, soil exhibiting a strong odour, soil saturated with petroleum product, or other indicators of soil or groundwater contamination, the Contractor shall stop excavation or dewatering in the area of the observed contamination. The Contractor will notify the QP_{ESA} to determine whether sampling or soil segregation is necessary.

Should sampling and analytical results identify concentrations of chemical parameters outside the applicable SCS and/or Excess Soil Quality Standards for remaining in place or reuse on-site, the material will be excavated and segregated pending acceptance at an appropriate facility or temporary storage area.

6.3 Suspected Geotechnically Unsuitable Material

If based on visual observations, material is suspected to not be geotechnically suitable for on-site reuse due to reasons including, but not limited to, excessive moisture, frozen material, organic content, debris, deleterious or compressible material, the material shall be directed to a segregated pile within the designated stockpile area. Photographs will be taken of the soil and a sample will be collected for further review by a geotechnical engineer. Should the material be deemed geotechnically suitable for reuse and meets the SCS at the Site, the material may be reused in accordance with project specifications and drawings. Should the material be deemed geotechnically unsuitable for reuse at the Site, the material shall be tested and transported to a suitable receiving facility to be approved by the QP_{ESA} in accordance with the Excess Soil Regulations.

6.4 On-Site Soil Management for Reuse

As described in the Preliminary Geotechnical Investigation (EXP, 2018), surficial topsoil was generally encountered across the Site with thicknesses measured between 150 to 300 mm. It was noted that the depths were representative at the borehole locations only and a more detailed program would be required for quantification purposes. It is anticipated that the topsoil present on Site could be reused on proposed landscaped areas of the Site. However, additional testing and evaluation may be required to confirm adherence to the Topsoil Specification details noted on the Landscape Site Plan (Appendix B).

As described in the Preliminary Geotechnical Investigation (EXP, 2018), fill and native materials which did not contain topsoil inclusions and other obviously unsuitable material, are generally suitable for reuse as backfill, provided the moisture content is within 2 percent of its optimum values. Some moisture content adjustment may be required to achieve proper compaction.

Based on the borehole logs, geotechnically unsuitable soils are present beneath the proposed building footprint and should be excavated. At the time of EXP's 2018 report the proposed building layout had not been established. Based on the current development plan the construction will consist of a single storey slab-on-grade paramedic facility with no basement. The Site building will be situated at the southeast corner of the Site. Based on Boreholes BH-11, BH-12, BH-14, and BH-15, it is anticipated that the fill material within the building footprint ranges in depths from about 0.6 to 1.8 metres below the ground surface (mbgs) (~Elev. 150.4 to 152.0 masl) subject to confirmation in the field by EXP personnel.

It is recommended that EXP personnel be present on-Site during the site grading activities to segregate excavated fill that would be deemed suitable for reuse as engineered fill from the unsuitable material (due to the presence of topsoil, moisture content, etc). Following the removal of the fill material within the building footprint and the completion of a sub-grade inspection by geotechnical personnel, the fill material segregated during the excavation activities and deemed suitable for reuse by EXP can be re-engineered below the proposed building slab in accordance with the recommendations discussed in Preliminary Geotechnical Investigation (EXP, 2018). EXP personnel should confirm the base of the excavation comprises of competent native soils suitable for the proposed building footings and floor slab construction.

Soils beneath the parking areas may be excavated for levelling purposes and to allow sufficient depth beneath the final paved parking elevations to facilitate the construction of the specified pavement structure make up for both the heavy and light duty asphalted areas on the Site (refer to Appendix A). Based on EXP's review of the Site topography and stratigraphy, and the proposed grading plans (refer to Appendix A), it is estimated that excess soils will be generated during the construction of the proposed parking areas, following the topsoil stripping activities. Similar to the grading activities within the building footprint, it is recommended that EXP provide full time monitoring by geotechnical personnel during the grading activities of the fill material present on Site to differentiate the excavated fill to segregate the material that would be suitable for re-use on Site as engineered fill.

The Landscape Plan (Appendix B) provided did not detail final grading elevations of the landscaped areas, including within Phase 2 and the areas depicted along the western and northern portions of Phase 1. It is recommended that consideration be given for the re-use of segregated fill material that was determined by geotechnical personnel to be unsuitable for re-use as engineered fill to be utilized below the topsoil in landscaped areas. Portion of this material may be reused in the proposed pavement area and service trenches outside the building area. However, this is best assessed in the field during construction. In the event that a surplus of excess soils is generated and it is determined cannot be beneficially reused on-Site, the requirements for soil export is detailed in Section 7.0 in this report.

7 Soil Export

7.1 Off-Site Export of Soil

The Contractor will be responsible for the excavation and prompt off-site transport for reuse and/or disposal of soil from the site. Excavation and off-site transport of impacted soils and excess soils shall be conducted under the supervision of a QP_{ESA} in accordance with the Excess Soil Regulations and Ontario Regulation 347.

The Contractor shall provide the name, address, current permits, approvals and sampling requirements of proposed receiving facilities for soils to be transported off-site. Receiving facilities are subject to approval by the QP_{ESA} and the Owner. Based on soil testing results, the QP_{ESA} will provide advice as to the possible reuse and/or disposal options for the soils. The QP_{ESA} shall issue a letter to the intended receiving facility providing a summary of the soil testing results and a professional opinion regarding the suitability of the soil for off-site reuse or disposal with a copy provided to the Client.

Soil shall not be exported off-site without being properly characterized under the supervision of the Source Site QP_{ESA} and approved by the Receiving Site in accordance with the Excess Soil Regulations.

7.2 Soil Export Categories for Volumes Greater than 350 m^3

Commonly expected soil categories are listed below. It is noted that there are several additional categories for soil reuse available, including soils that meet site-specific criteria set by receiving sites.

1. Excess soils that have been characterized in accordance with the Excess Soil Regulations and do not exceed Table 1 Full Depth Background Site Condition Standards for Agricultural and Other Property Use for all COCs may be exported to a receiving site that will accept the material for reuse. Soils in this category are most widely accepted at receiving sites requiring earth fill. Please note that some receiving sites will not accept material that is not geotechnically suitable.

2. Soil for export that exceeds Table 1 Full Depth Background Site Condition Standards for Agricultural and Other Property Use except for EC and/or SAR (salt-related parameters) but is within the MECP Table 1 SCS for all other parameters analyzed may be transported to a facility approved to receive such soils, provided that they are placed in accordance with the requirement for salt-impacted soils in the Excess Soil Rules.

3. Soil for export that exceeds Table 1 SCS for one or more parameters other than for EC and/or SAR (salt-related parameters) but meets Table 2.1 Excess Soil Quality Standards may be hauled to a receiving site that accepts Table 2.1 soils, provided that the material is geotechnically suitable and does not contain debris or deleterious materials.

4. Soil for export that exceeds Table 2.1 Excess Soil Quality Standards but meets Table 3.1 Excess Soil Quality Standards may be hauled to a receiving site that accepts Table 3.1 soils, provided that the material is geotechnically suitable and does not contain debris or deleterious materials.

5. Soil for export that does not meet the criteria for reuse shall be transported to an MECP approved waste treatment or disposal site.

6. In the event that soil meets reuse criteria but there is no reasonably available receiving site, these soils may be transported to an MECP approved waste treatment or disposal site permitted to accept the material.

7. Soil designated for transport to an MECP approved waste treatment or disposal site may be subject to applicable leachate and/or other analyses for waste classification purposes in accordance with Reg. 347 (as amended).

8. Soil that meets Reg. 347 criteria for listed or characteristic waste shall be transported to an approved waste treatment or disposal site permitted to accept hazardous waste.

9. Soil exhibiting visual or olfactory evidence of petroleum hydrocarbon impacts and/or odours shall be characterized prior to off-site disposal.

Receiving site operators may conduct independent reviews of the chemical analyses, volumes and other site specific criteria prior to disposal.

The contractor is responsible to source suitable receiving sites for all Excess Soil and other waste requiring off-site transport.

7.3 Soil Export Categories for Receiving Sites With Total Soil Reuse Volumes Up to 350 m^3

For receiving sites that are placing up to 350 m^3 of excess soils from combined sources (also referred to in the Excess Soil Rules as small volumes), the soil categories are similar to those listed in Section 7.2 above, with the exception that SCS for coarse textured soil standards (i.e. SCS Tables 2 to 9) are applicable instead of the Excess Soil Quality Standards. Leachate analysis is not a mandatory component for meeting reuse criteria for total soil reuse volumes at a receiving site of up to 350 m^3. Excess Soil Quality Standards must be used at receiving sites that accept greater than 350 m^3 of excess soils for final placement (see Section 7.2). As noted above, there are several additional categories for soil reuse available, including soils that meet site-specific criteria set by receiving sites.

7.4 Soil Disposal Characterization

Soil characterization for off-site reuse/disposal shall be conducted in accordance with O. Reg. 153/04, as amended – Records of Site Condition Reg. 347, as amended – General Waste Management, O. Reg. 406/19 – On-Site and Excess Soil Management, Excess Soil Rules, this Soil Management Plan and the proposed receiving facility's Fill Management Plan, if applicable. The frequency of soil sampling and parameters analyzed shall be based on the receiving facility's acceptance requirements, the Site QP_{ESA}'s recommendations, and applicable Excess Soil Regulations. In the event of conflicts, the most stringent standard and requirements shall apply.

Soil testing documentation shall include:

i) the rationale for the choice of parameters analyzed,
ii) the description of the methods used to ensure uniform and representative sample collection,
iii) a sketch depicting sample locations and depths,
iv) the number of soil samples collected,
v) the volume of each stockpile,
vi) laboratory certificates of analysis for soil samples analyzed, and
vii) a comparison of the testing results to the applicable Excess Soil Quality Standards, SCS or site-specific requirements of the receiving facility.

In the case where the receiving facility does not have specific sampling requirements, soil testing shall be conducted based on the professional judgement of the Site QP_{ESA} to properly characterize the materials and comply with Excess Soil Regulations. It is recommended that all receiving sites conduct an independent review of the chemical data and physical soil composition to confirm the materials are suitable for reuse at the specific receiving site. The contractor shall obtain written consent for the receipt of Excess Soil from each receiving site and provide a copy of same to the Client.

The criteria used to assess the quality of soil remaining on-site shall be MECP Table 2 Site Condition Standards as presented in the MECP document "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", dated April 15, 2011.

Soil testing results for off-site export shall be compared to the more stringent of the Excess Soil Quality Standards or site-specific standards applicable to the proposed receiving facility.

7.5 Soil Export Tracking

The contractor shall implement a recordkeeping system to document the quantity and quality of soil transported off-site. Recordkeeping shall include:

i) Volume/Number of trucks departing the Site,
ii) General description and quality by reference to the Excess Soil Quality Standards of soil transported off-site,
iii) Name of intended receiving facility,
iv) Weight slip or Bill of Lading signed by receiving facility acknowledging receipt of each load of soil and documenting volume and/or weight records,
v) The volume and/or weight of soil leaving the Site shall be cross referenced with the volume and/or weight of soil received at the receiving site,
vi) the written consent in a form acceptable to the Client for the receipt of the Excess Soil from each receiving site, to be received by the Client's QP_{ESA} prior to transport, and
vii) release and indemnity in a form acceptable to the Client from the owner of each receiving site, to be received by the Client's QP_{ESA} prior to transport

A sample Bill of Lading is included for reference in Appendix D. A sample Soil Tonnage Tracking Sheet (STTS) is included for reference in Appendix E.

The contractor shall provide all of the above soil tracking documentation promptly to the Client. The Client shall keep these records on-file for a minimum of seven (7) years, in accordance with RSC Regulations and Excess Soil Regulations.

8 Groundwater Management

Dewatering is not anticipated during proposed construction activities based on measured groundwater elevations to-date. Passive dewatering (i.e. pumping) may be required to remove accumulated precipitation, ponded water in the fill or wet sand seams within the native soils.

The Contractor shall dewater excavations as necessary to maintain dry and safe conditions with stable slope conditions to complete the work. Procedures shall be as follows:

i) In the absence of a sewer discharge agreement, water within excavations shall be collected and pumped into temporary storage tanks pending on-site treatment and discharge; or pumped into tanked trucks operated by an MECP approved waste hauler for off-site disposal.

ii) Treated effluent shall be discharged under a sewer discharge agreement to the municipal sanitary or storm sewer system, as specified by the permit.

9 Soil Import

Earth fill that is imported to the Site from an off-site source shall be imported in accordance with the requirements of the Excess Soil Regulations and the Imported Fill Acceptance Protocol outlined below.

9.1 Import of Non-Excess Soil Materials

In accordance with the Excess Soil Regulations and if the Site is not a Record of Site Condition property, materials sourced from the following locations are excluded from the Imported Soil Acceptance Protocol as set out below and do not require testing prior to import on-site.

i) Recycled concrete and/or recycled asphalt (i.e. non-aggregate materials) do not meet the definition of soil and are not included in the scope of this SMP.

The contractor requires written instructions from the Client's QP_{ESA} to place these materials at the Site.

9.2 Imported Soil Acceptance Protocol

Soil intended to be imported and used at the Site must be sampled, analyzed and deemed appropriate for reuse at the Site by a Qualified Person in Environmental Site Assessment (QP_{ESA}) and also deemed appropriate for reuse at the Site by the Client's QP_{ESA} prior to importation in accordance with the Excess Soil Regulations and the RSC Regulation, if applicable.

Soil imported to the Site shall meet the following conditions as determined by the Client's QP_{ESA} and in accordance with written instructions from the Client's QP_{ESA} prior to placement at the Site:

i) The Site does not have a Record of Site Condition (RSC) filed on the Environmental Site Registry and therefore is not limited to accepting imported soils that meet Table 1 SCS.

ii) Imported soil must be sampled and analyzed prior to import. A sampling and analysis plan acceptable to the Client's QP_{ESA} shall be prepared in advance of undertaking the sampling and analysis program.

iii) If the total volume of cumulative imported excess soil from all sources is less than 350 cubic metres, imported soils must meet Table 2 SCS for ICC and coarse textured soils. If the total volume of cumulative imported excess soil from all sources is greater than 350 cubic metres, imported soils must meet Table 2.1 Excess Soil Quality Standards and Table 2.1 Leachate Screening Levels.

iv) Imported soil must be geotechnically suitable and cannot contain any deleterious materials, organic materials (except in the case of topsoil imports), construction debris, etc.

v) Imported soil cannot exhibit any staining or odours associated with petroleum hydrocarbons or other contaminants.

vi) Imported soil must have been sampled and analyzed for appropriate parameters, as determined by the Source Site QP_{ESA} and agreed to by the Client QP_{ESA} based on:
    a. the history and prior usage of the imported soil, as ascertained from previous environmental investigations made available to the QP_{ESA}, and
    b. other relevant factors as determined by the QP_{ESA}, including potentially contaminating activities.

vii) Sampling frequency shall be as determined by the Client QP_{ESA} pending the coming into force of the applicable Excess Soil Regulations. This fill acceptance protocol requires at least one (1) soil sample for every 500 cubic metres of soil imported from each source site, with a minimum of three (3) samples from each source site, for reasonably expected parameters, as determined by the Source Site QP_{ESA}. Deviations from the sampling frequency outlined by this Soil Management Plan must be agreed upon in advance by the Receiving Site QP_{ESA}.

viii) Documentation for Soil Import

Documentation for soil to be imported to the Site shall be reviewed, evaluated and approved in writing by Client's QP_{ESA} prior to import. Documentation for imported soil is similar to documentation for soil export outlined in Section 7.3 and shall include:

a. the rationale for the choice of parameters analyzed,
b. the description of the methods used to ensure uniform and representative sample collection,
c. the number, location and depths of soil samples collected,
d. the volume of each stockpile or area sampled *in situ*,
e. laboratory certificates of analysis for soil samples analyzed,
f. a comparison of the testing results to the applicable Excess Soil Quality Standards or SCS, as applicable.
g. The opinion of the Source Site QP_{ESA} that the excess fill material to be exported is suitable for re-use at the Receiving Site and adheres to this Excess Fill Acceptance Protocol, and
h. a reliance letter from the owner of the imported soil's QP_{ESA} allowing the Client and the Client's QP_{ESA} to rely on the foregoing.

Soil shall not be imported to the Site without prior written approval from the Client's QP_{ESA} overseeing this Soil Management Plan.

9.3 Soil Import Tracking

Upon arrival of a load of imported soil that has met the requirements of Section 9.2 at the Site, the following inspections will be conducted by contractor:

i) The Bill of Lading, or equivalent tracking sheet, for the load shall be inspected by the Client's QP_{ESA}, for completeness and to ensure the time at which the load left the source site is consistent with the time of arrival at the Site given the distance from the source site. If discrepancies are identified with respect to timing of departure from the source site and arrival at the Site, the Client's QP_{ESA} shall be notified prior to accepting the material at the Site.

ii) If the imported soil is deemed suitable for receipt based on Section 9.2, the soil may be placed on-site or stockpiled for later use in accordance with this Plan.

iii) If the imported soil is considered suspect the soil shall either be rejected or segregated pending further testing/investigation by the Client's QP_{ESA}.

iv) The final placement of imported soil from each source site shall be recorded, including areas of placement on-site, depths and volumes. This record shall be provided to Client's QP_{ESA}.

9.4 Monitoring and Recordkeeping

Monitoring of soil export and import shall be conducted by the Client's QP_{ESA} to ensure compliance with this Soil Management Plan. In addition to the recordkeeping requirements in this Soil Management Plan, the contractor shall maintain the Daily Inspection Checklist provided in Appendix C. The Daily Inspection Checklist includes a brief description of that day's work activities including location and depth of excavation activities, if any, as well as copies of Bills of Lading (see Appendix D) and quantities of soil imported to or exported from the Site (see Appendix E).

Records shall be kept of any complaints received related to earthworks activities and what measures were taken to deal with the issue(s), if any.

9.5 Document Retention

The Client's QP_{ESA} shall retain a copy of all records relating to the SMP, including documentation related to soil import and export such as bills of lading and/or weigh bills, and shall provide same to the Client who shall retain same for a minimum period of seven (7) years.

10 SMP Is Part of Earthworks Contract

Please contact the undersigned Client QP_{ESA} if you have any questions, concerns or wish to make any changes to this Soil Management Plan.

This SMP forms part of any contract with the Client for earthworks at the Site.

Yours very truly,
EXP Services Inc.

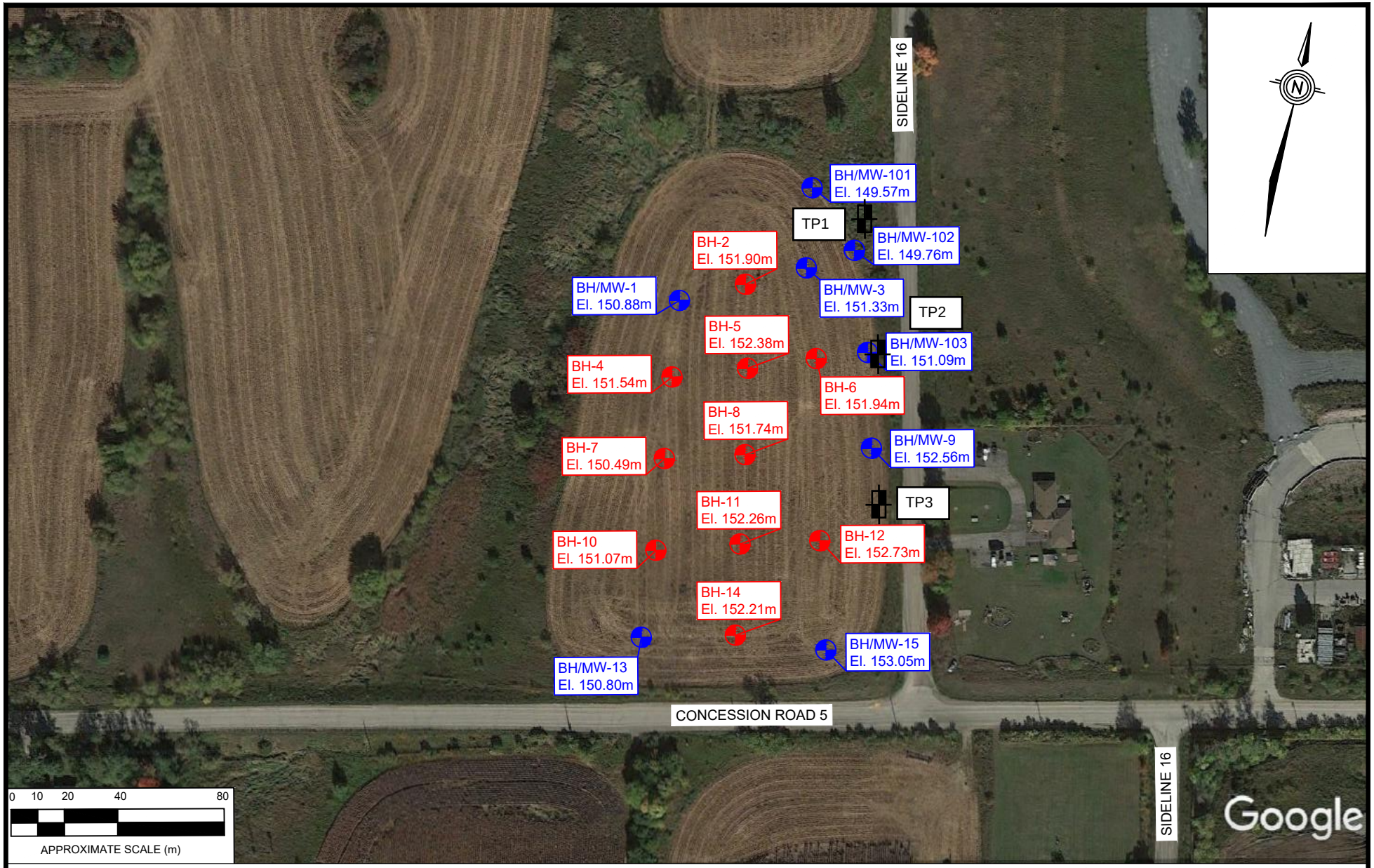
Rachel Baldwin, M.Sc.
Geo-Environmental Scientist
Earth and Environment

Stacy Meek, P.Eng., QP_{ESA}
Senior Project Manager
Earth and Environment

E:\BRM\BRM-00604892-B0\10 Project Management\16 Soil Management Plan\SMP Report\BRM-00604892-B0_Pickering EMS_Soil Management Plan_2021.08.31.Docx

Figures

Figure 1: Site Plan Soil Management Plan Northwest Corner of Concession Road 5 and Sideline 16, Pickering, ON	Project Number: BRM-00604892-B0 Date: August 2021 Drawn By: RB Checked By: SM	N	220 Commerce Valley Drive West Suite 110 Markham, Ontario L3T 0A8 (905) 695-3217 www.exp.com



NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR
2. SOIL SAMPLES WILL BE RETAINED IN STORAGE FOR 3 MONTHS AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. THIS DRAWING WAS REPRODUCED FROM A 2016 AERIAL PHOTOGRAPH TAKEN FROM GOOGLE EARTH.

LEGEND:

TEST PIT LOCATION

BOREHOLE LOCATION

BOREHOLE/MONITORING WELL LOCATION

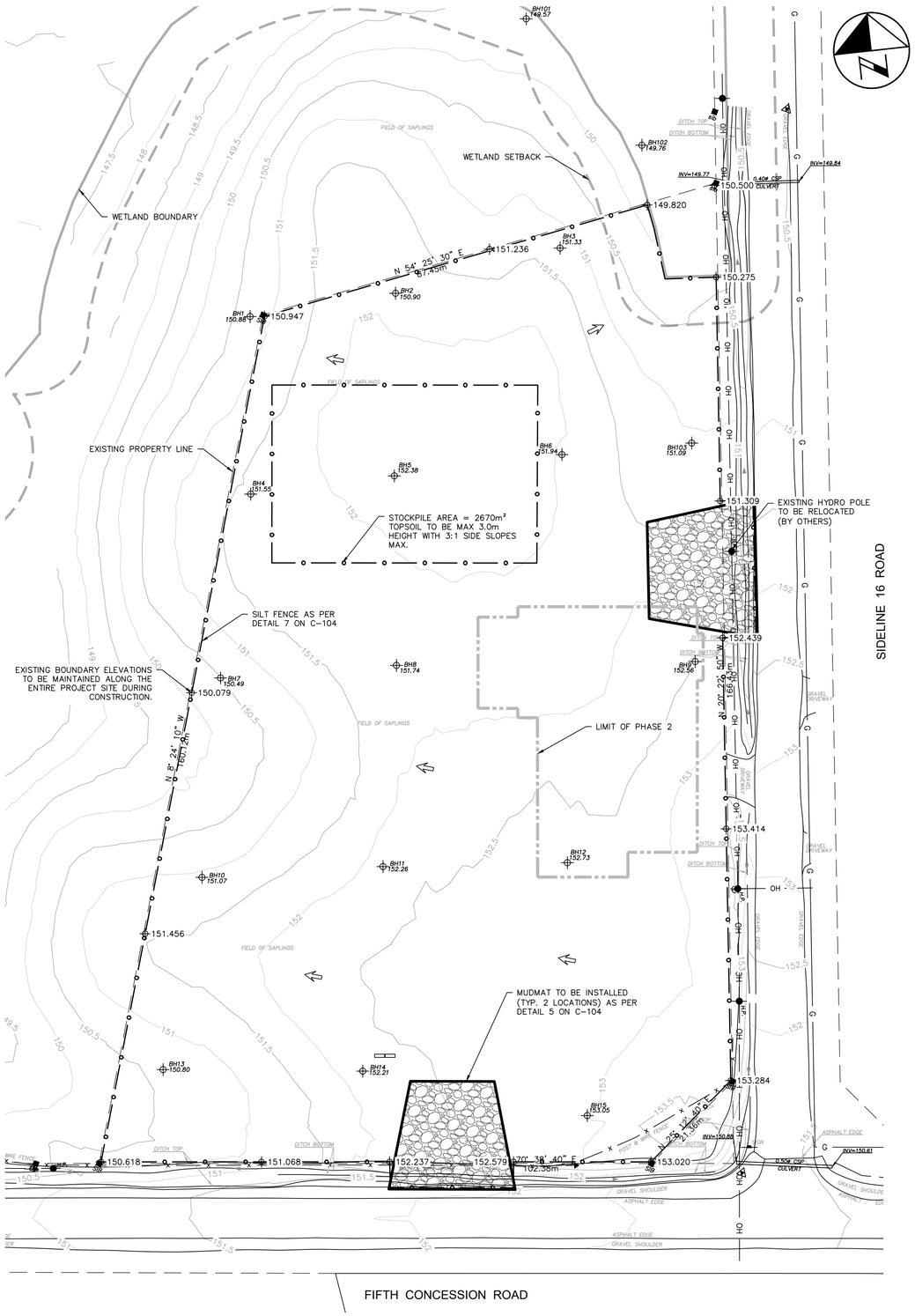
exp Services Inc.
t: +1.905.695.3217 | f: +1.905.695.0169
220 COMMERCE VALLEY DR., SUITE 500
MARKHAM, ON L3T 0A8
Canada
www.exp.com

PROJECT TITLE AND LOCATION:
GEOTECHNICAL INVESTIGATION
PROPOSED PICKERING EMERGENCY MEDICAL SERVICES (EMS) FACILITY
NW CORNER OF CONCESSION ROAD 5/SIDELINE 16
PICKERING, ONTARIO

DRAWING TITLE:
BOREHOLE AND TESTPIT LOCATION PLAN

PROJECT#: BRM-00604892-A0	DWN.: PJC
SCALE: AS SHOWN	CHKD.: PC
DATE: OCTOBER 2018	DWG. No.: 1

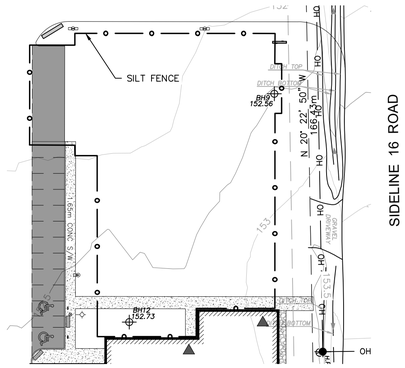
Appendix A
Civil Engineering Drawing Set



PHASE 1
EROSION & SEDIMENT
CONTROL

EROSION & SEDIMENT CONTROL GENERAL NOTES

1. PRIOR TO COMMENCEMENT OF ANY ON-SITE WORK/TOPSOIL STRIPPING, EROSION AND SEDIMENT CONTROL (ESC) MEASURES, AS PER APPROVED EROSION & SEDIMENT CONTROL PLAN, MUST BE INSTALLED TO PREVENT SURFACE RUNOFF FROM LEAVING THE SITE "UNTREATED". ALL ESC MEASURES ARE TO BE MAINTAINED UNTIL THE SITE HAS BEEN STABILIZED.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER INSTALLATION, MAINTENANCE AND REMOVAL OF ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION, AS DIRECTED BY THE ENGINEER OR THE CITY OF PICKERING.
3. SEDIMENT CONTROL FENCE TO USE GEOTEXTILE WITH WEAVE DENSITY OF 270R TERRAFIX OR EQUIVALENT.
4. ALL EXPOSED SOILS SHALL BE IMMEDIATELY STABILIZED AS DIRECTED BY THE ENGINEER OR CITY OF PICKERING.
5. CHECK DAMS ARE TO BE USED IN ANY TEMPORARY DRAINAGE SWALES REQUIRED DURING THE CONSTRUCTION PERIOD.
6. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED AND SHALL BE DETERMINED BY THE ENGINEER OR THE CITY OF PICKERING.
7. ALL SWALES ARE TO BE STABILIZED PRIOR TO USE.
8. INSPECTION OF THE PROPOSED EROSION AND SEDIMENT CONTROL MEASURES WILL OCCUR ON A WEEKLY BASIS, AFTER RAINFALL EVENTS EXCEEDING 10mm OR AFTER RAPID SNOW MELT EVENTS AND DAILY DURING EXTENDED RAIN OR SNOW MELT PERIODS. THE SILT CONTROL FENCE MUST BE INSPECTED FOR RIPS OR TEARS, BROKEN STAKES, BLOW OUTS AND ACCUMULATION OF SEDIMENT. THE SILT CONTROL FENCE MUST BE FIXED AND/OR REPLACED IMMEDIATELY WHEN DAMAGED. ACCUMULATED SEDIMENT MUST BE REMOVED FROM THE SILT CONTROL FENCE WHEN ACCUMULATION REACHES 50% OF THE HEIGHT OF THE FENCE.
9. ROCK CHECK DAMS ARE TO BE CLEANED OF ALL ACCUMULATED SEDIMENT AS SOON AS SEDIMENT HAS ACCUMULATED TO A DEPTH GREATER THAN 50% OF ALL THE UPSTREAM CHECK DAMS.
10. CLEANING AND REPAIR OF MUD MATS AND ANY OTHER TEMPORARY SEDIMENT CONTROL MEASURES SHALL BE DONE AS NECESSARY THROUGH REGULAR INSPECTION OR AS DIRECTED BY THE ENGINEER OR CITY OF PICKERING. ALL DAMAGED ESC MEASURES SHALL BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
11. MATERIALS TO REPAIR DAMAGED ESC MEASURES MUST BE KEPT ON-SITE AT ALL TIMES.
12. THE ESC STRATEGIES ON THESE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO PREVENT SEDIMENT RELEASES. FAILED ESC MEASURE MUST BE REPAIRED IMMEDIATELY.
13. NO CONSTRUCTION ACTIVITY OR MACHINERY SHALL INTRUDE BEYOND THE SILT CONTROL FENCE OR LIMIT OR DEVELOPMENT. ALL CONSTRUCTION VEHICLES SHALL LEAVE THE SITE AT DESIGNATED LOCATIONS AS SHOWN ON THE PLANS. ALL MATERIALS AND EQUIPMENT SHALL BE STORED ON SITE IN A DESIGNATED AREA. NO MATERIALS OR EQUIPMENT SHALL BE STORE ON THE MUNICIPAL RIGHT OF WAY. NO CONSTRUCTION VEHICLES WILL PARK ON MUNICIPAL ROADS.
14. SERVICING OF CONSTRUCTION EQUIPMENT ON SITE IS PROHIBITED.
15. THE CONTRACTOR MUST CLEAN ADJACENT ROADS ON A REGULAR BASIS. THE ROAD SHALL BE, AT A MINIMUM SCRAPED DAILY AND FLUSHED (IF NECESSARY) ON FRIDAY EVENINGS OR SATURDAY MORNINGS.
16. DUST CONTROL TO BE REVIEWED DAILY. WATER TRUCK OR CALCIUM CHLORIDE IS TO BE PROVIDED ON-SITE AND HAUL ROADS/WORKING AREAS ARE TO BE TREATED AS REQUIRED TO ENSURE THAT DUST IS CONTROLLED ON-SITE.
17. AT THE END OF CONSTRUCTION PERIOD, ACCUMULATED SEDIMENT IS TO BE REMOVED OFF SITE PRIOR TO THE REMOVAL OF THE SILT FENCE.
18. ALL LITTER AND DEBRIS SHALL BE MONITORED AND DISPOSED OF DAILY OR AS NECESSARY THROUGH REGULAR INSPECTION.
19. ALL TOPSOIL STOCKPILES SHALL BE SURROUNDED WITH SEDIMENT CONTROL FENCE AND STABILIZED WITH SEED MIX AS PER THIS DRAWING.
20. DISTURBED AREAS ARE TO BE MINIMIZED TO THE EXTENT POSSIBLE AND STABILIZED AS THE WORK PROGRESSES. ANY AREA EXPOSED FOR MORE THAN 30 DAYS WILL BE STABILIZED.



PHASE 2
EROSION & SEDIMENT
CONTROL

LEGEND

- PROPOSED SILT FENCE
- PROPOSED STAGING LIMIT
- PROPOSED MUDMAT
- EXISTING WETLAND BOUNDARY
- EXISTING WETLAND SETBACK
- EXISTING PROPERTY LINE
- EXISTING BOREHOLE
- EXISTING UNDERGROUND GAS
- EXISTING OVERHEAD HYDRO
- EXISTING FENCE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING HYDRO POLE
- EXISTING DITCH LINE
- EXISTING EDGE OF PAVEMENT
- OVERLAND FLOW

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

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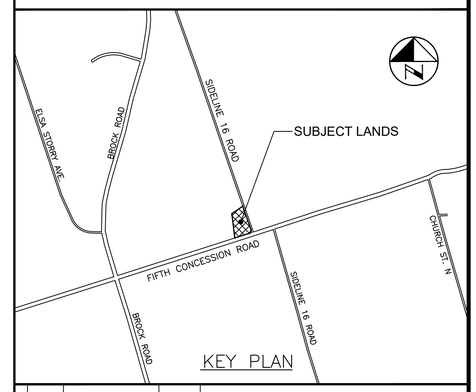

KEY PLAN

CONSULTANT REVISIONS

NO.	DATE	NAME	REVISIONS
5	06/15/21	MB	ISSUED FOR 100% DETAILED DESIGN
4	03/31/21	MB	RE-ISSUED FOR SITE PLAN APPROVAL
3	11/26/20	MB	ISSUED FOR 60% DETAILED DESIGN
2	10/30/20	MB	ISSUED FOR SITE PLAN APPROVAL
1	06/20/20	MB	ISSUED FOR 30% DETAILED DESIGN

PRIME CONSULTANT

AECOM
AECOM CANADA LTD.
50 SPORTSWORLD CROSSING
ROAD, SUITE 290
KITCHENER, ON, N2P 0A4
TEL: 519-650-5313
FAX: 519-650-3424

SURVEY & BENCHMARK

SURVEY COMPLETED BY IBW SURVEYORS JULY 2018.

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ELEVATIONS ARE GEODETIC AND REFERRED TO CITY OF PICKING BENCHMARK 4-031 AND HAVING A GEODETIC ELEVATION OF 151.957m.

DESIGN BY: SM	SCALE 1:500
DRAWN BY: MB	DATE: 2020-10-30
CHECKED BY: SM	CONSULTANT PROJECT NO. 60611569
APPROVED BY: –	SPA NO. S11/20

THE REGIONAL MUNICIPALITY
OF DURHAM
WORKS DEPARTMENT
DESIGN, CONSTRUCTION & ASSET MANAGEMENT

1890 FIFTH CONCESSION RD
SEATON PARAMEDIC FACILITY
CITY OF PICKERING
EROSION & SEDIMENT CONTROL
CONSTRUCTION MANAGEMENT PLAN

PROPERTY NO.	CITY FILE NO.	FACILITIES PROJECT NO.
XXX-X-XXX	S11/20	60611569
CONTRACT NO.	DRAWING NO.	SHEET NO.
T-XXXX-20XX	C-101	X OF XX

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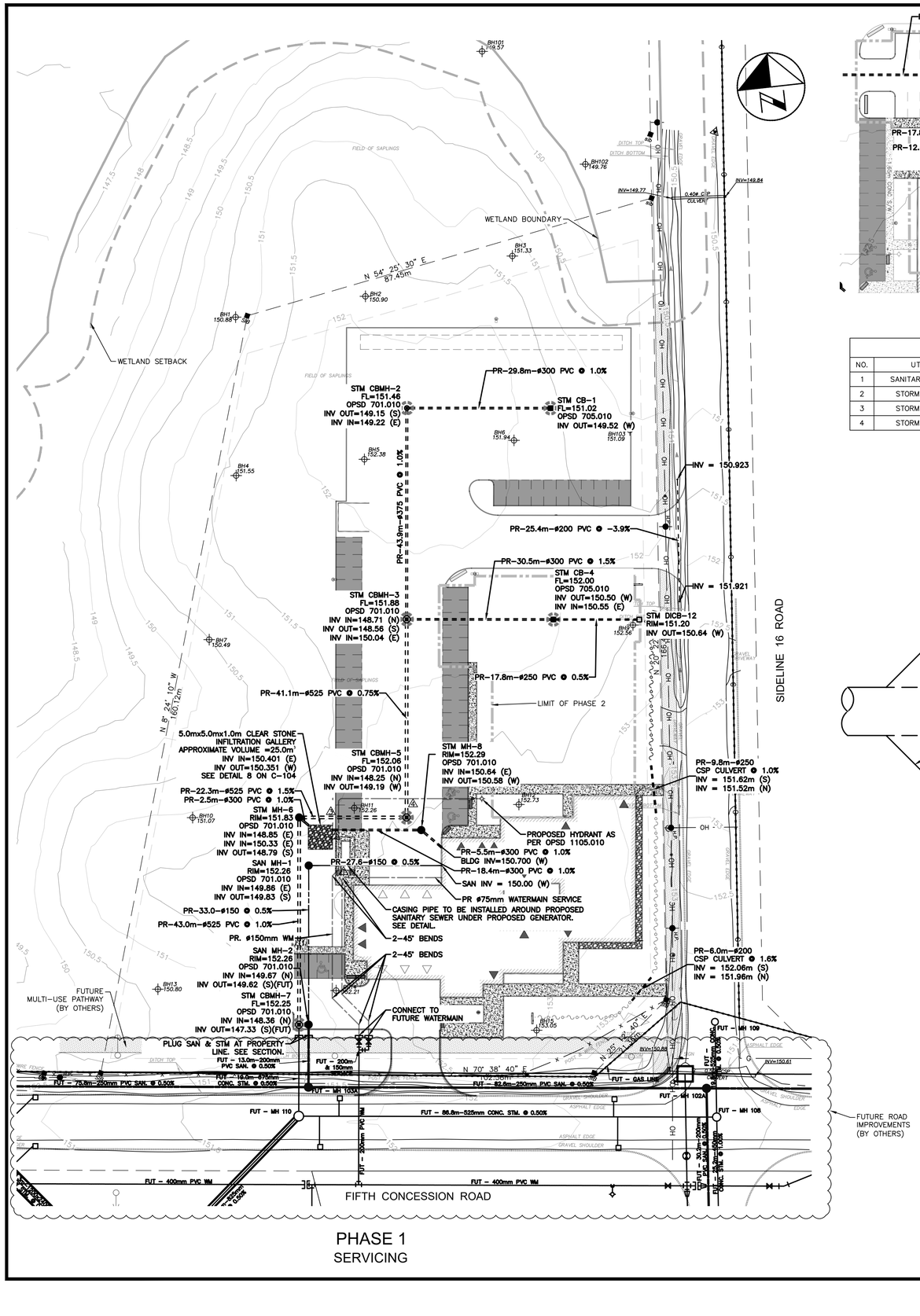
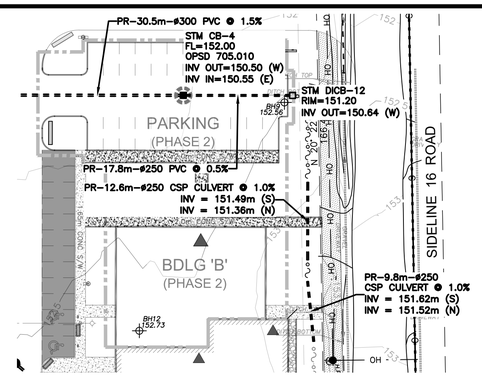
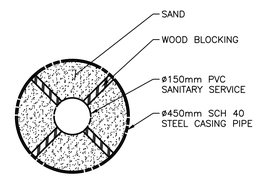


PHASE 1
SERVICING



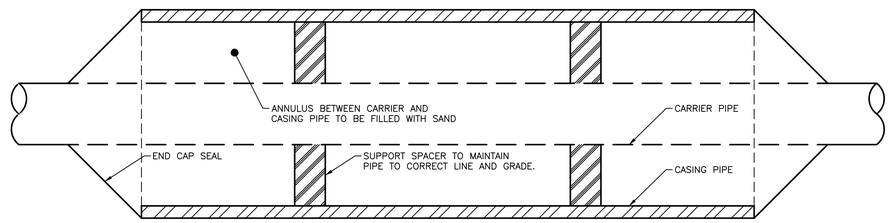
PHASE 2
SERVICING

UTILITY CROSSING TABLE				
NO.	UTILITIES	OBVERT (m)	INVERT (m)	CLEARANCE (m)
1	SANITARY & WATER	149.043 (SAN)	150.456 (WAT)	1.413
2	STORM & WATER	150.714 (STM)	151.214 (WAT)	0.500
3	STORM & WATER	148.502 (STM)	150.557 (WAT)	2.055
4	STORM & WATER	148.803 (STM)	150.141 (WAT)	1.338



DETAIL CASING PIPE

NOT TO SCALE



SECTION CASING PIPE

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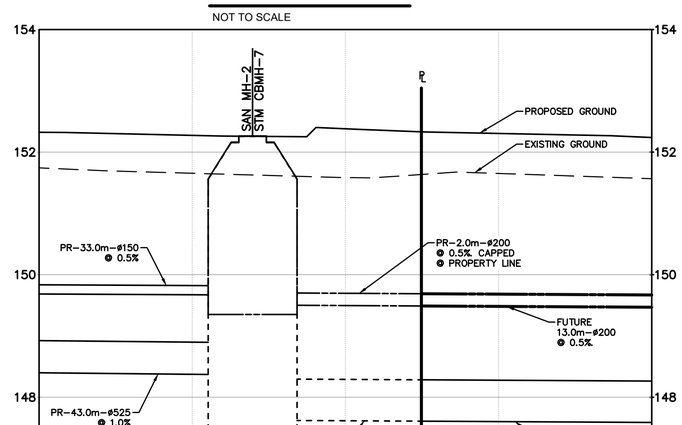

SECTION

1:50

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

LEGEND

CB	PROPOSED CATCH BASIN
	EXISTING STORM SEWER
STM MH	PROPOSED STORM SEWER
MH 136 (FUT.)	FUTURE STORM SEWER
STM MH	PROPOSED SANITARY SEWER
MH 121A (FUT.)	FUTURE SANITARY SEWER
WV	FUTURE WATERMAIN
WV	PROPOSED WATERMAIN
	PROPOSED SWALE
	PROPOSED STAGING LIMIT
	EXISTING WETLAND BOUNDARY
	EXISTING WETLAND SETBACK
	EXISTING PROPERTY LINE
	PROPERTY LINE SETBACK
BH12 152.73	EXISTING BOREHOLE
G	EXISTING UNDERGROUND GAS
OH	EXISTING OVERHEAD HYDRO
x	EXISTING FENCE
152	EXISTING MAJOR CONTOUR
151.5	EXISTING MINOR CONTOUR
H.P.	EXISTING HYDRO POLE
	EXISTING DITCH LINE
	EXISTING EDGE OF PAVEMENT

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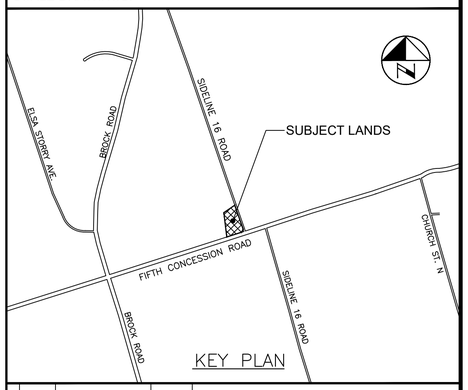

KEY PLAN

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1	06/20/20	MB	ISSUED FOR 30% DETAILED DESIGN
NO.	DATE	NAME	REVISIONS

PRIME CONSULTANT

AECOM
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50 SPORTSWORLD CROSSING ROAD, SUITE 290
KITCHENER, ON, N2P 0A4
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DESIGN BY: SM	SCALE 1:500
DRAWN BY: MB	DATE: 2020-10-30
CHECKED BY: SM	CONSULTANT PROJECT NO. 60611569
APPROVED BY: –	SPA NO. S11/20

THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
DESIGN, CONSTRUCTION & ASSET MANAGEMENT

1890 FIFTH CONCESSION RD SEATON PARAMEDIC FACILITY CITY OF PICKERING SITE SERVICING PLAN

PROPERTY NO. XXX-X-XXX	CITY FILE NO. S11/20	FACILITIES PROJECT NO. 60611569
CONTRACT NO. T-XXXX-20XX	DRAWING NO. C-102	SHEET NO. X OF XX

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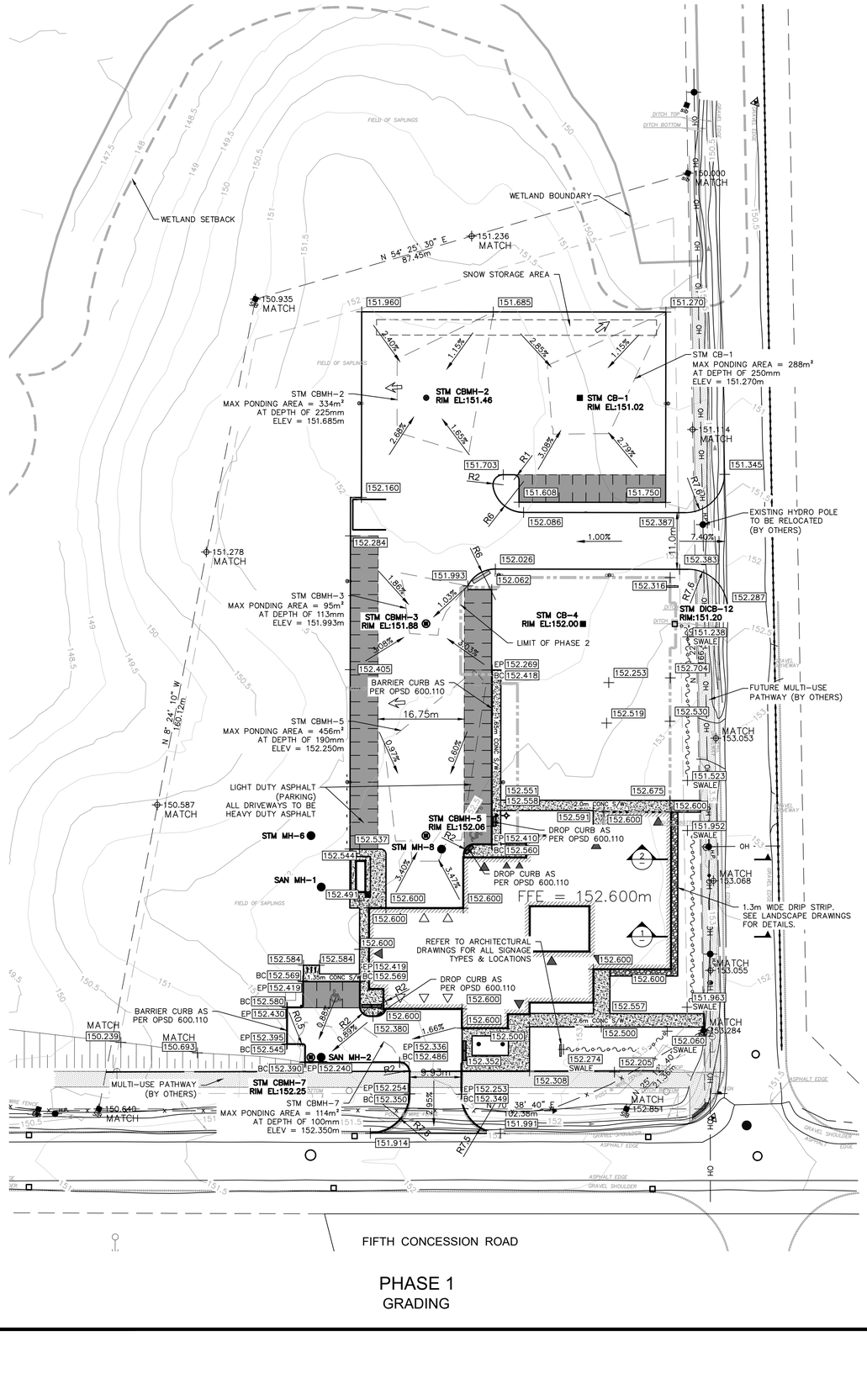
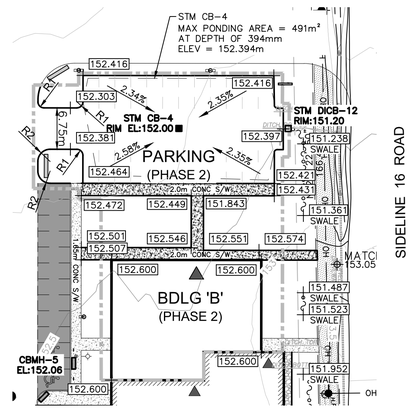


PHASE 1
GRADING



PHASE 2
GRADING

LEGEND

316.710	PROPOSED SPOT ELEVATION
151.633	EXISTING SPOT ELEVATION
0.73%	SURFACE FLOW ARROW
	OVELAND FLOW
	PROPOSED STAGING LIMIT
	PROPOSED PONDING AREA
	PROPOSED SWALE
	EXISTING WETLAND BOUNDARY
	EXISTING WETLAND SETBACK
	EXISTING PROPERTY LINE
	PROPERTY LINE SETBACK
BH12 152.73	EXISTING BOREHOLE
G	EXISTING UNDERGROUND GAS
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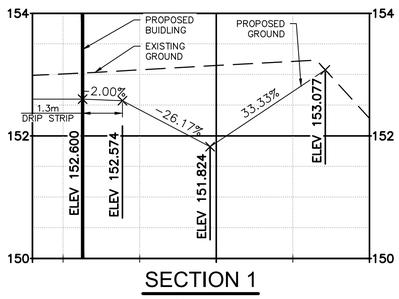

SECTION 1
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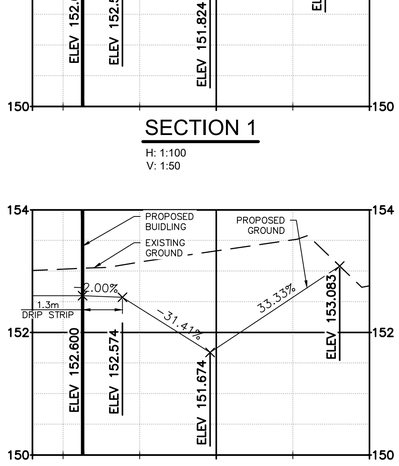
V: 1:50



SECTION 2
H: 1:100
V: 1:50

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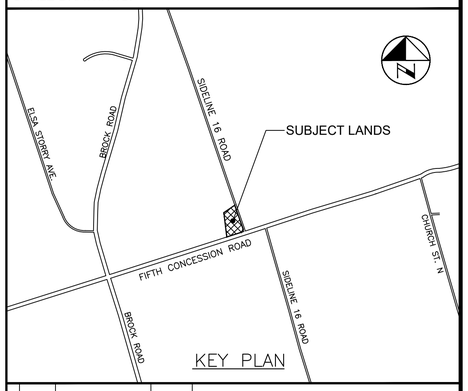

KEY PLAN

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DESIGN BY: SM	SCALE 1:500
DRAWN BY: MB	DATE: 2020-10-30
CHECKED BY: SM	CONSULTANT PROJECT NO. 60611569
APPROVED BY: –	SPA NO. S11/20

THE REGIONAL MUNICIPALITY
OF DURHAM
WORKS DEPARTMENT
DESIGN, CONSTRUCTION & ASSET MANAGEMENT

1890 FIFTH CONCESSION RD
SEATON PARAMEDIC FACILITY
CITY OF PICKERING
SITE GRADING PLAN

PROPERTY NO. XXX-X-XXX	CITY FILE NO. S11/20	FACILITIES PROJECT NO. 60611569
CONTRACT NO. T-XXXX-20XX	DRAWING NO. C-103	SHEET NO. X OF XX

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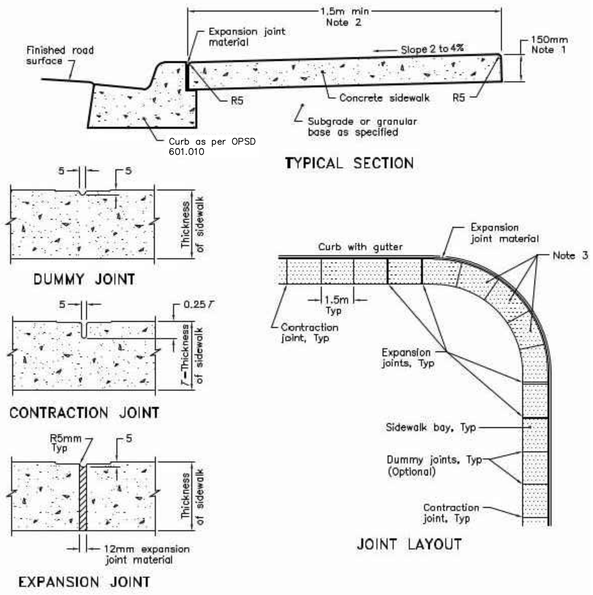
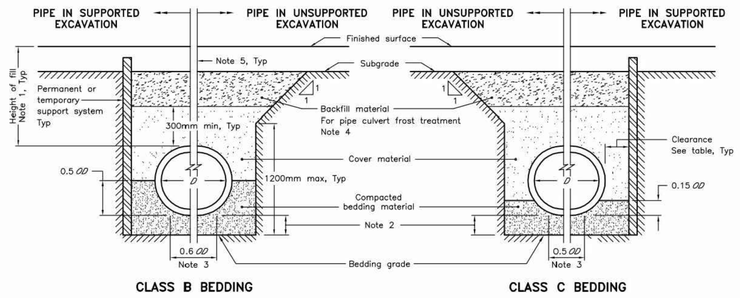


NOTES:

1 At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.033, and 310.039.
A All dimensions are in millimetres unless otherwise shown.

DETAIL MONOLITHIC SIDEWALK (1)

NOT TO SCALE



NOTES:

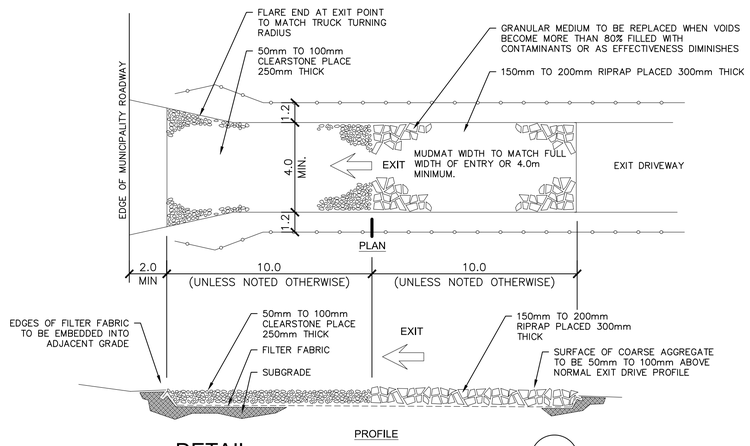
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.15D. In no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B All dimensions are in metres unless otherwise shown.

LEGEND:
D – Inside diameter
OD – Outside diameter

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

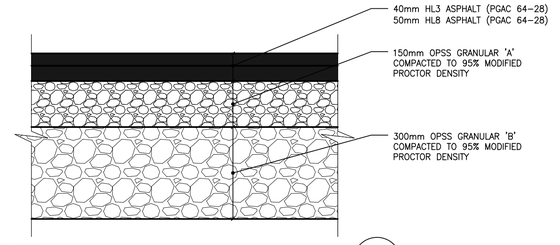
DETAIL PIPE BACKFILL (2)

NOT TO SCALE



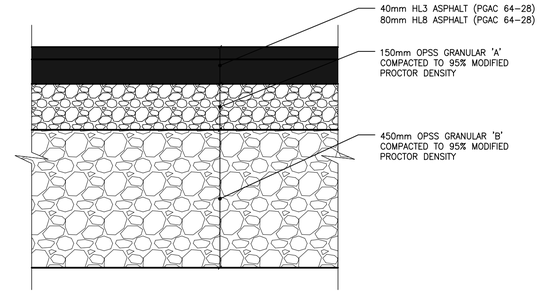
DETAIL EXIT MUDMAT (5)

NOT TO SCALE



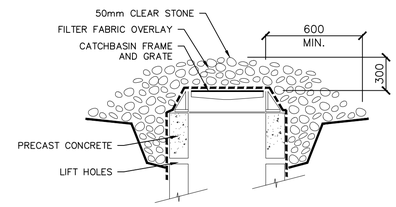
DETAIL LIGHT DUTY ASPHALT (3)

NOT TO SCALE



DETAIL HEAVY DUTY ASPHALT (4)

NOT TO SCALE

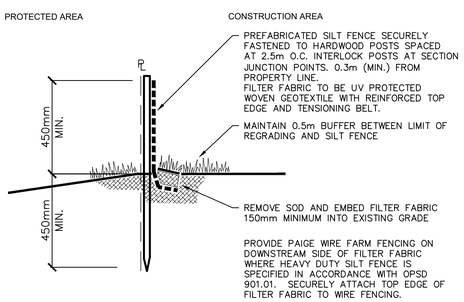


TYPICAL DETAIL FOR ALL SINGLE AND DOUBLE CATCHBASINS, AND CATCHBASIN MANHOLES PRIOR TO PLACEMENT OF ADJUSTING RINGS, PARGING OF LIFT HOLES AND PLACEMENT OF GRANULAR ROAD BASE.

REMOVE FILTER FABRIC, CLEAR STONE AND ACCUMULATED SEDIMENT IMMEDIATELY PRIOR TO FRAME ADJUSTMENT TO BASE COURSE ASPHALT ELEVATION AND BACKFILL WITH COMPACTED GRANULAR 'B'. PLACE FILTER FABRIC BELOW GRATE AFTER ADJUSTMENT AND MAINTAIN UNTIL BOULEVARD LANDSCAPING HAS BEEN ESTABLISHED.

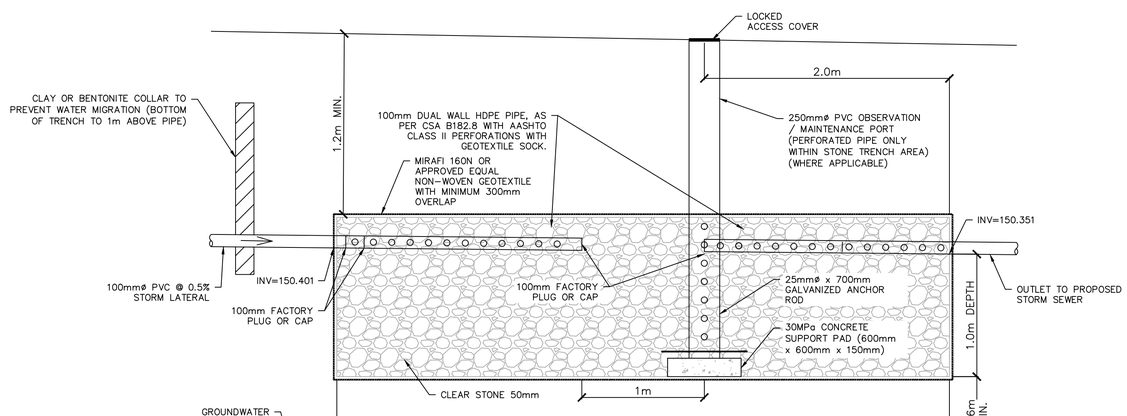
DETAIL CATCHBASIN TREATMENT (6)

NOT TO SCALE



DETAIL SILT CONTROL FENCING (7)

NOT TO SCALE



DETAIL INFILTRATION GALLERY (8)

NOT TO SCALE

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

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CONSULTANT REVISIONS

NO.	DATE	NAME	REVISIONS
5	06/15/21	MB	ISSUED FOR 100% DETAILED DESIGN
4	03/31/21	MB	RE-ISSUED FOR SITE PLAN APPROVAL
3	11/26/20	MB	ISSUED FOR 60% DETAILED DESIGN
2	10/30/20	MB	ISSUED FOR SITE PLAN APPROVAL
1	06/20/20	MB	ISSUED FOR 30% DETAILED DESIGN

PRIME CONSULTANT

AECOM
AECOM CANADA LTD.
50 SPORTSWORLD CROSSING ROAD, SUITE 290
KITCHENER, ON, N2P 0A4
TEL: 519-650-5313
FAX: 519-650-3424

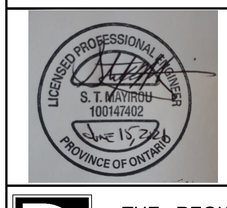
SURVEY & BENCHMARK

SURVEY COMPLETED BY IBW SURVEYORS JULY 2018.

ALL ELEVATIONS ARE IN METERS. DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99986.

ELEVATIONS ARE GEODETIC AND REFERRED TO CITY OF PICKING BENCHMARK 4-031 AND HAVING A GEODETIC ELEVATION OF 151.957m.

DESIGN BY: SM	SCALE 1:500
DRAWN BY: MB	DATE: 2020-10-30
CHECKED BY: SM	CONSULTANT PROJECT NO. 60611569
APPROVED BY: –	SPA NO. S11/20



THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
DESIGN, CONSTRUCTION & ASSET MANAGEMENT

1890 FIFTH CONCESSION RD SEATON PARAMEDIC FACILITY CITY OF PICKERING DETAILS

PROPERTY NO. XXX-X-XXX	CITY FILE NO. S11/20	FACILITIES PROJECT NO. 60611569
CONTRACT NO. T-XXXX-20XX	DRAWING NO. C-104	SHEET NO. X OF XX

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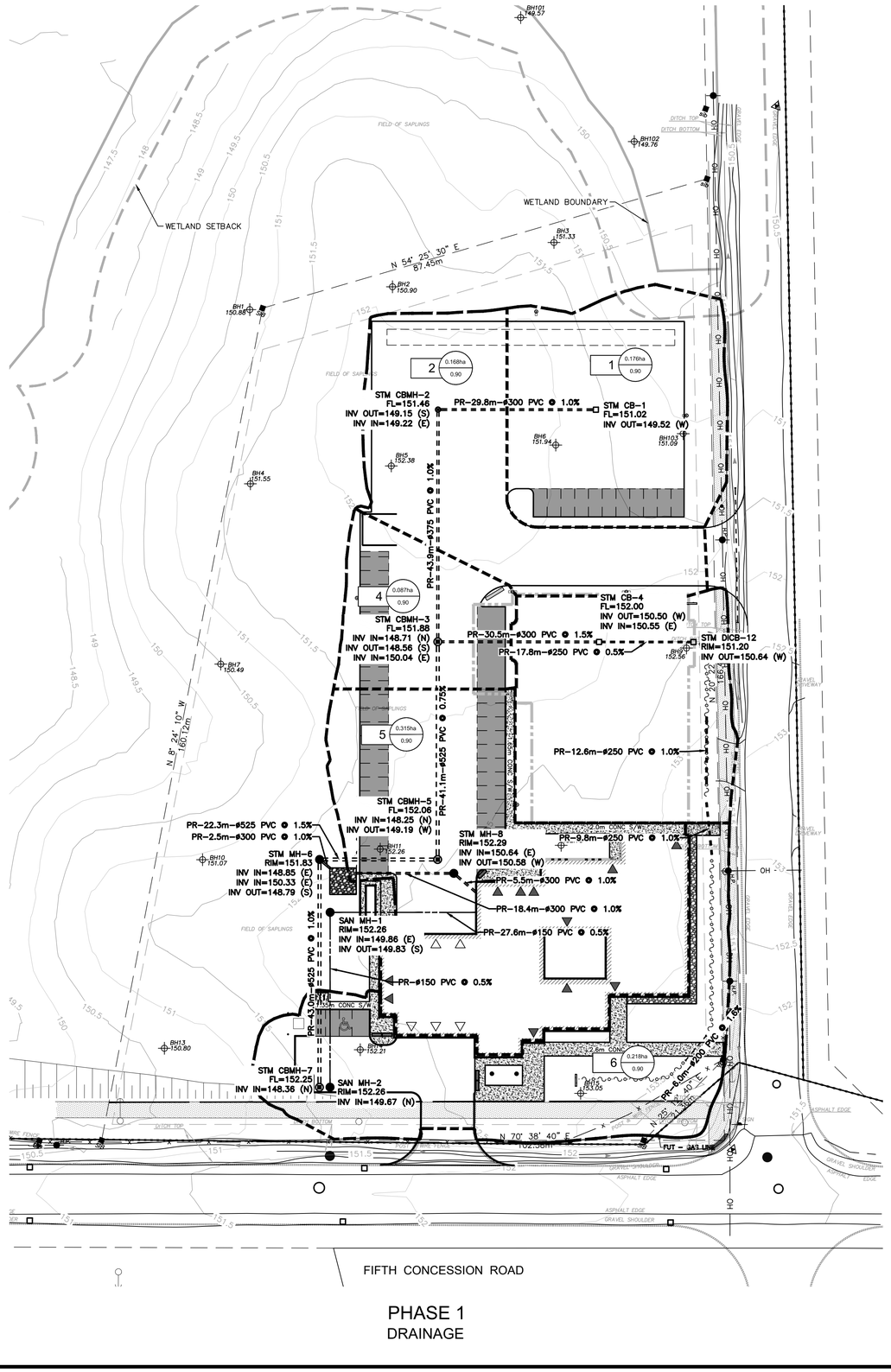
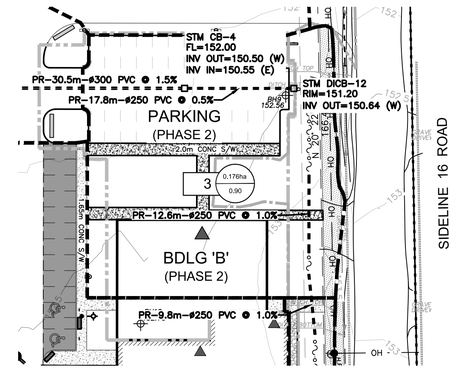


PHASE 1
DRAINAGE



PHASE 2
DRAINAGE

LEGEND

AREA NUMBER — 1 — 0.176ha — 0.90 — CATCHMENT AREA — RUNOFF COEFFICIENT

	PROPOSED STORM CATCHMENT AREAS
CB	PROPOSED CATCH BASIN
	EXISTING STORM SEWER
STM MH	PROPOSED STORM SEWER
MH 136 (FUT.)	FUTURE STORM SEWER
STM MH	PROPOSED SANITARY SEWER
MH 121A (FUT.)	FUTURE SANITARY SEWER
WV	FUTURE WATERMAIN
WV	PROPOSED WATERMAIN
	PROPOSED STAGING LIMIT
	PROPOSED SWALE
	EXISTING WETLAND BOUNDARY
	EXISTING WETLAND SETBACK
	EXISTING PROPERTY LINE
	PROPERTY LINE SETBACK
BH12 52.73	EXISTING BOREHOLE
G	EXISTING UNDERGROUND GAS
OH OH	EXISTING OVERHEAD HYDRO
	EXISTING FENCE
152	EXISTING MAJOR CONTOUR
151.5	EXISTING MINOR CONTOUR
H.P.	EXISTING HYDRO POLE
	EXISTING DITCH LINE
	EXISTING EDGE OF PAVEMENT

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

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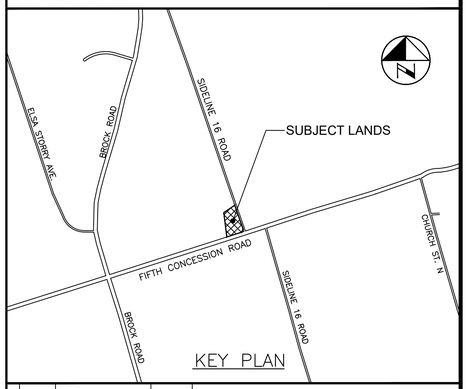

KEY PLAN

CONSULTANT REVISIONS

NO.	DATE	NAME	REVISIONS
5	06/15/21	MB	ISSUED FOR 100% DETAILED DESIGN
4	03/31/21	MB	RE-ISSUED FOR SITE PLAN APPROVAL
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DESIGN BY: SM	SCALE 1:500
DRAWN BY: MB	DATE: 2020-10-30
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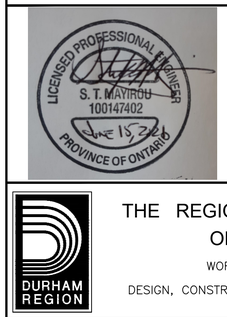
APPROVED BY: –	SPA NO. S11/20



THE REGIONAL MUNICIPALITY OF DURHAM
WORKS DEPARTMENT
DESIGN, CONSTRUCTION & ASSET MANAGEMENT

1890 FIFTH CONCESSION RD SEATON PARAMEDIC FACILITY CITY OF PICKERING DRAINAGE AREAS

PROPERTY NO. XXX-X-XXX	CITY FILE NO. S11/20	FACILITIES PROJECT NO. 60611569
CONTRACT NO. T-XXXX-20XX	DRAWING NO. C-105	SHEET NO. X OF XX

C:\Users\byersmi\Desktop\60611569 Seaton RDPS\900-CAD_GIS\910-CAD\20-SHEETS\60611569 C105 PROPOSED DRAINAGE AREA.dwg

Appendix B
Landscape Site Plan

GENERAL NOTES:

1. ENSURE THAT PLANT MATERIAL DOES NOT DRY OUT PRIOR TO INSTALLATION.
2. TREES SHALL BE SET @ 50mm ABOVE ORIGINAL NURSERY GRADE AND SURROUNDING GRADE TO ALLOW FOR SETTLEMENT.
3. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
4. WATER AND MULCH PLANT IMMEDIATELY FOLLOWING PLANTING.
5. FOR TREES PLANTED WITHIN PLANTING OR SHRUB BEDS, DELETE SAUCER AROUND BASE OF TREE.
6. CONTRACTOR SHALL REMOVE TREE STAKES AND TIES ONE YEAR AFTER PLANTING, OR AT END OF 2 YEAR WARRANTY PERIOD IF STAKES ARE STILL REQUIRED.
7. TREES SHOWING SIGNS OF GIRDLING MAY BE REQUIRED TO BE REPLACED.
8. NO TREE PITS SHALL BE LEFT OPEN OVERNIGHT.
9. CONTRACTOR TO STAKE LIMITS OF SHRUB BEDS AND SEEDED AREAS FOR CONSULTANT REVIEW AND APPROVAL PRIOR TO EXCAVATING AND PLANTING

TOPSOIL

TOPSOIL SHALL BE A SCREENED, FERTILE, FRIABLE, NATURAL LOAM CONTAINING NOT LESS THAN 4% ORGANIC MATTER FOR CLAY LOAMS AND NOT LESS THAN 2% ORGANIC MATTER FOR SANDY LOAMS TO A MAXIMUM OF 15%.

TOPSOIL SHALL BE CAPABLE OF SUSTAINING VIGOROUS PLANT GROWTH, FREE OF SUBSOIL CONTAMINATION, ROOTS AND STONES OVER 30 MM IN DIAMETER AND WEEDS, WITH A PH RANGING FROM 6.5 TO 7.0.

TOPSOIL FOR SEEDED AND SODDED AREAS: MIXTURE OF PARTICULATES, MICRO ORGANISMS AND ORGANIC MATTER WHICH PROVIDES SUITABLE MEDIUM FOR SUPPORTING INTENDED PLANT GROWTH.

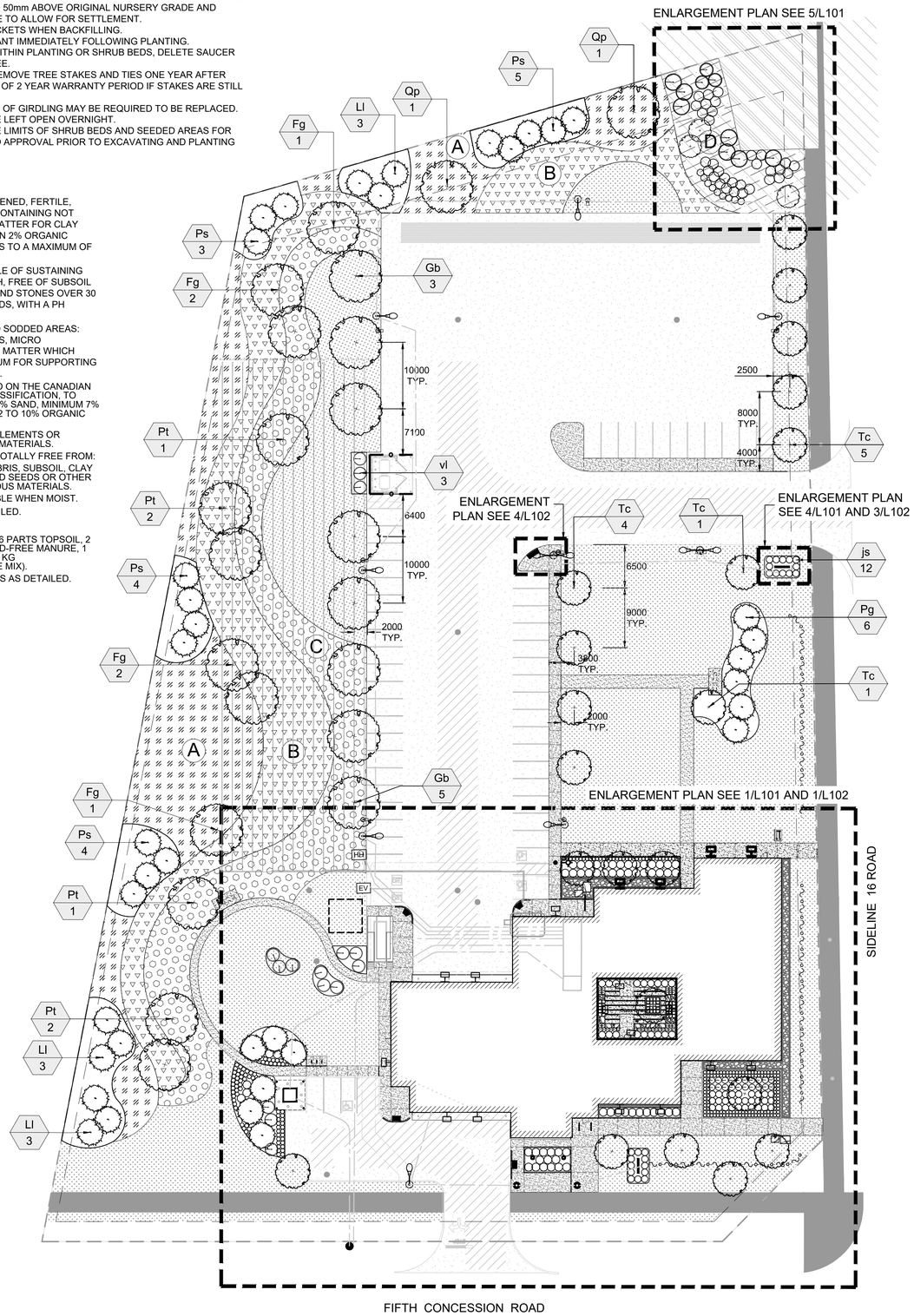
- SOIL TEXTURE BASED ON THE CANADIAN SYSTEM OF SOIL CLASSIFICATION, TO CONSIST OF 20 TO 70% SAND, MINIMUM 7% CLAY, AND CONTAIN 2 TO 10% ORGANIC MATTER BY WEIGHT.
- CONTAIN NO TOXIC ELEMENTS OR GROWTH INHIBITING MATERIALS.
- FINISHED SURFACE TOTALLY FREE FROM:
- STONES, ROOTS, DEBRIS, SUBSOIL, CLAY LUMPS, WEEDS, WEED SEEDS OR OTHER SOLID OR DELETERIOUS MATERIALS.
- CONSISTENCY: FRIABLE WHEN MOIST.

TOPSOIL DEPTHS AS DETAILED.

PLANTING MIXTURE

PLANTING MIXTURE TO BE 6 PARTS TOPSOIL, 2 PARTS DECOMPOSED WEED-FREE MANURE, 1 PART PEAT MOSS AND 0.75 KG SUPERPHOSPHATE (TRIPLE MIX).

PLANTING MIXTURE DEPTHS AS DETAILED.



LEGEND:

- SOD, AS PER DETAIL 4/L103
- (A) TABLELAND GRASS SEED MIXTURE, AS PER DETAIL 4/L103
- (B) NATIVE PRAIRIE MEADOW SEED MIXTURE, AS PER DETAIL 4/L103
- (C) FLOWERING LAWN SEED MIXTURE, AS PER DETAIL 4/L103
- (D) STANDARD OBL WETLAND NATIVE SEED MIXTURE, AS PER DETAIL 4/L103
- MULCHED PLANTING BED 75mm DEPTH
- CONIFEROUS TREE, AS PER DETAIL 1/L103
- DECIDUOUS TREE, AS PER DETAIL 2/L103
- SHRUBS, AS PER DETAIL 3/L103
- SITE LIMIT
- LANDSCAPE BOULDER AS PER DETAIL 5/104

PLANT LIST

DECIDUOUS TREES

KEY	QTY	BOTANICAL NAME	COMMON NAME	CONDITION	SPACING	NOTES
Ac	3	Amelanchier canadensis	Serviceberry	50mm WB	As per drawing	Tree Form
Al	5	Amelanchier laevis	Allegheny Serviceberry	45mm WB	As per drawing	Multi Stemmed
Ar	4	Acer rubrum 'Armstrong'	'Armstrong' Red Maple	60mm WB	As per drawing	
Fg	6	Fagus grandfolia	American Beech	60mm WB	As per drawing	
Gb	8	Ginkgo biloba 'Magyar'	Magyar Maidenhair Tree	60mm WB	As per drawing	
Pt	6	Populus tremuloides	Paper Birch	60mm WB	As per drawing	
Qp	2	Quercus palustris	Pin Oak	50mm WB	As per drawing	
Tc	11	Tilia cordata 'Corinthian'	Corinthian Linden	45mm WB	As per drawing	
CONIFEROUS TREES						
Ll	9	Larix laricina	American Larch	250mm WB	As per drawing	
Pg	12	Picea glauca	White Spruce	250mm WB	As per drawing	
Ps	16	Pinus strobus	Eastern white Pine	250mm WB	As per drawing	
SHRUBS						
cs	19	Cornus sericea	Red Osier Dogwood	50cm, 3 gal	200cm	
csk	104	Cornus sericea 'Kelseyi'	'Kelsey' Red Osier Dogwood	40cm, 3 gal	45cm	
js	24	Juniper sabina 'Calgary Carpet'	Calgary Carpet Juniper	50cm,3 gal	100cm	
po	16	Physocarpus opulifolius	Common Ninebark	50cm, 3 gal	150cm	
rt	7	Rhus typhina	Staghorn Sumac	100cm, 7 gal	300cm	
sa	9	Symphoricarpos albus	Snowberry	40cm, 3 gal	100cm	
sj	6	Spirea japonica 'Flaming Mound'	'Flaming Mound' Spirea	50cm, 3 gal	90cm	
tm	18	Taxus x media 'Hillii'	Hill's Yew	80cm, bbc	100cm	
vd	3	Viburnum dentatum	Arrowwood	100cm, 7 gal	175cm	
vl	9	Viburnum lentago	Nannyberry	200cm, wb	150cm	Clump
GRASSES						
ag	20	Andropogon gerardii	Big Bluestem	1 gal	60cm	
av	31	Andropogon virginicus	Broom Sedge	1 ltr	50cm	
cc	84	Calamagrostis canadensis	Canada Bluejoint Reedgrass	2 gal	80cm	
cv	171	Carex vulpinoidea	Fox Sedge	2 gal	30cm	

SEEDING MIXES

SYMBOL	COVER	QTY.	SPECIFICATION	SPECIES	APPLICATION RATE
A	1000 m²	2.7 kg	Tableland Grass Mixture	Big Bluestem (Andropogon gerardii), Canada Wild Rye (Elymus canadensis), Indiangrass (Sorghastrum nutans), Little Bluestem (Schizachyrium scoparium), Prairie Cordgrass (Spartina pectinata), Switchgrass (Panicum virgatum).	500g of seed per 180 m²
B	1100 m²	3.1 kg	Native Prairie Meadow Mixture	Black Eyed Susan (Rudbeckia hirta), Early Goldenrod (Solidago juncea), Fowl Bluegrass (Poa palustris), Foxglove/Beardtongue (Penstemon digitalis), Indiangrass (Sorghastum nutans), Little Bluestem (Schizachyrium scoparium), New England Aster (Aster novae-angliae), Showy Tick Trefoil (Desmodium canadense), Switchgrass (Panicum virgatum), White Vervain (Verbena urticifolia), Wild Bergamot (Monarda fistulosa).	500g of seed per 180 m²
C	920 m²	9.1 kg	Flowering Lawn Mixture	English Daisy, Thrift, White Dutch Clover, Birdsfoot Trefoil, Chamomile, Sheeps Fescue and Creeping Red Fescue	1.5kg of seed per 135 m²
D	275 m²	0.8 kg	Standard OBL Wetland Native Mixture	Awl Sedge, Blunt Broom Sedge, Boneset, Fox Sedge, Giant Bur Reed, Lurid Sedge, Nodding Bur Marigold, Nodding Sedge, Purple Stemmed Aster, Soft Rush, Spotted Joe Pye Weed, Square Stemmed Monkey Flower, Swamp Milkweed, Tussock Sedge, Virginia Wild Rye, Wool Grass	500g of seed per 180 m²
	3980 m²		Sod	As per spec	

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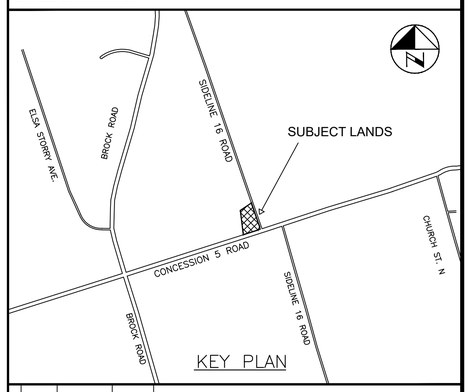

CONSULTANT REVISIONS

NO.	DATE	NAME	REVISIONS
6	JUN 11	KB	ISSUED FOR 100 SUBMISSION
5	MAR 31	KB	ISSUED FOR 90 SUBMISSION
4	MAR 31	KB	ISSUED FOR SPA RE-SUBMISSION
3	DEC 24	KB	ISSUED FOR 60% REVIEW
2	NOV 26	KB	ISSUED FOR 30% REVIEW
1	OCT 30	KB	ISSUED FOR SPA

PRIME CONSULTANT

ONTARIO ASSOCIATION OF LANDSCAPE ARCHITECTS — DEREK WECK — MEMBER

SUB-CONSULTANT

DESIGN BY: DW	SCALE 1:400
DRAWN BY: KB	DATE: 2020-10-30
CHECKED BY: DW	CONSULTANT PROJECT NO. 60611569
APPROVED BY: DW	

CONTRACT REVISIONS

NO.	DATE	NAME	REVISIONS

THE REGIONAL MUNICIPALITY OF DURHAM

WORKS DEPARTMENT

DESIGN, CONSTRUCTION & ASSET MANAGEMENT

SEATON EMS

LANDSCAPE SITE PLAN

PROPERTY NO.	FACILITY CODE	FACILITIES PROJECT NO.
XXX-X-XXX	XXX-XXX-XXXX	XXXX-XX-XX
CONTRACT NO.	DRAWING NO.	SHEET NO.
T-XXXX-20XX	L100	X OF XX

Appendix C
Daily Inspection Checklist

Soil Management Plan - Daily Inspection Checklist			
Name of Inspector:			
Date:			
Description of Field Work Activities:			
Weather and Site Conditions:			
	Suggested Measures	**Status**	**Notes**
Administrative Considerations	- Designated area for employee parking away from work area.		
	- Construction fencing surrounding site.		
Dust Control and Runoff Management	- Limit vehicular speed within construction area.		
	- Visual inspection and implementation of sweeping, cleaning and/or watering of off-site roadways.		
	- Placement and maintenance of larger aggregate and/or mud mats at site entrances/exits and vehicle traffic routes on-site.		
	- Minimize dust emissions with potable water misting or use of dust suppressant, as needed.		
	- Limit soil handling during periods of high winds.		
	- Limit height of stockpiles, if any. Tarp stockpiles that are to remain at grade for an extended period.		
	- Placement and maintenance of silt fencing around site.		
	- Visual inspection of vehicles/equipment and manual removal of excess soil prior to exiting site. Implementation of tire/equipment washing station, if required.		
Off-Site Export of Soil	- Export trucks are to be covered during transport.		
	- Confirm tracking of all soil loads, including information regarding number of loads (weight/volume) and receiving site receipt as outlined in SMP.		
Soil Import	- Inspect all loads of soil imported. Document number of loads (weight/volume), name/address of source site, general area of soil placement, approximate volume of soil placed in each area.		
Record keeping	- Document any complaints received regarding site activities.		

exp.

Appendix D
Bill of Lading

LOAD NUMBER:

B I L L O F L A D I N G

SOURCE SITE:

DESCRIPTION/SKETCH OF LOAD - SOURCE SITE:
SOIL TYPE/QUALITY:

DATE SHIPPED:	TIME LEFT SOURCE SITE:		VEHICLE PLATE NO.:
		A.M.	
		P.M.	
RECEIVING SITE:		TRUCKING COMPANY:	
		NAME OF DRIVER:	
		TRUCK/LOAD SIZE:	
DESCRIPTION/SKETCH OF LOAD - RECEIVING SITE:			

DISPATCHER CERTIFICATION:	HAULER CERTIFICATION:
"I DECLARE THAT THE INFORMATION ON THIS TICKET IS CORRECT AND COMPLETE"	"I DECLARE THAT THE MATERIAL BEING HAULED HAS BEEN GENERATED FROM THE INDICATED SHIPPING SITE ABOVE"
NAME (PRINT)	NAME (PRINT)
SIGNATURE	SIGNATURE

DATE RECEIVED:	TIME OF RECEIPT AT RECEIVING SITE:		WEIGHT OF SOIL RECEIVED:
		A.M.	
		P.M.	
RECEIVER:			DESCRIPTION OF SOIL RECEIVED:
NAME (PRINT)			
SIGNATURE			

NOTE: A BILL OF LADING SIGNED BY THE DISPATCHER AND HAULER MUST ACCOMPANY EVERY LOAD OF SOIL LEAVING THE SHIPPING SITE AND BE PRESENTED UPON ARRIVAL AT THE RECEIVING SITE.

Appendix E
Soil Tonnage Tracking Sheet

SOIL TONNAGE TRACKING SHEET (STTS)

Site Location: _____ **Date:** _____

Project # _____ **Soil Receiving Site / Destination:** _____

Soil Point of Origin _____ **Soil Import or Soil Export (Circle One)**

		Load Number										
		1	2	3	4	5	6	7	8	9	10	11
Soil Hauler Information												
Company	License Plate	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site	Time Off-Site

Total Number of Loads: _____ **Total Estimated Tonnage (tonnes):** _____

OR

Consultant Representative (Signature): _____ **Total Estimated Volume (cubic metres):** _____

Note: One triaxle dump truck holds approx. 10 m3 or 25 tonnes of soil

Consultant Representative (Print): _____

Appendix F
Existing Soil Data Compared to Table 1 and Table 2.1 Excess Soil Quality Standards

PROJECT NO. BRM-00604892-B0

SOIL MANAGEMENT PLAN

NORTHWEST OF CONCESSION ROAD 5 AND SIDELINE 16, PICKERING, ONTARIO

TABLE F1 - SUMMARY OF PETROLEUM HYDROCARBONS AND VOLATILE ORGANICS PARAMETERS IN SOIL

PARAMETER	SAMPLE ID:				BH103 SS6	BH102 SS5	BH102 SS5D^	BH101 SS3	TP1	TP2	TP2D^	TP3
	SAMPLE DEPTH (mbgs):				4.6 - 5.2	3.0 - 3.7	3.0 - 3.7	1.5 - 2.1	0 - 0.3	0 - 0.3	0 - 0.3	0 - 0.3
	SAMPLE COLLECTION DATE:				2018/09/04	2018/09/05	2018/09/05	2018/09/05	2018/10/04	2018/10/04	2018/10/04	2018/10/04
	SAMPLE COLLECTION TIME:				17:00	09:00	09:15	11:00	15:30	15:50	16:20	17:00
	TABLE 1 (RPICC) SCS	TABLE 2.1 (RPI) SCS	UNITS	RDL								
Petroleum Hydrocarbons												
F1 (C6-C10)	25	25	ug/g	10	<10	<10	<10	<10	<10	<10	<10	<10
F1 (C6-C10) - BTEX	25	25	ug/g	10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16)	10	10	ug/g	10	**12**	<10	<10	<10	<10	<10	<10	<10
F3 (C16-C34)	240	240	ug/g	50	66	<50	<50	<50	<50	<50	<50	<50
F4 (C34-C50)	120	2800	ug/g	50	<50	<50	<50	<50	<50	<50	<50	<50
Reached Baseline at C50			ug/g		YES	YES	YES	YES	YES	YES	YES	YES
F4G (Gravimetric)			ug/g		-	-	-	-	-	-	-	-
Volatile Organic Compounds												
Benzene	0.02	0.02	ug/g	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Toluene	0.2	0.2	ug/g	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	0.05	0.05	ug/g	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
m+p-Xylene			ug/g	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
o-Xylene			ug/g	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Xylenes, Total	0.05	0.091	ug/g	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acetone	0.5	0.5	ug/g	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromodichloromethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromoform	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Bromomethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Carbon Tetrachloride	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chlorobenzene	0.05	0.083	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloroform	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibromochloromethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichlorobenzene	0.05	3.4	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,3-Dichlorobenzene	0.05	0.26	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,4-Dichlorobenzene	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dichlorodifluoromethane	0.05	1.5	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloroethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1-Dichloroethylene	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
cis-1,2-Dichloroethylene	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
trans-1,2-Dichloroethylene	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-Dichloropropane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
cis-1,3-Dichloropropene	0.05	0.05	ug/g	0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
trans-1,3-Dichloropropene	0.05	0.05	ug/g	0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
1,3-Dichloropropene (cis+trans)	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Ethylene Dibromide	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Hexane (n-Hexane)	0.05	2.5	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methyl Ethyl Ketone (MEK)	0.5	0.5	ug/g	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl Isobutyl Ketone (MIBK)	0.5	0.5	ug/g	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methyl tert-butyl ether (MTBE)	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Methylene Chloride (Dichloromethane)	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Styrene	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,1,2-Tetrachloroethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Tetrachloroethylene	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,1-Trichloroethane	0.05	0.11	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2-Trichloroethane	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trichloroethylene	0.05	0.05	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Trichlorofluoromethane	0.25	0.25	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Vinyl Chloride	0.02	0.02	ug/g	0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

NOTES:

1) All Concentrations in µg/g (Unless Otherwise Stated)

2) Table 1 (RPIICC) SCS - Full Depth Generic Background Site Conditions for Residential/Parkland/Institutional Property/Industrial/Commercial/Community Use (O. Reg. 406/19)

3) Table 2.1 (RPI) SCS - Bulk Soil Site Condition Standards under a Potable Groundwater Condition for Residential/Parkland/Institutional Property Use (O. Reg. 406/19)

4) Detected Concentrations Above Table 1 SCS (RPI) Shown As: 0

5) Detected Concentrations Above Table 2.1 SCS (RPI) Shown As: 0

6) ^Denotes a Field Duplicate Sample

PROJECT NO. BRM-00604892-B0

SOIL MANAGEMENT PLAN

NORTHWEST OF CONCESSION ROAD 5 AND SIDELINE 16, PICKERING, ONTARIO

TABLE F2 - SUMMARY OF POLYCYCLIC AROMATIC HYDROCARBONS IN SOIL

PARAMETER	SAMPLE ID:				BH103 SS6	BH103 SS6D^	BH102 SS4	BH101 SS5	TP1	TP2	TP2D^	TP3
	SAMPLE DEPTH (mbgs):				4.6 - 5.2	4.6 - 5.2	2.3 - 2.9	3.0 - 3.7	0 - 0.3	0 - 0.3	0 - 0.3	0 - 0.3
	SAMPLE COLLECTION DATE:				2018/09/04	2018/09/04	2018/09/05	2018/09/05	2018/10/04	2018/10/04	2018/10/04	2018/10/04
	SAMPLE COLLECTION TIME:				17:00	17:15	08:45	11:15	15:30	15:50	16:20	17:00
	TABLE 1 (RPICC) SCS	TABLE 2.1 (RPI) SCS	UNITS	RDL								
Polycyclic Aromatic Hydrocarbons (PAHs)												
Acenaphthene	0.072	2.5	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthylene	0.093	0.093	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Anthracene	0.16	0.16	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(a)anthracene	0.36	0.5	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(a)pyrene	0.3	0.31	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0055	0.0064	<0.0050
Benzo(b/j)fluoranthene	0.47	3.2	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0085	0.012	0.013	0.0058
Benzo(g,h,i)perylene	0.68	6.6	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0075	0.0081	<0.0050
Benzo(k)fluoranthene	0.48	3.1	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chrysene	2.8	7	ug/g	0.0050	0.0065	0.0051	<0.0050	0.0062	<0.0050	0.0058	0.0066	<0.0050
Dibenzo(a,h)anthracene	0.1	0.57	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene	0.56	0.69	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0089	0.009	0.0098	0.0058
Fluorene	0.12	6.8	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Indeno(1,2,3-cd)pyrene	0.23	0.38	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.006	0.0068	<0.0050
1-Methylnaphthalene	0.59	0.59	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2-Methylnaphthalene	0.59	0.59	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
1+2-Methylnaphthalene	0.59	0.59	ug/g	0.0071	<0.0071	<0.0071	<0.0071	<0.0071	<0.0071	<0.0071	<0.0071	<0.0071
Naphthalene	0.09	0.2	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Phenanthrene	0.69	6.2	ug/g	0.0050	<0.0050	0.0056	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Pyrene	1	28	ug/g	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0075	0.0078	0.0086	<0.0050

NOTES:

1) All Concentrations in µg/g (Unless Otherwise Stated)

2) Table 1 (RPIICC) SCS - Full Depth Generic Background Site Conditions for Residential/Parkland/Institutional Property/Industrial/Commercial/Community Use (O. Reg. 406/19)

3) Table 2.1 (RPI) SCS - Bulk Soil Site Condition Standards under a Potable Groundwater Condition for Residential/Parkland/Institutional Property Use (O. Reg. 406/19)

4) Detected Concentrations Above Table 1 SCS (RPI) Shown As: 0

5) Detected Concentrations Above Table 2.1 SCS (RPI) Shown As: 0

6) ^Denotes a Field Duplicate Sample

PROJECT NO. BRM-00604892-B0

SOIL MANAGEMENT PLAN

NORTHWEST OF CONCESSION ROAD 5 AND SIDELINE 16, PICKERING, ONTARIO

TABLE F3 - SUMMARY OF METALS AND INORGANICS PARAMETERS IN SOIL

PARAMETER	SAMPLE ID:				BH103 SS6	BH102 SS4	BH101 SS6	BH101 SS6D^	TP1	TP2	TP2D^	TP3
	SAMPLE DEPTH (mbgs):				4.6 - 5.2	2.3 - 2.9	4.6 - 5.2	4.6 - 5.2	0 - 0.3	0 - 0.3	0 - 0.3	0 - 0.3
	SAMPLE COLLECTION DATE:				2018/09/04	2018/09/05	2018/09/05	2018/09/05	2018/10/04	2018/10/04	2018/10/04	2018/10/04
	SAMPLE COLLECTION TIME:				17:00	08:45	11:30	11:45	15:30	15:50	16:20	17:00
	TABLE 1 (RPICC) SCS	TABLE 2.1 (RPI) SCS	UNITS	RDL								
Metals (including Hydride-Forming Metals)												
Acid Extractable Antimony (Sb)	1.3	7.5	ug/g	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Acid Extractable Arsenic (As)	18	18	ug/g	1.0	1.9	1.1	1	1.2	1.5	2	2	2.2
Acid Extractable Barium (Ba)	220	390	ug/g	0.50	37	81	82	77	31	35	38	41
Acid Extractable Beryllium (Be)	2.5	4	ug/g	0.20	0.29	0.4	0.36	0.37	0.3	0.33	0.37	0.39
Acid Extractable Boron (B)	36	120	ug/g	5.0	<5.0	7.6	8.2	8.1	<5.0	<5.0	<5.0	<5.0
Acid Extractable Cadmium (Cd)	1.2	1.2	ug/g	0.10	<0.10	<0.10	<0.10	<0.10	0.21	0.17	0.2	0.18
Acid Extractable Chromium (Cr)	70	160	ug/g	1.0	13	17	18	18	9.7	11	12	13
Acid Extractable Cobalt (Co)	21	22	ug/g	0.10	5.3	6.1	5.7	5.7	3	4	4.3	5
Acid Extractable Copper (Cu)	92	140	ug/g	0.50	13	11	11	12	5.2	7.7	8.4	7.9
Acid Extractable Lead (Pb)	120	120	ug/g	1.0	6.6	5.7	4.4	4.5	10	12	13	12
Acid Extractable Molybdenum (Mo)	2	6.9	ug/g	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Acid Extractable Nickel (Ni)	82	100	ug/g	0.50	11	13	12	12	6.2	8.8	9.1	10
Acid Extractable Selenium (Se)	1.5	2.4	ug/g	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Acid Extractable Silver (Ag)	0.5	20	ug/g	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Acid Extractable Thallium (Tl)	1	1	ug/g	0.050	0.11	0.14	0.1	0.096	0.066	0.098	0.12	0.12
Acid Extractable Uranium (U)	2.5	23	ug/g	0.050	0.63	0.47	0.68	0.62	0.53	0.4	0.45	0.51
Acid Extractable Vanadium (V)	86	86	ug/g	5.0	20	24	26	26	19	21	22	24
Acid Extractable Zinc (Zn)	290	340	ug/g	5.0	26	34	29	30	35	37	42	38
Other Regulated Parameters												
Hot Water Extractable Boron		1.5	ug/g	0.050	<0.050	<0.050	0.19	0.2	0.41	0.59	0.56	0.42
Soluble (20:1) Chloride (Cl-)			ug/g		-	-	-	-	-	-	-	-
WAD Cyanide (Free)	0.051	0.051	ug/g	0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02	0.02	0.01
Electrical Conductivity	0.57	0.7	mS/cm	0.002	0.17	0.13	0.15	0.15	0.14	0.14	0.14	0.15
Hexavalent Chromium (CrVI)	0.66	8	ug/g	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Acid Extractable Mercury (Hg)	0.27	0.27	ug/g	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Available (CaCl2) pH			pH		7.86	7.76	8.18	8.15	7.4	7.32	7.41	7.51
Sodium Adsorption Ratio	2.4	5	N/A		0.26	0.38	0.46	0.5	0.27	0.25	0.24	0.23

NOTES:

1) All Concentrations in µg/g (Unless Otherwise Stated)

2) Table 1 (RPIICC) SCS - Full Depth Generic Background Site Conditions for Residential/Parkland/Institutional Property/Industrial/Commercial/Community Use (O. Reg. 406/19)

3) Table 2.1 (RPI) SCS - Bulk Soil Site Condition Standards under a Potable Groundwater Condition for Residential/Parkland/Institutional Property Use (O. Reg. 406/19)

4) Detected Concentrations Above Table 1 SCS (RPI) Shown As: 0

5) Detected Concentrations Above Table 2.1 SCS (RPI) Shown As: 0

6) ^Denotes a Field Duplicate Sample

PROJECT NO. BRM-00604892-B0

SOIL MANAGEMENT PLAN

NORTHWEST OF CONCESSION ROAD 5 AND SIDELINE 16, PICKERING, ONTARIO

TABLE F4 - SUMMARY OF POLYCHLORINATED BIPHENYLS IN SOIL

PARAMETER	SAMPLE ID:				BH103 SS6	BH103 SS6D^	BH102 SS4	BH102 SS6	BH102 SS6D^	BH101 SS5	BH101 SS6	TP1	TP2	TP2D^	TP3
	SAMPLE DEPTH (mbgs):				4.6 - 5.2	4.6 - 5.2	2.3 - 2.9	4.6 - 5.2	4.6 - 5.2	3.0 - 3.7	4.6 - 5.2	0 - 0.3	0 - 0.3	0 - 0.3	0 - 0.3
	SAMPLE COLLECTION DATE:				2018/09/04	2018/09/04	2018/09/05	2018/09/05	2018/09/05	2018/09/05	2018/09/05	2018/10/04	2018/10/04	2018/10/04	2018/10/04
	SAMPLE COLLECTION TIME:				17:00	17:15	08:45	09:20	09:30	11:15	11:30	15:30	15:50	16:20	17:00
	TABLE 1 (RPICC) SCS	TABLE 2.1 (RPI) SCS	UNITS	RDL											
Polychlorinated Biphenyls (PCBs)															
Aroclor 1242			ug/g	0.010 - 0.015	<0.015	<0.010	<0.010	<0.015	<0.015	<0.010	<0.015	<0.010	<0.010	<0.010	<0.010
Aroclor 1248			ug/g	0.010 - 0.015	<0.015	<0.010	<0.010	<0.015	<0.015	<0.010	<0.015	<0.010	<0.010	<0.010	<0.010
Aroclor 1254			ug/g	0.010 - 0.015	<0.015	<0.010	<0.010	<0.015	<0.015	<0.010	<0.015	<0.010	<0.010	<0.010	<0.010
Aroclor 1260			ug/g	0.010 - 0.015	<0.015	<0.010	<0.010	<0.015	<0.015	<0.010	<0.015	<0.010	<0.010	<0.010	<0.010
Total Polychlorinated Biphenyls (PCBs)	0.3	0.35	ug/g	0.010 - 0.015	<0.015	<0.010	<0.010	<0.015	<0.015	<0.010	<0.015	<0.010	<0.010	<0.010	<0.010
Organochlorine Pesticides (OCs)															
Aldrin	0.05	0.05	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
alpha-Chlordane	0.05	0.05	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
gamma-Chlordane	0.05	0.05	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Total Chlordane	0.05	0.05	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
o,p-DDD	0.05	3.3	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
p,p-DDD	0.05	3.3	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Total DDD		3.3	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
o,p-DDE	0.05	0.26	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
p,p-DDE	0.05	0.26	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Total DDE		0.26	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
o,p-DDT	1.4	1.4	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
p,p-DDT	1.4	1.4	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Total DDT		1.4	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Dieldrin	0.05	0.05	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Endosulfan I	0.04	0.04	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Endosulfan II (beta)	0.04	0.04	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Total Endosulfan		0.04	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Endrin	0.04	0.04	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Heptachlor	0.05	0.072	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Heptachlor epoxide	0.05	0.05	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Hexachlorobenzene	0.01	0.034	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Hexachlorobutadiene	0.01	0.01	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
gamma-Hexachlorocyclohexane (Lindane)	0.01	0.01	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Hexachloroethane	0.01	0.01	ug/g	0.0020	<0.0020	-	-	<0.0020	<0.0020	-	<0.0020	-	-	-	-
Methoxychlor	0.05	0.13	ug/g	0.0050	<0.0050	-	-	<0.0050	<0.0050	-	<0.0050	-	-	-	-

NOTES:

1) All Concentrations in µg/g (Unless Otherwise Stated)

2) Table 1 (RPIICC) SCS - Full Depth Generic Background Site Conditions for Residential/Parkland/Institutional Property/Industrial/Commercial/Community Use (O. Reg. 406/19)

3) Table 2.1 (RPI) SCS - Bulk Soil Site Condition Standards under a Potable Groundwater Condition for Residential/Parkland/Institutional Property Use (O. Reg. 406/19)

4) Detected Concentrations Above Table 1 SCS (RPI) Shown As: 0

5) Detected Concentrations Above Table 2.1 SCS (RPI) Shown As: 0

6) ^Denotes a Field Duplicate Sample

Regional Municipality of Durham

Network Standards

1.0 - Introduction

1.1 – Overview

The purpose of this document is to provide guidelines for network closet setup for the Region of Durham network and associated applications. The intent is to minimize the potential exposure to the Region of Durham from damages that may result from the incorrect installation of, and unauthorized use of Information Technology resources. Damages include the interruption of communications, loss of sensitive data, damage to public image, damage to critical Region of Durham computer systems, etc.

1.2 – Scope

This policy applies to all Region of Durham employees, contractors, consultants, temporary workers, and personnel affiliated with third parties utilizing network connectivity to access the Region of Durham network and systems for business purposes only.

1.3 – Audience

The information contained within this document is considered to be confidential and should only be disclosed to employees, partners and consultants who are involved in network closet construction activities.

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2.0 - Definition and Implementation

2.1 – General

The data network is available to Region of Durham employees to provide access to perform business functions and for site-to-site communications.

2.1.1 All copper cabling installed will come with a minimum of 10 years manufacturer warranty, fibre optics and other miscellaneous equipment will have a minimum of 1 years manufacturer warranty

2.1.2 Unless otherwise specified, all equipment purchased must be brand new and in perfect condition

2.2 – Data Room requirements

2.2.1 Walls must be covered with fire retardant paint, or fire-resistant boards to be used

2.2.2 All concrete flooring must be sealed to prevent dust buildup

2.2.3 Minimum of 3 foot clearance on all sides of network racking equipment is required. Additional room may be required as per racking specification.

2.2.4 Entrance to room must be locked with security card access available. CS-IT staff only to be permitted access to room.

2.2.5 After construction work is completed, rooms will be cleaned and made free of dust, debris, and construction waste.

2.2.6 Any HVAC setpoints to be 21 degrees Celsius with approximately 50% humidity

2.3 – Data Racking Requirements

2.3.1 Option 1 – Full Cabinet

2.3.1.1 For use in scenarios where there will be multiple network switches, servers, VoIP equipment, firewalls or other security equipment, or if there are any other IT requirements indicated by CS-IT.
2.3.1.2 Cabinet model will be Tripp-Lite SR42UBWD
2.3.1.2.1 Doors front and back will use uniform key
2.3.1.2.2 Blanking plates will be used to cover all unused spaces and ensure air flow
2.3.1.2.3 M6 cage nuts to be installed in top and bottom hole per rack unit (center hole left empty)
2.3.1.3 Data room must be minimum 11’ lengthwise, 9’ widthwise in size
2.3.1.3.1 Additional racks must extend the width by 3’ per rack
2.3.1.4 Climate control is mandatory for this installation, to be determined by contractor with setpoints indicated as per item 2.2.6
2.3.1.5 Power:

2.3.1.5.1 2x 30 amp 208 v outlets to be provided with NEMA L6-3R outlets, as well as 2x APC AP8841 power distribution units

2.3.1.5.2 2x 20 amp 120v power outlets to be provided with NEMA 5-20R outlets, as well as 2x Tripp-Lite PDUMV20NET power distribution units

2.3.1.5.3 All power outlets to be mounted above the racks, no power cabling or their runs are to be mounted within the rack

2.3.1.6 Entrance to room must be locked with security card access available. CS-IT staff only to be permitted access to room.

2.3.2 Option 2 – Wall mount Rack

2.3.2.1 For use in scenarios where there are basic requirements for rackmountable equipment

2.3.2.2 Wall-mount rack unit will be Triplite SRW12US33 or Triplite SRW10US, (where server depth is not required)

2.3.2.3 Doors and Panels will use a uniform key

2.3.2.4 Blanking plates will be used to cover all unused spaces and ensure air flow

2.3.2.5 Data room must be 7' lengthwise and 7' widthwise in size

2.3.2.6 Wall mount must not be placed more than 4 feet off the ground for service access

2.3.2.7 Wall mount must be placed in such a way that it is able to swing open to its fullest extent

2.3.2.8 Climate control is mandatory for this installation, to be determined by contractor with setpoints indicated as per item 2.2.6

2.3.2.9 Two duplex receptacles or a single quad receptacle power outlet to be provided, with a total of 4x NEMA 5-15 plugs providing 120v 15a power service. The power outlet must be mounted on the wall beside the rack in such a way that it does not impede the rack when the rack is swung open.

2.3.2.10 Entrance to room must be locked with security card access available. CS-IT staff only to be permitted access to room.

2.3.3 Option 3 – Sundry

2.3.3.1 For use in scenarios where RoD is not the owner of the room. Location will have minimal requirements for rackmountable equipment.

2.3.3.2 Rack model will be R.F. Mote RFM-1911-WMB-22

2.3.3.3 Rack will not be mounted more than 4 feet off the ground

2.3.3.4 Will require floor space of 7' lengthwise, 6' widthwise

2.3.3.5 One duplex receptacle power outlet to be provided, with 2x NEMA 5-15 plugs providing 120v 15a power service. The power outlet must be mounted on the wall beside the rack.

2.3.4 Contractor Responsibilities

2.3.4.1 Contractor to follow the CS-IT racking design as issued

2.3.4.2 Contractor must install all cage nuts into rails

2.3.4.3 Contractor will mount cabling and patch panels into racks

2.3.4.4 Contractor to install miscellaneous equipment

2.3.4.5 Contractor to remove all left over equipment, dispose of any waste and ensure room is free of dust and debris

2.4 – Singlemode Cabling requirements

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2.4.1 All singlemode cabling shall be fibre optic cable 9/125um OS2 and constructed with Belden optical fibre.

2.4.2 Outdoor cables shall be loose tube CMR (FT4) outdoor rated fibre optic cable.

2.4.3 Intra-building singlemode fibre optic backbone cables from the Building Entrance Facility (BEF) to the Telecommunications Room (TR) shall be a minimum twelve (12) strand cable unless otherwise specified by CS-IT.

2.4.4 Cable to be formed into groups of 12 fibres. Groups and individual fibres shall be identified in accordance with ANSI/EIA/TIA-598-A

2.4.5 Fiber optic cable groups shall be assembled to form a single compact core and covered by a protective sheath. The sheath shall consist of an overall jacket and one or more layers of dielectric material applied over the core.

2.4.6 The fibre optic connectors must be field installable connectors. The connectors shall be LC style UPC for both inter-building backbone cables and intra-building backbone cables.

2.4.7 All connectors are to meet ANSI/EIA/TIA and IEC standards for repeatability.

2.4.8 The connector shall be capable of terminating on either 900 micron tight-buffered cable, 3.0 mm jacketed fibres or 250 micron loose tube fibres. The connector shall also have a zirconia ceramic ferrule for both multimode and singlemode connectors and must have a locking feature to the coupler.

2.4.9 The connector shall provide a strain relief mechanism for installation on a single fibre.

2.4.10 The fibre within the body of the connector shall be isolated mechanically from cable tension bending and twisting as per ANSI/TIA-568-C.3.

2.4.11 Fibre optic patch panel manufactured by Belden to be provided where possible and shall be rack mountable in a 19” rack and black in colour.

2.4.12 The panels shall comply with ANSI/TIA-568-C.3 (connecting hardware section).

2.4.13 The fibre optic patch panel shall have a slide out shelf or swing out drawer for access to the fibre terminations, adapter panels for patching.

2.4.14 The fibre optic patch panel shall provide for bend radius control and use a strain relief to accommodate the fibre optic cables.

2.4.15 The fibre optic patch panel shall be capable of terminating tight buffered and loose tube multimode or singlemode fibre optic cables.

2.4.16 Belden dual fibre optic patch cords are to be singlemode 9/125um. Connector types on ends of patch cords to be determined by CS-IT.

2.4.17 Patch cords to be factory assembled and verified. Fiber patch cords shall comply with ANSI/TIA-568-C.3

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2.4.18 The colour of the singlemode patch cords will be yellow. The length of the patch cords will be ten (10) feet or three (3) meters unless otherwise specified.

2.4.19 Fibre runs shall be labeled on both ends of patch panel with a general indication of where the fibre is terminated.

2.4.20 All cabling must be fully tested. Full test report must be provided to CS-IT.

2.5 – Multimode Cabling requirements

2.5.1 All multimode cabling shall be fibre optic cable 50/125um OM4 and constructed with Belden optical fibre.

2.5.2 Outdoor cables shall be loose tube CMR (FT4) outdoor rated fibre optic cable.

2.5.3 Intra-building singlemode fibre optic backbone cables from the Building Entrance Facility (BEF) to the Telecommunications Room (TR) shall be a minimum twelve (12) strand cable unless otherwise specified by CS-IT.

2.5.4 Cable to be formed into groups of 12 fibres. Groups and individual fibres shall be identified in accordance with ANSI/EIA/TIA-598-A

2.5.5 Fiber optic cable groups shall be assembled to form a single compact core and covered by a protective sheath. The sheath shall consist of an overall jacket and one or more layers of dielectric material applied over the core.

2.5.6 The fibre optic connectors must be field installable connectors. The connectors shall be LC style UPC for both inter-building backbone cables and intra-building backbone cables.

2.5.7 All connectors are to meet ANSI/EIA/TIA and IEC standards for repeatability.

2.5.8 The connector shall be capable of terminating on either 900 micron tight-buffered cable, 3.0 mm jacketed fibres or 250 micron loose tube fibres. The connector shall also have a zirconia ceramic ferrule for both multimode and singlemode connectors and must have a locking feature to the coupler.

2.5.9 The connector shall provide a strain relief mechanism for installation on a single fibre.

2.5.10 The fibre within the body of the connector shall be isolated mechanically from cable tension bending and twisting as per ANSI/TIA-568-C.3.

2.5.11 Fibre optic patch panel manufactured by Belden to be provided where possible and shall be rack mountable in a 19” rack and black in colour.

2.5.12 The panels shall comply with ANSI/TIA-568-C.3 (connecting hardware section).

2.5.13 The fibre optic patch panel shall have a slide out shelf or swing out drawer for access to the fibre terminations, adapter panels for patching.

2.5.14 The fibre optic patch panel shall provide for bend radius control and use a strain relief to

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accommodate the fibre optic cables.

2.5.15 The fibre optic patch panel shall be capable of terminating tight buffered and loose tube multimode or singlemode fibre optic cables.

2.5.16 Belden dual fibre optic patch cords are to be multimode 50/125um. Connector types on ends of patch cords to be determined by CS-IT.

2.5.17 Patch cords to be factory assembled and verified. Fiber patch cords shall comply with ANSI/TIA-568-C.3

2.5.18 The colour of the multimode patch cords will be Erika Violet. The length of the patch cords will be ten (10) feet or three (3) meters unless otherwise specified.

2.5.19 Fibre runs shall be labeled on both ends of patch panel with a general indication of where the fibre is terminated.

2.5.20 All cabling must be fully tested. Full test report must be provided to CS-IT.

2.6 Ethernet Cable Specifications

2.6.1 The installed cabling system must be a Belden Certified Network System and receive applicable warranty from manufacturer

2.6.2 All cabling shall confirm to transmission standards ANSI/EIA/TIA-568-C.2 and ANSI/EIA/TIA-568-C.3

2.6.3 Following Ethernet copper cabling to be used:

2.6.3.1 10GX Category 6A Enhanced Premise Horizontal Cable (625MHz), 4 Pair, 23 AWG Solid Bare Copper Conductors, U/UTP, Plenum-CMP, Flamarrest® PVC-LS Jacket

2.6.4 A 3 meter service loop is required on both ends of any cable run

2.6.5 No individual cable run shall exceed 75 metres

2.6.6 All cabling shall be run in existing building cabling trays

2.6.7 Velcro cable ties shall be used. When used in areas considered environmental space, all bundling materials must be appropriately listed and plenum (FT6) or riser rated as per Ontario Building Code.

2.6.8 Following patch panel to be used where patch panels are necessary

2.6.8.1 Belden AX103253 Patch Panel

2.6.9 Client work area outlets must be installed at minimum 3 feet off of the ground unless specified by CS-IT

2.6.10 Wireless access points will be terminated in ceiling with Belden AX102651 KeyConnect Side-Entry Boxes, with Shutter Door ID Window

2.6.11 For data drops, the following modular jack will be used:

2.6.11.1 Belden AX102289 10GX Modular Jacks Punch Down Jacks KeyConnect-Style (purple)

2.6.12 For wireless access points, the following modular jack will be used:

2.6.12.1 Belden AX102282 10GX Modular Jacks Punch Down Jacks KeyConnect-Style (white)

2.6.13 One data port shall be terminated at each desk/workstation unless otherwise requested

2.6.14 All patch cabling to be provided by contractor:

2.6.14.1 One Belden CA21106001 (1 foot blue patch cable) to be provided for every data port terminated in data room

2.6.14.2 One Belden CA21105004 (4 foot green patch cable), one CA21105007 (7 foot green patch cable) to be provided for every data port terminated at a desk

2.6.14.3 One Belden CA21105010 (10 foot green patch cable) to be provided for every port in work areas not located at a desk

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2.6.14.4 Two Belden CA21109001 (1 foot white patch cable) to be provided for every cable run installed for wireless access points

2.6.15 Ethernet drops to be labeled on both the patch panel and in the work area as follows:

2.6.15.1 In locations where there are multiple data rooms, the first character will indicate the floor number, the second character to indicate the cardinal direction of the network closet in comparison to the centre of the building, the third character being a dash, and the fourth through sixth characters indicating a cable number which increments per drop run. If there are existing cable numbers in the network closet, the label must start at the highest current existing number.

2.6.15.2 In locations where there is only a single data room, the first through third character will indicate a cable number which increments per drop run.

2.6.15.3 Hand written labels will not be accepted.

2.6.15.4 Cabling labels shall be made of materials designed to outlast the cabling elements to which they attach. Office quality labels will not be accepted.

2.6.16 All copper cabling must be fully tested to satisfy Category 6a copper requirements as per ANSI/TIA 568 C.2-2 specification. Full test report must be provided to CS-IT.

2.7 Wireless Access Points

2.7.1 All wireless access point cabling shall be performed as per Ethernet cable specification in 2.6

2.7.2 Access points are to be installed in the ceiling and not side-mounted on walls unless otherwise specified by CS-IT

2.7.3 Access points are not to be installed in locations where they are shadowed by metal structures, including HVAC or venting

2.7.4 Access point mounting equipment to be provided by CS-IT

3.0 - Responsibilities/Parties Involved

3.1 – Policy Content Owner

The Manager of Enterprise Technology is the content owner and is responsible for the creation and on-going maintenance of this document.

3.2 – Compliance

- Individuals involved with network setup, data cabling, and data room construction are expected to familiarize themselves with this policy and consistently comply with it throughout their daily business activities.
- CS-IT will review work completed and report any compliance violations for remediation.

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4.0 - Waivers

Waivers to any provision of this document must be approved by the Manager of Enterprise Technology and the requesting department's management.

5.0 - Review Process

This policy and any associated procedures and standards will be reviewed annually. A detailed report which includes the relevance of the policy and compliance to the provisions of the policy will be generated. Such a review should verify that the policy is consistent with Regional practices and that it is achieving its intended purpose.

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Regional Municipality of Durham
Corporate Policy and Procedures Manual

Title: Security Services Installation and Security System Standards	**Guideline #: 1.01**
Approved By: Security Services Supervisor	**Page #: 1 (of 5)**
Issued: May 10, 2019	**Revised: June 10, 2021**
Responsibility: Facilities Maintenance and Operations	**Section: Security Services**

1. Purpose

To provide a detailed guideline for the installation of security systems and a set of standards for the equipment to be used in the installation of security systems in Regional facilities.

2. Technical Abbreviations

AC	Alternating Current
AMP	Ampere
CAD	Computer Aided Drawing
CCTV	Closed Circuit Television
CRI	Color Rendering Index
DVR	Digital Video Recorder
EOL	End of Line
GSM	Global System for Mobile
HSCIP	High Security Communication Internet Protocol
IP	Internet Protocol
LCD	Liquid Crystal Display
MAC	Media Access Control
NAR	Nuisance Alarm Rates
NC	Normally Closed
NO	Normally Open
PD	Probability of Detection
PPS	Physical Protection System
PSS	Physical Security System
SMTP	Simple Mail Transfer Protocol

UPS	Uninterruptable Power Supply
WAN	Wide Area Network

3. General Guidelines

Product Selection

Where products are not specified, proposed products must be confirmed with Security Services for suitability and compatibility prior to procurement. Proposed products should be high quality, industry standards with a proven track record of reliability and be quickly and easily obtainable from multiple sources to reduce downtime in the event repairs. They need to minimize nuisance alarm rates (NAR) while maintaining a high probability of detection (PD). Any quality manufacturer should have PD and NAR rates readily available for all their sensor products.

Existing Security System

Any addition or renovation to a facility that has a pre-existing security system needs to ensure compatibility and tie-in with the existing system. If the existing system is not compatible due to the age of the system, upgrading of the existing system needs to be coordinated with the new project.

Cabling

Controllers and devices should be wired neatly. Cables should have enough slack to allow for restriping and terminating the cables in the event of hardware changes while not leaving so much slack as to overburden the enclosure. Cables should be run at 90 degrees with an appropriate amount of cable tie-down points. Care should be taken to not “drape” cables across control boards.

Cable run through ceilings should be in conduit or in a cable tray. If that is not possible, then the cable must be plenum-rated and suspended so it does not lie on the ceiling. The method of suspension cannot affect the ability to pull new cable (i.e. “J” hooks are acceptable; tie-wrapping cable to drop ceiling support wires is not).

All devices should be installed and wired as per manufacturer’s specification. All cable should be supplied, installed and terminated according to manufacturer’s specification.

Any cable run through a new, or existing, fire separation must be sealed as per current fire code.

Cable run outside of the data room needs to be protected from tampering using metal conduit, PVC conduit, cable armoring, etc.

Hardware

Enclosures containing major components should have all components labeled. The label should contain the type of equipment, serial number, and zone range, if applicable. The label

should be made of laminated plastic 1/8” thick, white with a black centre core. They should be a minimum of 1” X 3” with minimum ¼” high engraved block lettering.

Ladders

Access ladders should be enclosed below 12 feet to prevent climbing by unauthorized personal. Ladder covers should be monitored with contacts to notify Regional staff in the event of unauthorized access. Care should be taken to not run other services near the ladder to prevent individuals from bypassing the enclosure.

Door Hardware

Door hardware appropriate for the specific environment must be used. This is especially important in areas where the hardware will be exposed to chemicals that will accelerate the corrosion process.

Network Connection

Any device that will be connected to the Region of Durham network needs to be coordinated well in advance with Corporate Services – Information Technology (CS-IT). Typically, they require **30 days’ notice**, need media access control (MAC) addresses for all the hardware to be installed on site and will provide the range of IP addresses to be used.

Warranty

The warranty period for all items should be 2 years, inclusive of parts and labour.

4. Access Control and Intrusion System

Power

All AC power should be hard-wired on a dedicated 15 Amp circuit, no additional cord and plug connected device(s) should be allowed.

Backup batteries for both main control panels and access door controllers should be 12V 7Ah and be labeled with the month and year of installation.

All devices in the field should have a numerical label indicating the zone number or door number.

Security System

The Region of Durham has standardized on the ICT Integrated Access Control and Intrusion Platform running on ProtegeGX software.

The security integrator will be responsible for testing the complete system on site using test users. Once the local testing is complete the security integrator will supply a complete system configuration file (in Excel spreadsheet or similar format) to Security Services, who

will program the site in the Regional server. The Integrator will provide all required maps to configure the active map feature for site control.

The main control panel must be an ICT PRT-CTRL-DIN panel with a PRT-PSU-DIN-2A power supply running the most recent firmware version.

For connection back to headquarters for programming a network connection is required. Where no WAN is available a Cisco cellular router should be installed to facilitate the connection. These routers can be ordered through the Region of Durham procurement contracts. Telephony and CSIT will need to be involved to properly setup the device prior to installation on site.

If the site is to be monitored, a global system for mobile (GSM) unit needs to be installed for backup communications. The current GSM unit is model #DSC 3G4010, a newer model should be installed if available.

Door Controllers, Modules, Readers and Keypads

Access control doors will use ICT door controllers in appropriately sized enclosures with hard-wired power, running the latest firmware.

Point expansion modules will be appropriately sized ICT modules running the most recent firmware.

Sites that require elevator floor control must use the ICT elevator interface modules in an appropriately sized enclosure running the most recent firmware.

Card readers will be ICT V2 multi-function high security readers. They can be switch-plate or mullion mount, standard reader or arming station.

LCD Keypads will be ICT Keypads.

Contacts and Motion Detection

Concealed door contacts should be 1” diameter 3-wire, capable of being wired as normally closed (NC) or normally open (NO) with an end of line (EOL) resistor. It should be installed in the field NO with the EOL resistor at the device. Gap distance in a steel frame should be no more than ½” and in a wooden frame, no more than 1”. In a steel door with a recessed trough on the top edge, it is acceptable to use a rare earth magnet in compression housing. If the door has access control, the contact should be wired back to the door controller.

Surface contacts should be capable of being wired as NC or NO with an EOL resistor. It should be installed in the field NO with the EOL resistor at the device. Gap distance should be no more than ¾”.

Overhead door contacts should be capable of being wired as NC or NO with an EOL resistor. It should be installed in the field NO with the EOL resistor at the device. Gap distance should be between 2” and 6”. Ideally, they should be installed on top of the door, but may be floor

mounted if necessary due to door design. The tail on the overhead door contact must be armored.

Motion detectors should be dual-tech at a minimum, using passive infra-red and microwave detection. The sensors should have the pet immunity and tamper detection functions available. They should be able to be wired NC or NO/EOL. It should be installed in the field NO/EOL with the resister at the device and running through the tamper loop. Care should be taken when selecting the mounting location to reduce the risk of false alarm from heat sources.

Glassbreak detectors should have sensitivity adjustments to account for room acoustics and be adequate for the area to be covered. They should be able to be wired NC or NO/EOL and have tamper detection. It should be installed in the field NO/EOL with the resister at the device and running through the tamper loop.

Door Strikes and Locks

Electric door strikes (mortise or RIM type) should be fail-secure by default. Fail-safe strikes should only be used where they are placed in an evacuation route which requires the door to be swung in. If the door swings out, a fail-secure strike shall be used with free egress door hardware. If a fail-safe device is used it must not be hooked up to backup battery power and should have a current limiting device to reduce heat. They should operate on 12V DC power. In-rush current should not exceed one ampere (1A) and holding current should not exceed 500 milliampere (mA). The actuating solenoid should move from the fully secure position to the fully open position in not more than 500 milliseconds (ms). The strike selected should be appropriate for the size and weight of the door and the mechanism should be encased in a hardened guard barrier to deter forced entry.

Electromagnetic locks should be avoided where possible. If required for a specific application, it should contain no moving parts and generate at least 1,200 lbs. (544 kgs) of holding force. It must release in the event of a power failure or fire-alarm and should have no back-up power. It should operate on 12V DC power and contain internal circuitry to eliminate residual magnetism and inductive kickback. It should not dissipate more than 12 watts and the holding current should be no greater than 500mA. It should go from the fully secure to fully released state in no greater than 300ms. The electromagnetic locking mechanism should be encased in a hardened guard barrier to deter forced entry. Installation shall follow the local jurisdiction having authority.

Panic/Holdup Devices

Bell or Alarm boxes should be mounted in a highly visible area high enough to be out of easy reach. The enclosure should be monitored for tampering with a supervised tamper switch.

Panic/Holdup buttons should be Potter momentary buttons (part # HUB-M) wired NO with an EOL resistor at the device.

Door release buttons should be RCI rocker switches (part # 909S-MO) wired NO with an EOL resistor at the device.

Automatic request to exit devices should be motion activated with adjustable detection area, adjustable sensitivity and built in LED indicators. It should have tamper protection, run on 12V DC and have an adjustable relay timer. The device should be wired NO with an EOL resistor at the device.

Wireless panic/holdup receivers should be Visonic (part # mcr-304). When installed the device should be wired to monitor low battery and tamper alarms.

Wireless panic/holdup pendants should be Visonic (part # mct-201-wp).

This is by no means a complete list of all possible devices but covers standard installation products. Specialized products or applications need to be reviewed on a case by case basis.

5. Video Surveillance System

The Region of Durham uses the Digital Watchdog Spectrum Video Management System (VMS), which is a scalable system. The camera load at a specific facility will determine the type and size of recording and control hardware.

All network cable used for the video surveillance system needs to be RED Cat6 FT6 cable labeled at both ends. All connectors should have flexible rubber boots. Excess cable at the head end should be kept to a minimum, with enough cable left for routing and re-terminating if necessary. Coils of spare cable should not be left behind unless specifically requested.

All video network connections should terminate on dedicated video switches. Switch should be DLink DGS-1210-28MP (or most recent model).

The uninterruptable power supply (UPS) installed should be capable of handling the load from the switches and NVR for a period of no less than 30 minutes. The UPS needs to be able to transmit simple mail transfer protocol (SMTP) notification from its own on-board network interface card and be able to have its batteries services while in operation. UPS shall be an Xtreme Power P80 1500VA model with optional simple network management protocol (SNMP) notification card.

Equipment

Head-end equipment (NVR, Switches, UPS, Local Monitors, etc.) should be housed in an appropriately sized lockable rack with proper venting.

All devices shall be programmed with usernames and passwords supplied by the Security Services department. No devices shall have default login and passwords left enabled.

The system will need to record all cameras 24 hours per day, at 10 frames per second for 30 days. The system will also need to handle an additional 50% camera load for future expansion, no system should be installed running at maximum capacity.

Additional Server Requirements

Rack Mount
Windows 10 Pro

150 GB SSD Raid Redundant Operating System Drive
Intel 7 Processor
16 GB Memory
2X gigabit ethernet ports
600 Mbps max video recording rate
Video Outputs – HDMI and DVI

Cameras

- Spot monitors required for up to 16 cameras to be displayed should use the Senstar Thin Clint 10D or equivalent. If more than 16 cameras need to be displayed on a spot monitor an independent client computer should be used.

- Standard interior fixed view camera should be AXIS P3367-V (or most current version), or equivalent running the most recent firmware.

- Standard exterior fixed camera should be AXIS AXISP3367-VE (or most current version), or equivalent running the most recent firmware.

- Standard mid-range exterior fixed camera should be AXIS Q1785-LE (or most current version), or approved equivalent running the most recent firmware.

- Standard long-range exterior fixed camera should be VIVOTEKIZ9361-EH-0103 (or most current version), or approved equivalent running the most recent firmware.

- Standard 180’ fisheye camera should be AXIS P3807PVE (or most recent version), or equivalent running the most recent firmware.

- Standard PTZ camera should be AXIS Q6125LE (or most recent version), or equivalent running the most recent firmware.

- Standard 360’ camera should be AXIS M3057PLVE (or most recent version), or equivalent running the most recent firmware.

Mounting hardware for all exterior cameras needs to be sized appropriately in order to account for maximum wind and ice loads expected at the site.

Cameras should be configured with appropriate annotations. The NVR should be configured with required cameras layouts and any required camera tours.

All cameras should be properly focused and aimed to provide required views.

6. High Security Locks & Keys

The Region of Durham uses the Mul-T-Lock 3-in-1 high security lock system and owns its own patented keyway. The constructor can use one of our authorized lock installers to perform the work or their own certified Mul-T-Lock installer. If they are going to use their own installer the lock and key order has to be authorized by the Security Services Department before Mul-T-Lock will release the product.

The consultant or project manager will provide layout drawings and door hardware schedules to the Security Services Department who will determine the lock coding for each door and keys required (2 per cylinder). An e-mail will be sent to the locksmith and Mul-T-Lock representative, authorizing release of the indicated products.

Once the locksmith receives the keys and hardware, the products will be turned over to Security Services for distribution prior to scheduling the lock installation.

Offices should be keyed to the Region's standard Schlage office key system.

If a high-security key cabinet is required it shall be the Morse Watchmans KeyWatcher Touch system with card reader access control, large cabinet enclosure with enough internal key control modules.

7. Timelines for System Integration and Programming

High security locks and keys from Mul-T-Lock take an average of 8 weeks to arrive once the order has been authorized. Additional distribution and programming of the key database means these items should be **ordered at least 3 months prior to occupancy**.

The security system configuration files from the integrator should be received by Security Services no less than **30 days prior to occupancy** for programming.

Information required for monitoring, including special alarm response instruction and call lists need to be provided to Security Services **no less than 14 days prior to occupancy**.

Network devices need to be active and correctly programmed on site for Security Services to program the systems. Delays due to coordination issues with CS-IT will result in the system not being functional.

8. Project Close Out

Camera views and all security system components must be confirmed by Security Services during project close out. The warranty period for any installed items shall not commence until Security Services has signed the Security Services Installation Checklist, acknowledging security system functionality.

9. Inquiries

For further information regarding this guideline, contact Security Services.

Regional Municipality of Durham
Security Services Guidelines

Title: Physical Protection System Installation Guidelines Checklist	
Checklist #: 1.02	**Page #: 1 (of 4)**
Issued: May xx, 2019	**Revised:**
Responsibility: Facilities Maintenance and Operations	**Section: Security Services**

General Guidelines

Inspection Item	Yes	No	N/A	Notes
Installed products were approved by security	☐	☐	☐	
Newly installed items tied into existing security	☐	☐	☐	
Controllers wired in a neat manner	☐	☐	☐	
Head end cables run at 90 degrees with appropriate restraints	☐	☐	☐	
Cable has appropriate (“FT”) rating for the application	☐	☐	☐	
Cable not in conduit is properly supported	☐	☐	☐	
Cable is installed in accordance with manufacturers specifications	☐	☐	☐	
All devices installed and wired as per manufactures specifications	☐	☐	☐	
All cables run, or holes drilled, through fire separations properly sealed	☐	☐	☐	
Cable outside of data rooms protected from tampering through appropriate protection	☐	☐	☐	
Enclosures properly labeled	☐	☐	☐	
Access ladders protected below 12’	☐	☐	☐	

Inspection Item	Yes	No	N/A	Notes
Access Ladders monitored with contacts	☐	☐	☐	
Area around access ladder clear of other items	☐	☐	☐	
Door hardware is appropriate for the environment	☐	☐	☐	

Access Control and Intrusion System

Inspection Item	Yes	No	N/A	Notes
AC power is hardwired	☐	☐	☐	
AC power is on a dedicated and properly labeled circuit	☐	☐	☐	
Back-up batteries are all 12V 7ah	☐	☐	☐	
Batteries are labeled with the installation date	☐	☐	☐	
Field devices are labelled with zone number or door number	☐	☐	☐	
Testing report from contractor supplied showing all items of the system functional	☐	☐	☐	
Main control panel is Verex Interlogix XL panel with feature expansion board and WW modem	☐	☐	☐	
Connection for programming from RHQ correctly configured and tested	☐	☐	☐	
Site monitoring commissioned and tested, report forwarded to Security Services	☐	☐	☐	
Door control modules are the most recent version	☐	☐	☐	
Point expansion modules are all the most recent version	☐	☐	☐	
Elevator access control installation meets all requirements of the jurisdiction having authority	☐	☐	☐	
Card readers are Interlogix GPROX III with non-proprietary formatting	☐	☐	☐	
Door contacts are installed and wired NO/EOL	☐	☐	☐	

Inspection Item	Yes	No	N/A	Notes
Door contacts on access control doors are wired to the door controller	☐	☐	☐	
Gap distance to trigger door contacts falls within acceptable range	☐	☐	☐	
Overhead door contacts are installed at the top of the door if possible	☐	☐	☐	
Motion detectors are dual tech at a minimum	☐	☐	☐	
Motion detectors are installed to reduce false alarms	☐	☐	☐	
Electric strikes are fail-secure unless otherwise required by the AHJ	☐	☐	☐	
Electric strikes operate on 12V DC	☐	☐	☐	
Electromagnetic locks operate on 12V DC and meet all requirements of the AHJ	☐	☐	☐	
Bell or alarm boxes are out of reach and monitored with a tamper switch	☐	☐	☐	
Panic/holdup buttons are wired NO/EOL	☐	☐	☐	
Door release buttons are wired NO/EOL	☐	☐	☐	
Automated RTE devices are wired NO/EOL with tamper protection	☐	☐	☐	
Wireless devices are configured to transmit low battery and tamper alarms	☐	☐	☐	
Other devices are installed according to manufactures specification with appropriate line supervision	☐	☐	☐	

Video Surveillance

Inspection Item	Yes	No	N/A	Notes
CCTV recorder is a Digital Watchdog Spectrum product	☐	☐	☐	

Inspection Item	Yes	No	N/A	Notes
Network cable is red FT6 CAT6 cable with flexible boots	☐	☐	☐	
Network cables are labeled at both ends	☐	☐	☐	
Head-end video cables terminate on a dedicated video switch	☐	☐	☐	
UPS with SNMP notification card installed	☐	☐	☐	
SNMP function tested through the Region WAN	☐	☐	☐	
CCTV head-end equipment is secured in a lockable rack with proper ventilation	☐	☐	☐	
All default admin passwords for CCTV equipment has been changed and supplied to Security Services	☐	☐	☐	
System has sufficient recording capacity for 10 FPS, 24hrs per day for 30 days with an extra 50% capacity	☐	☐	☐	
CCTV equipment is running the most recent version of their software or firmware	☐	☐	☐	
Cameras are mounted with appropriate hardware to prevent vibration or sway	☐	☐	☐	
All cameras in the system are appropriately named and required camera layouts created	☐	☐	☐	
All cameras focused and aimed correctly	☐	☐	☐	

High Security Locks, Keys and Door Hardware

Inspection Item	Yes	No	N/A	Notes
Mul-T-Lock cylinders installed on all perimeter doors with key access	☐	☐	☐	
Mul-T-Lock cylinders installed on internal non-office doors requiring key access	☐	☐	☐	
Offices are keyed to the Region's standard Schlage office key system	☐	☐	☐	

High-security Morse Watchman's KeyWatcher Touch Keybox installed and programmed on Region WAN	☐	☐	☐	
Perimeter doors and doors leading to secured spaces are appropriately protected against tampering	☐	☐	☐	

Final Sign-Off

When the security contractor and project manager have completed the security systems checklist, forward the signed checklist to Security Services for final inspection. Once Security Services approves the installation, the system is considered commissioned and the warranty period shall start from the date of sign-off.

Security Contractor:	_____	_____	_____
	Name (please print)	Signature	Date (mm/dd/yyyy)
Project Manager:	_____	_____	_____
	Name (please print)	Signature	Date (mm/dd/yyyy)
Security Services:	_____	_____	_____
	Name (please print)	Signature	Date (mm/dd/yyyy)

1 General

1.1 Section includes

.1 This Section specifies requirements for the bonds, insurance and warranty security holdback.

1.2 Reference standards

.1 Appendix B – Supplementary Conditions to CCDC 2 General Conditions

.2 CCDC 2 – General Conditions

1.3 Surety bonds

.1 Provide a performance bond in an amount equal to fifty per cent (50 %) of the tendered price for the faithful performance of the Contract, including all obligations during the warranty period. The warranty period will be extended if known deficiencies are incomplete upon expiration of the two (2) year period. In any case, the performance bond shall continue until the final acceptance certificate has been issued by the Owner in accordance with General Conditions.

.2 Provide a labour and material payment bond in an amount equal to fifty per cent (50 %) of the tendered price for the faithful payment of all labour and materials related to this Contract.

.3 Bonds forms shall be as specified in Appendix B – Supplementary Conditions to CCDC 2 General Conditions.

.4 **Bonds shall not be extended to cover any work beyond the original scope of the Work unless explicitly requested by the Owner.** The Contractor shall not be entitled to claim for bonding on such additional work unless such additional bonding is requested by the Owner. The Owner accepts that all additional work performed by Change Order is not covered by the bonds. The Owner shall not be entitled to a credit related to the bonds if a change in the Work results in a reduction of the Contract Price.

.5 Any contract progress reports issued by the Contractor's surety company must be issued directly to the Owner or Consultant at the address provided.

1.4 Insurance

.1 Provide insurance as required by GC 11.1 of the CCDC 2 General Conditions, as amended by Appendix B – Supplementary Conditions to CCDC 2 General Conditions.

1.5 Warranty security holdback

.1 A warranty security holdback will be retained progressively, commencing on the first payment certificate, from monies that would otherwise be payable to the Contractor, up to a maximum value of $231,000.

.2 The maximum Warranty Security Holdback will be held commencing on the Substantial Performance Payment Certificate.

.3 The Warranty Security Holdback withheld on progress payments prior to the Substantial Performance Payment Certificate will be based on the percentage of work completed up to the end of the payment period for the respective progress payment. For this purpose, the “percentage of work completed” will be calculated based on the original tendered scope of work. Change Orders will not be considered in the calculation of this “percentage of work completed”.

.4 The retained amount is strictly to be used as a warranty security and is in addition to the regular holdback and finishing holdback retained in accordance with the Construction Act, the Contractor's performance bond and any monies withheld due to known incomplete and/or deficient work.

.5 Where Change Orders are issued which increase the final Contract Price, the Owner reserves the right to withhold additional warranty security at the same rate (as is determined by dividing the specified maximum warranty security by the awarded Contract Price) on the value of such additional work. The Owner will notify the Contractor if the Owner intends to invoke this right on any Change Order and payment for any carrying costs on additional warranty security shall be deemed to be included in the respective Change Order.

.6 Except as otherwise provided hereunder, the warranty security, less any deductions made therefrom as provided for in the Contract, shall be released to the Contractor following the issuance by the Owner of the Final Acceptance Certificate at the end of the warranty period.

.7 No substitute form of security will be permitted.

1.6 Basis of payment

.1 Payment for bonds and insurance shall be included in the monthly payment certificate after submission of satisfactory documents.

.2 Payment for all carrying costs associated with the warranty security holdback, including interest thereon, shall be made under this Section on the appropriate line item in the payment certificate. No other compensation for warranty security holdbacks will be considered. Progress payments will be made as follows:

- 25 % on the first progress payment certificate
- 25 % on the Substantial Performance Payment Certificate
- 50 % on the Final Payment Certificate, together with the release of the warranty security holdback at the end of the warranty period, as may be extended in accordance with the Contract.

.3 The sum of prices bid for bonds, insurance and warranty security holdback carrying costs shall not exceed 2 % of the lump sum tendered price.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 This Section specifies requirements for an extension of the Contract warranty period.

1.2 Related requirements

.1 CCDC 2 – 2008 General Conditions

.2 Supplementary Conditions

1.3 Extension of warranty period

.1 Provide extension of warranty period for one (1) additional year (for a total of two (2) years) according to Appendix B – Supplementary Conditions.

1.4 Basis of payment

.1 Payment for this Section shall be made on the Substantial Performance Payment Certificate.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Documents and terminology.

.2 Associated requirements.

.3 Work expectations.

.4 Work by other parties.

.5 Premises usage.

1.2 Related requirements

.1 Section 01 21 13 – Cash Allowances

.2 Section 01 32 00 – Construction Progress Documentation

.3 Section 01 78 00 – Closeout Submittals

.4 CCDC 2 – 2008 – Agreement, Definitions and General Conditions

.5 Appendix B – Supplementary conditions.

1.3 References – words, terms and definitions

.1 Refer to and acknowledge other words, terms, and definitions in CCDC 2 Definitions.

1.4 Complementary documents

.1 Drawings, Specifications, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents which leave doubt as to the intent or meaning, abide by Precedence of Documents article below or obtain direction from the Consultant.

.2 Drawings indicate general location and route of conduit and wire/conductors. Install conduit or wiring/conductors and plumbing piping not shown or indicated diagrammatically in schematic or riser diagrams to provide an operational assembly or system.

.3 Install components to physically conserve headroom, to minimize furring spaces, or obstructions.

.4 Locate devices with primary regard for convenience of operation and usage.

.5 Examine all discipline Drawings, Specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional work beyond work described to be brought to attention of Consultant.

1.5 Location

.1 The Place of the Work is located at 1890 Fifth Concession Road, Pickering Ontario.

.2 The materials and/or services shall be delivered FOB Destination(s), Prepaid.

1.6 Description of the Work

.1 Work of this Contract comprises general construction of a one (1) storey 1,520 m^2 Paramedic Response Station and Training Facility with fifty four (54) parking spaces and an outdoor driver training pad.

.2 Division of the Work among Subcontractors, suppliers and vendors is solely the Contractor's responsibility. Neither the Region of Durham nor Consultant assumes any responsibility to act as an arbiter to establish subcontract terms between sectors or disciplines of work.

.3 Refer to the Drawings and Specifications for the required Work.

.4 Division 01 General Requirements, of the Specification generally specify work and coordination of the work that is the direct responsibility of the Contractor but shall not be interpreted to define absolutely the limits of responsibility that must be established between the Contractor and their Subcontractors by their separate agreements.

.5 Ensure that Subcontractors understand that the General Conditions of the Contract as amended by the Supplementary Conditions, and Division 01 General Requirements, apply to Sections of the Specification governing their work.

.6 Ensure that the work includes all labour, equipment and products required, necessary or normally recognized as necessary for the proper and complete execution of the work of each trade.

.7 The Work also includes the examination of the site, submission of samples, scheduling and coordination, project meetings, protection of the existing facility, repair and preparation of surfaces, quality control, inspection reports, project cleanliness, maintenance of data, preparation of as-built red lines over drawings and specifications, compile inventory of building elements, final cleaning and warranty.

1.7 Contract method

.1 Construct Work under a single CCDC 2, 2008, Stipulated Price Contract as amended by the Supplementary Conditions.

.2 Refer to Section 01 21 13 – Cash Allowances for cash allowance amounts applicable to assignable contracts.

.3 Assume responsibility for assigned contracts as Subcontracts forming part of the Work.

.4 Contract Documents were prepared by the Region of Durham. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The Region accepts no responsibility for damages, suffered by any third party as a result of decisions made or actions based on the Contract Documents.

1.8 Documents provided

.1 Owner will supply the Contractor with additional sets of Contract Documents for construction purposes. Refer to Supplementary Conditions for number of copies to be provided.

1.9 Performance of the Work

.1 Refer to Appendix B – Supplementary Conditions for the Contract Time.

1.10 Discrepancies and clarifications

.1 Advise Consultant of discrepancies discovered in requirements of the Contract Documents and request clarification from Consultant in written form.

.2 Advise Consultant when clarifications are required pertaining to meaning or intent of requirements of Contract Documents and request clarification from Consultant in written form.

.3 Do not proceed with related work until written clarification is provided by Consultant.

.4 Failure to notify Consultant shall result in Contractor incurring responsibility for resulting deficiencies and expense at no additional cost to the Owner.

.5 Written instructions issued by Consultant for clarification, implicitly supersede applicable and relevant aspects of the Contract Documents irrespective of whether these documents are explicitly or specifically cited in clarification requests or clarification instructions.

1.11 Work performed under separate contracts

.1 Work not to be included in the Contract, as noted "NIC" or “By Others” on the Drawings, shall be governed by GC 3.2, Construction by Owner and Other Contractors, of the General Conditions.

1.12 Work by Owner

.1 Permit the Owner and/or their other contractors to inspect the work at any reasonable time, and to perform such work and install such equipment as the Owner may require.

.2 Items include:

.1 IT Network Equipment

.2 Phones

1.13 Items supplied by Owner

.1 Certain items will be supplied by the Owner for installation in, and as part of, the Work. Refer to the relevant technical specification for installation of such items.

.2 Install items supplied by Owner during the Work.

.3 Coordinate shipping with the Owner. Items supplied by the Owner will be made available from the Owner’s storage facility located in proximity to the Place of the Work. Contractor to arrange and pay cost of pick-up and

shipping to the Place of the Work. Location of Owner's storage facility may change through the course of the Work to another nearby facility.

.4 Store items supplied by Owner at the Place of the Work and protect from damage in the same manner as items supplied by the Contractor.

.5 Install completely, and leave in full operating condition, in accordance with manufacturer's directions.

.6 Items to be supplied by the Owner for installation by the Contractor as part of the Work include:

.1 Kitchen Appliances – Stoves, Microwaves, Refrigerators, and Dishwasher.

.2 TV's.

.3 Wireless-access points.

1.14 Basis of payment

.1 All payment for the Work of the Contract shall be included, properly balanced, in other Sections in Appendix C – Pricing Form as agreed by the Owner prior to commencing the Work.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Owner access.

.2 Contractor's use of site.

.3 Connecting to existing services.

.4 Site access.

.5 Continuity of existing service.

.6 Working hours.

1.2 Related requirements

.1 Section 01 32 00 – Construction Progress Documentation

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 50 00 – Temporary Facilities and Controls

.4 Section 01 53 00 – Temporary Construction

.5 Section 01 55 00 – Vehicular Access and Parking

.6 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Owner access

.1 The building and parking areas, which are not immediately affected by the Work, will remain occupied by the Owner during the Work.

.2 Ensure adequate access to areas not occupied for the Work.

1.4 Contractor's use of site

.1 Accept full responsibility of assigned work and storage areas from the time of Contract award until completion of the Work.

.2 Do not unreasonably encumber site with materials or equipment.

.3 Use of site is limited to areas within the property line.

.4 Do not obstruct entrances, stairs or fire exits.

.5 Do not prop open any doors.

.6 Maintain free access route for emergency vehicles, waste disposal trucks and delivery vehicles.

.7 Provide for all vehicular and pedestrian traffic.

.8 The placement of a refuse bin will be allowed in an area agreed by the Owner.

.9 Repair all damage to paving, grass, walkways, curbs, trees, planting beds, and any other areas, caused by the Contractor's operations.

1.5 Site access by Contractor

.1 Unless stated otherwise, the Contractor will be permitted access to the site from start of construction until Substantial Performance of the Contract.

.2 Access Roads and Walks:

.1 All construction vehicles and personnel required for construction shall use existing access roads and walks as indicated on drawings. When no longer required, or at completion of Work, make good all disturbed surfaces. Maintain roads and walks, removing dirt, mud, debris, ice, snow and other obstructions during use.

.2 Repair and maintain public roads and access at no cost to the Owner.

.3 Provide for access of emergency vehicles at all times.

.3 After Substantial Performance of the Contract, the Contractor shall not enter the facility without prior written authorization from the Owner and the Contractor's activities shall be restricted to the work duly authorized by the Owner, including modifications and rectification of deficiencies. If the Contractor proposes to perform additional work other than the authorized work, further written approval must be obtained by the Contractor from the Owner prior to proceeding with such additional work.

.4 Workers employed on the site shall sign a "Daily Register" provided showing "IN" and "OUT" times and number of hours worked on each shift. Times shall be recorded in 24-hour time (i.e. 00:00 to 23:59).

.5 All Contractor's workers employed on site shall be orientated by the facility operator prior to start of work.

1.6 Working hours

.1 Carry out Work between the hours of 7:00 a.m. and 5:00 p.m. local time, Monday through Friday except statutory holidays.

.2 If the Contractor wishes to complete any work outside of these regular hours, obtain permission from the facility operator through the Owner at least forty eight (48) hours prior.

.3 The Owner will not be responsible for additional costs associated with working after regular hours unless such after-hours work is ordered by the Owner and not specified as a requirement in the Contract Documents.

.4 The Owner will not be responsible for additional costs associated with working after regular hours if such after-hours work is required for the Contractor to return to the agreed upon construction schedule.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Review and coordination of electronic databases with associated Contract Documents.

1.2 Definitions

.1 Revit, by Autodesk: Refers to the proprietary computer aided drafting (CAD) software used by the Consultant to generate the 2-dimensional (2D) or 3-dimensional (3D) virtual model, and generate the image drawings, that together represent a portion of the Work of the Contract Documents.

.2 Model Database: An electronic file containing three-dimensional geometry data, and may contain data about the building elements they represent and their required or actual properties. The model database represents a virtual model of the project.

.3 Constructor: Refers to Construction Manager and applicable subcontractors whose Work are represented by aspects and elements included in the Model Database.

.4 Element: Refers to a portion or component of the Work. Elements relate primarily to overall geometric forms of the facility as represented. Elements are identified consistently in Model Databases.

.5 Face: Refers to a single plane in three-dimensional space, and whose perimeter shape is defined in the remaining two dimensions.

1.3 Submittals

.1 Submit to consultant a monthly update in full sized PDF drawings red-line indicating updates and as built condition which differ from Contract Documents, and incorporating any changes in the Work submitted during that time period.

.2 Update facility data matrix with each monthly submission. Final facility data matrix must be submitted 30 days prior to substantial completion.

1.4 Site work

.1 The Contract Documents depict the existing building conditions as observed and as indicated on documents provided to the Consultant by the Owner.

.1 Before starting the Work, Constructor to verify that existing conditions match those depicted in the Contract Documents.

.2 Notify the Consultant upon discovery, if discrepancies are present.

.2 Consultant has established an origin in space for referencing the two dimensional and three dimensional Contract Documents representations.

.1 Project grid and associated work points are measured from these origin points.

.2 Transmit electronic data to and from Consultant using the “origin to origin” option in Revit.

.3 Establish elevations, levels, perimeters and control points based on the origin point by utilizing standard engineering survey practices.

.4 Additional site control points may be established to complement the origin point, at the discretion of the Constructor and field surveyor.

.5 Protect control points through duration of construction.

1.5 Review of model database and contract documents

.1 Before starting the Work, Constructors shall jointly perform thorough reviews of the Contract Documents to assess the quality and accuracy of the prepared documents, the coordination between Contract Documents, and logic of construction sequencing necessary to further detail and construct the Work:

.1 After joint reviews by Constructors, perform separate and subsequent joint reviews with the Consultant.

.2 Identify known or potential problems in the Contract Documents, such as conflicts or omissions that may impact construction cost or schedule.

.3 Report the results of reviews to Consultant in writing, prior to proceeding with the Work. The Consultant will review the report

and respond in writing to the Constructor, issuing an approval to proceed.

.4 Follow-up review meetings are necessary between Constructors, Owner and Consultant to resolve design issues.

.5 Failure to perform this document review process indicates acceptance of the quality, accuracy and completeness of the Contract Documents.

.2 Contract Documents have been created using modelling software for the Model Database and the two-dimensional drawings respectively.

.1 Perform reviews and ongoing construction administration utilizing the same software to ensure that building information is conveyed and implemented accurately.

.2 Consultant cannot guarantee that translation of Contract Document files into other software formats will be error free. Should translation of files be required, only current version IGES file format will be provided.

.3 All such translation is the responsibility of the Constructor unless agreed otherwise.

.4 Two dimensional drawings shall take precedence over model data base.

1.6 Ownership and use

.1 Ownership of Data: Model database, two dimensional drawing files, electronic media, electronic forms and associated stored representations are subject to terms and conditions for use of the Consultant's documentary representation of the Work.

.2 Constructors recognize that information stored on electronic media, such as computer CD or DVD disc, may be subject to uncontrollable deterioration or loss. Constructors agree that the Consultant shall not be liable for the completeness or accuracy of any information provided on electronic media.

.1 Model Database and other Contract Documents complement each other.

.2 Hard copy documents together with electronic data files will form the basis of the Work.

.3 In the event of a conflict, hardcopy documents take precedence over Model Database.

.3 Upon request and receipt of payment, Consultant-prepared Model Database will be selectively distributed as part of the Contract Documents after contract award. Refer to Drawings for description of file naming and organization of data.

.4 The use of the Model Database by Constructors is limited to the following:

.1 Establishing project reference origin point of (0,0,0) at the Project site.

.2 Establishing scope of project elements represented.

.3 Defining geometric parameters of elements represented.

.4 Coordinating the two dimensional drawings with the elements represented.

.5 Referencing the intent of Consultant's design for development and coordination of elements related or adjacent to the work.

.6 Preparing facility data collection.

.5 Constructors agree to the following by use of the Model Database:

.1 Authorized Use of Model Database: Consultant grants the Constructor the non-exclusive right to use the Model Database for the Project in accordance with these conditions. Use the Model Database for establishing geometries of represented surfaces, objects and elements and their relationship to work points established in associated Contract Documents as part of this Project.

.2 Constructors, their respective agents or representatives shall not be entitled to rely on the detail or specifications contained in the Model Database for any other purpose.

.3 Constructors acknowledge:

.1 the limited completeness of data in the Model Database,

.2 that this data is intended to supplement other Contract Documents, and

.3 that the Model Database may require further engineering by the contracted fabricator or other constructor,

.4 for fabrication or erection purposes. The Model Database will also be used to represent the Project Record Documents upon completion, and may be used in future for facility maintenance or future additions.

.4 Unauthorized Use of Model Database: This database shall not be used by Constructors, or transferred to any other party, for use in other projects, additions to the current project, or any other purpose for which the material is not strictly intended by the Consultant, without Consultant's express written permission. Any unauthorized modification or reuse of the material shall be at the Constructor's sole risk, and Constructors shall cause their subcontractors having access to Model Database media to agree to defend, indemnify and hold the Consultant harmless, from all claims, injuries, damages, loses, expenses, and legal fees arising out of the unauthorized modification or use of these materials.

.5 Model database prepared by the Consultant is provided solely as an instrument of the Consultant's service and is protected by applicable laws. By delivering the Model database to Constructors, the Consultant shall not expand in any manner, the scope of services for which each was engaged pursuant to its Agreement with the Owner, or in any manner alter the division of responsibilities between the Consultant, Constructors and Owner, as defined in their respective Agreements.

.6 Constructor's Coordination Requirements: Before using the information contained in the Model Database for the development of Constructor's engineering and shop drawings, the Constructor shall:

.1 Review and verify conditions, dimensions and data in Model Database prior to the development of shop fabrication drawings, layout drawings, numerically controlled fabrication equipment, or other applications which define, control or regulate the fabrication and erection of project components. Further explanation of elements in the Model Database files are included on 2D drawings.

.2 Take all reasonable measures to prevent unauthorized access or copy or loss of this Model Database.

.3 Maintain independent records of modifications to Model Database which may be processed by Constructor or their employees and agents.

.4 Cause subcontractors to be solely and exclusively responsible for the accuracy and adequacy of all subsequent Model Database data, computer models or other electronic media developed by such subcontractors.

.5 Take appropriate action by way of instruction, with subcontractors, employees and agents who have access to Model Database, to ensure compliance with these conditions.

.6 Others whose work is represented or closely associated with the coordination of exterior enclosure work, will require that copies of Constructors generated model data, computer models or other electronic media be made to the Consultant for review, prior to beginning fabrication operations. Information required is in addition to and submitted with required shop drawing submittals.

.7 By using the Model Database, Constructors also agree to the following conditions:

.1 Verify locations of critical elements during and after installation and record items that vary from the Model Database. Refer to requirements of Section 01 78 00 – Closeout Submittals.

.2 Import data for control points, surfaces and lines of fabricated and installed Work into Model Database.

.3 Copy data files to Consultant and Owner, on substantial completion of the assigned Work. Coordinate with Section 01 78 00 – Closeout Submittals.

.8 Information stored in the Model Database can conceivably be modified by other parties, intentionally or otherwise, without notice or indication. Consultant reserves the right to remove all indication of its ownership or involvement in the Model Database from each

electronic medium not held in its possession. The Consultant does not convey, nor do Constructors obtain any right, title, or interest in the Model Database developed by the Consultant.

1.7 Facility asset data collection

.1 Consultant shall provide Contractor with a spreadsheet template showing rows of assets and columns of assets attributes. Contractor shall be responsible for filling in asset information required for the fields which are assigned under the Contractor's responsibility.

.2 At agreed upon milestones (generally, in accordance with defined milestones based on the Contractor's construction schedule) Contractor shall provide incremental submissions of data to Consultant in the prescribed formats for the asset types indicated in the asset Matrix provided by Owner.

.1 With each submission, Contractor shall provide supporting information describing assets installed. This includes, but is not limited to, Product Data Sheets, Shop Drawings, Warranty information, maintenance data and other similar information as required to support Owner's facility management objectives.

.2 Contractor shall notify Consultant promptly of any modification to installed assets performed after installation and Provide revised documentation to ensure Consultant can update Building Information Model as necessary.

.3 Contractor and Consultant shall jointly coordinate an effective methodology for collecting, tracking and assembling the required data.

.1 Contractor shall confirm subcontractors' integration of the requirement, identify the parties responsible for collection, tracking and assembly of all required data, and explain their quality control process to ensure the accuracy of the data provided.

.2 The Contractor shall ensure all assets are represented and the data provided is accurate and in the required format.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Cash allowances.

1.2 Cash allowances

.1 Consultant Responsibilities:

- .1 Consult with Contractor for consideration and selection of Products, suppliers, and installers.
- .2 Owner and Consultant to select Products.
- .3 Prepare Change Order.

.2 Contractor Responsibilities:

- .1 Assist Consultant in selection of Products, suppliers and installers.
- .2 Obtain proposals from suppliers and installers and offer recommendations.
- .3 On notification of selection by Consultant or Owner, execute purchase agreement with designated supplier and installer.
- .4 Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
- .5 Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

.3 Supply-only cash allowances shall include:

- .1 Net cost of products
- .2 Delivery to Site
- .3 Applicable taxes and duties, excluding HST
- .4 Supply and install cash allowances shall include:
  - .1 Net cost of Products
  - .2 Delivery to Site
  - .3 Unloading, storing, handling or Products on Site
  - .4 Installation, finishing and commissioning of Products
  - .5 Applicable taxes and duties, excluding HST
- .5 Inspection and testing allowances shall include:

.1 Net cost of inspection and testing services

.2 Applicable taxes and duties, excluding HST

.4 Include cash allowances in the Contract Price. Differences in costs will be adjusted by Change Order.

.5 The following schedule will assist in defining each allowance and what the amount applies to. Coordinate such statements with specifications prepared by other consultants and thoroughly coordinate - cite cash allowance amounts only in this section - do NOT cite them in other specification sections. Have these other spec sections reference this section.

.6 Allowances Schedule:

.1 Related to Section 01 45 00 – Quality Control: Include a cash allowance of $ 75,000 for purchase and delivery of Inspection and Testing as referenced in the Sections, but are not limited to,

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 05 12 23 – Structural Steel for Buildings

.3 Geotechnical Inspection and Testing

.2 Related to Section 28 31 00 – Fire Alarm System: Include a cash allowance of $15,000 for fire alarm verification as required under Section 28 31 00 – Fire Alarm System.

.3 Related Section 26 05 05 – Basic Materials and Methods, 2.22 Electric Vehicle Chargers: Include a cash allowance of $20,000 to provide equipment and installation of the complete system.

1.3 Use of cash allowances

.1 Expenditures against cash allowance will be made only upon receipt of written authority from the Owner.

.2 No expenditure against a cash allowance shall be made or incurred except as instructed by the Owner in writing.

.3 Submit copies of all invoices for labour, materials and equipment to the Owner to substantiate charges against the allowances.

.4 Any unused portion of cash allowances will be credited to the Region upon completion of the Work.

.5 The cash allowances do not include Harmonized Sales Tax (HST).

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Substitutions

.1 Base the work of this Contract and the Contract Price using new materials and products specified.

.2 Where materials and products are specified only by reference to standards, provide any materials or products which meet the standard.

.3 Where materials or products are specified by trade name and a referenced standard, the material or product selected shall also meet the standard.

.4 Where materials and products are specified by naming one product, substitutions will not be considered unless the Owner has accepted an alternative prior to Contract signing.

.5 Where materials or products are specified by naming more than one material or product, provide any one of the specified materials or products.

.6 Where the Specifications include "or approved alternate" or similar clause, substitutions proposed will be considered only under the following conditions:

.1 If the materials and products specified are not available; or

.2 If substitute materials and products to those specified, which are considered by the Consultant as equivalent or superior to those specified in performance and meeting the design intent, will not increase the Contract Price and Contract Time; or

.3 If a material or product is specified together with a requirement for performance and, in the opinion of the Contractor, the specified material or product will not produce the required results.

.7 With request for substitution include:

.1 Complete data substantiating compliance of the proposed substitute with contract requirements.

.2 For Products: Product identification, including manufacturer's name and address; manufacturer's literature, including product description, performance and test data, reference standards, and

limitation, samples, if appearance is relevant; names and addresses of similar projects where the product has been used.

.3 For Construction Methods: Detailed description of the proposed method, and drawings illustrating it.

.4 Itemized comparison of proposed substitution with product or method specified.

.5 Data relating to changes in construction schedule.

.6 Quotation for change in contract sum if substitution is approved.

.8 In submitting a request for substitution, the Contractor represents:

.1 That the Contract has investigated the proposal and (unless the proposal explicitly states otherwise) determined that it is equal or superior to the product or method specified;

.2 That the same warranty will be furnished for the substitute as for the original;

.3 That the Contractor will co-ordinate installation of the accepted substitute into the work, making such changes in the Work as may be required to accommodate the change;

.4 That the Contractor will bear and waives all claims for additional compensation for costs which subsequently become apparent arising out of the substitution; and

.5 That the quotation is complete and includes all related costs.

.9 Substitutions will not be considered which are implicit in submitted shop drawings or samples rather than formally presented proposals as described above.

.10 Substitutions will not be considered which require substantial changes to the Contract Documents.

.11 Requests for substitutions prior to date set for receipt of bids will not be accepted.

.12 There is no obligation on the part of the Consultant or Owner to accept proposed substitutions.

1.2 Substitutions - code requirements

.1 Ensure that proposed substitutions for materials, products, methods and processes meet the requirements of the building code, and authorities having jurisdiction.

.2 Ensure that proposed substitute materials, products, methods and processes do not negate the compliance of adjacent materials, products and constructions with the requirements of the applicable building code and other requirements of authorities having jurisdiction, to which the proposed substitutions may be applied or attached.

.3 Obtain written approval of proposed substitutions from the authority having jurisdiction and submit the approval with the proposed substitution for the Consultant's consideration.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Request for interpretation - RFI

.1 A request for interpretation (RFI) is a formal process used during the Work to obtain an interpretation of the Contract Documents.

.2 Submittal procedures:

.1 RFI form:

.1 Submit RFI on “Request for Interpretation” form, appended to this section. The Consultant shall not respond to an RFI except as submitted on this form.

.2 Where RFI form does not provide sufficient space for complete information to be provided thereon, attach additional sheets as required.

.3 Submit with RFI form necessary supporting documentation.

.2 RFI log:

.1 Maintain log of RFIs sent to and responses received from the Consultant, complete with corresponding dates.

.2 Submit updated log of RFIs with each progress draw submittal.

.3 Submit RFIs sufficiently in advance of affected parts of the Work so as not to cause delay in the performance of the Work. Costs resulting from failure to do this will not be paid by the Owner.

.4 RFIs shall be submitted only to the Consultant.

.5 RFIs shall be submitted only by Contractor. RFIs submitted by Subcontractors or Suppliers shall not be accepted.

.6 Number RFIs consecutively in one sequence in order submitted.

.7 Submit one distinct RFI per RFI form.

.8 Consultant shall review RFIs from the Contractor submitted in accordance with this section, with the following understandings:

.1 Consultant’s response shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Price or Contract Time or changes in the Work.

.2 Only the Consultant shall respond to RFIs. Responses to RFIs received from entities other than the Consultant shall not be considered.

.9 Allow ten (10) Working Days for review of each RFI by the Consultant.

.1 Consultant's review of RFI commences on date of receipt by the Consultant of RFI submittal and extends to date RFI returned by Consultant.

.2 When the RFI submittal is received by Consultant before noon, review period commences that day; when RFI submittal is received by Consultant after noon, review period begins on the next Working Day.

.10 Contractor shall satisfy itself that an RFI is warranted by undertaking a thorough review of the Contract Documents to determine that the claim, dispute, or other matters in question relating to the performance of the Work or the interpretation of the Contract Documents cannot be resolved by direct reference to the Contract Documents. Contractor shall describe in detail this review on the RFI form as part of the RFI submission. RFI submittals that lack such detailed review description, or where the detail provided is, in the opinion of the Consultant, insufficient, shall not be reviewed by the Consultant and shall be rejected.

2 Products – not used

3 Execution – not used

End of section

Contractor's Requests for Interpretation (1 of 2)
Contractor's Supplemental Instructions

Date	No. of Pages
To	From
Co.	Co.
Phone #	Phone #
Fax #	Fax #

Project: _____ **RFI No.:** _____

Owner: _____ **Date of Request:** _____

To: _____ **Contractor:** _____

(Consultant's Representative)

Project No.: _____ **Contractor's Representative:** _____

Consultant's Fax No.: _____ **Fax No.:** _____

Interpretation Requested: (Description of request for interpretation and references to relevant portions of Contract Documents)

Attachements: _____

Requested by: _____

Contractor's Requests for Interpretation (2 of 2)

Consultant's Supplemental Instruction:

Attachements: _____

Reply by: _____

The work shall be carried out in accordance with these Supplemental Instructions issued in accordance with the Contract Documents without change in Contract Price or Contract Time. Prior to proceeding with these instructions, indicate accemptance of these instructions as being consistent with the Contract Documents by returning a signed copy to the Consultant.

Supplemental Instruction Issued:	**Supplemental Instruction Accepted:**
By: _____	**By:** _____
Consultant **Date**	**Contractor** **Date**

Cc: ☐ **Owner** ☐ **Consultant** ☐ **Contractor** ☐ **Field** ☐ **Other:** _____

1 General

1.1 Changes in the work

.1 The following shall govern changes in the work.

.2 Written instructions, with or without revised Drawings, or drawings additional to the Contract Documents, or both will be issued to the Contractor for proposed changes in the work. The written instructions will indicate whether the changes in the work are to be performed immediately or after the cost of changes is agreed upon. Work which is to proceed immediately shall have a mutual agreed to budget figure where applicable.

.3 The Contractor shall submit his quotation within ten (10) working days with full documentation for the changes in a detailed breakdown as determined by the Consultant as will allow the Consultant to ascertain the accuracy of amounts involved.

.4 The Contractor shall review all cost submissions to ensure their accuracy and/or conformance to unit costs if applicable prior to submission to the Consultant.

.5 In the event of a change to the work carried out by the Contractor's own forces plus the total amount for extras will include the cost, plus 10 % for the Contractor's supervision, overhead expenses and profit on additional work by his own forces only after all credits for each item included in the change order have been deducted. The Contractor's mark-up for such subtrade work shall be 5 %.

.6 In the event of a change to the work carried out by Subcontractors where the Contractor submits quotations from his Subcontractors, the Consultant reserves the right to call for detailed breakdowns including material invoices and labour time sheets. The Subcontractors will be permitted to add no more than 10 % for overhead and profit on additional work only after all credits for each item included in the change orders have been deducted. The Contractor's mark-up for such subtrade work shall be 5 %.

.1 The Contractor shall inform all his subcontractors of these terms.

.7 Overhead for changes in the work shall include all indirect costs, but not restricted to, site superintendence, subtrade attendance, plant and equipment, including operators, site offices, storage compounds, cleaning

and the like; first aid; timekeeping; security; all temporary services; office administration; processing correspondence, changes, shop drawings and the like; costing and accounting; payroll; technical staff, building permit and statutory fees; insurance and bonds; scheduling.

.8 Profit for changes in the work is the remuneration to the Contractor and the Subcontractors and is to apply to the sum of the actual cost and overhead.

.9 Where provided for, unit prices for additions and deletions to the work shall be those as approved by the Owner. Unit prices include all overhead and profit changes.

.10 Where the Contractor or any Subcontractor proceeds with any change on a time and material basis, daily time sheets and material slips shall be submitted. The application for a final change order must be accompanied by these time sheets, materials slips, and a breakdown.

.11 Where the Owner and Contractor cannot mutually agree upon the cost or evaluation of a given change, the Contractor, upon receiving written directions from the Owner, shall proceed with the required change without delaying the work and the evaluation of the change will be submitted for arbitration at the completion of the Project.

.12 Owner and Consultant shall have twenty one (21) working days in which to review and approve Contractor's quotations for changes to the work.

.13 The Consultants at time to time may issue job instructions solely for the purposes of clarifying drawings and specifications. As such Contractor shall not be permitted to apply costs against these job instructions.

.14 In the event of large scope changes, the Contractor and Subcontractors agree to negotiate the unit prices to a lesser amount than those previously tendered.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Special procedures for progress payments on Region of Durham Tenders.

1.2 Related requirements

.1 Appendix B – Supplementary Conditions to Stipulated Price Contract CCDC 2 - 2008

.2 Section 01 33 00 – Submittal Procedures

.3 Construction Act

1.3 Construction Act Holdback

.1 In accordance with the Construction Act, a 10 % holdback will be deducted from each progress payment.

.2 The Owner shall have the right to withhold the 10 % Construction Act regular and finishing holdbacks until the Owner is in receipt of the submissions specified in Section 01 33 00 – Submittal Procedures, Articles 3.1.1.3 (submissions at Substantial Performance) and 3.1.1.4 (submissions at Completion) as applicable.

1.4 Submission of Proper Invoices for payment

.1 In accordance with Appendix B – Supplementary Conditions, applications for payment shall be preceded by a payment review meeting to be held no less than five (5) calendar days before the end of the monthly payment period.

.2 In accordance with Appendix B – Supplementary Conditions, email draft invoices to the Consultant and the Owner at least one (1) business day prior to the scheduled monthly payment review meeting.

.3 At the payment review meeting, review with Owner and Consultant the Contractor’s draft invoice, status of Change Orders and Change Directives, holdbacks and net amount due for that billing period.

.4 Consultant and Owner will provide a marked-up copy of the Contractor’s draft invoice within five (5) business days of the payment review meeting.

.5 **Submit Proper Invoice by email to the Consultant and the Owner's Project Manager, Mr. Sameh George and Contract Services Coordinator, Ms. Janeete Cornier** for processing no earlier than seven (7) calendar days after the end of the billing period. **Do not mail a hardcopy**. Ensure Proper Invoice complies with all requirements detailed in Appendix B – Supplementary Conditions. Email title shall include "**URGENT – PROGRESS PAYMENT REQUEST for Contract T-1160-2021**" and be marked as High Priority.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 This Section includes administrative provisions for coordinating construction operations including, but not limited to, the following:

.1 General project coordination procedures

.2 Coordination of Drawings

.3 Administrative and supervisory personnel

.2 Each Subcontractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to specific Subcontractors by Contractor.

1.2 Related requirements

.1 Section 01 31 14 – Interference and Coordination Drawings

.2 Section 01 32 00 – Construction Progress Documentation

.3 Section 01 33 00 – Submittal Procedures

.4 Section 01 45 00 – Quality Control

.5 Section 01 78 00 – Closeout Submittals

.6 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Administrative requirements

.1 General Coordination: Coordination that generally applies to all components of the Contract Documents as follows:

.1 Subcontractor shall coordinate construction activities as required with Contractor's Schedule to ensure efficient and orderly installation of each part of Work.

.2 Subcontractors shall notify Contractor where the Subcontractor's installation of one part of Work is dependent on installation of other components.

.3 Schedule and coordinate construction activities of other Subcontractors in sequence required to obtain best results. Where availability of space is limited, Subcontractor shall coordinate

installation of different components to assure maximum accessibility for required maintenance, service, and repair.

.4 Subcontractors shall make adequate provisions to accommodate items scheduled for later installation by other Subcontractors, under separate contract or by Contractor's own forces.

1.4 Quality assurance

.1 Designate an on-site party responsible for instructing workers and overseeing the environmental goals for the project.

.2 Review environmental procedures and status of Waste Management Plan and Environmental Protection Plan at each construction meeting.

1.5 Existing site conditions

.1 Existing construction shown has been taken from available information. When specific details are unavailable, assumptions have been made regarding probable construction. Any variance from construction, as shown on the Drawings shall be immediately brought to the attention to the Owner.

.2 Make careful examination of the site and investigate and be satisfied as to all matters relating to the nature of the Work to be undertaken.

.3 Check all site dimensions prior to fabrication of materials and construction.

.4 Report any inconsistencies, discrepancies, omissions and errors between site conditions and Contract Documents to the Consultant prior to the commencement of Work.

.5 Ensure that each Subcontractor performing work related to the site conditions has examined the site so that all are fully informed on anything which may affect their Work thereon in order that construction proceeds competently and expeditiously.

1.6 Coordination

.1 Cooperate with the Owner's representatives at the Place of the Work to minimize disruptions to the building operation and services.

.2 Coordinate with the Owner's representative regarding access and use of site.

.3 Coordinate performance and sequencing of the Work with the Owner.

1.7 Submittals

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide interference and coordination drawings in accordance with Section 01 31 14 – Interference and Coordination Drawings.

1.8 Dimensions

.1 Do not scale directly from Drawings. Obtain clarification from the Consultant if there is ambiguity or lack of information.

.2 Details and measurements of any Work which is to fit or to conform with Work installed shall be taken at the Place of the Work.

.3 Verify dimensions at the Place of the Work before commencing Shop Drawings or other submittals. Before fabrication commences report discrepancies to the Consultant in writing. Incorporate accepted variances on Shop Drawings and as-built records.

.4 In areas where equipment is scheduled to be installed, check dimensional data on equipment to ensure that the area and equipment, including future known equipment are compatible with necessary access and clearances provided. Equipment supplied shall be dimensionally suitable for space allocation.

.5 Verify that the Work is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent Work, as set out in accordance with the requirements of the Contract Documents and ensure that Work installed in error is rectified at Contractor's expense before construction continues.

.6 Owner will accept no claims for extra expense on the part of the Contractor for non-compliance.

1.9 Supervision of the work

.1 Provide all superintendence, labour, equipment, and materials necessary to complete the project in an orderly, competent, and expeditious manner.

.2 While work is in progress, maintain site superintendence capable of acting competently on-site instructions given by the Owner.

.3 Maintain good order and discipline among workers engaged on the project.

1.10 Maintenance of documents on site

.1 Maintain at the job site, one (1) copy of each of following:

.1 Drawings

.2 Specifications

.3 Addenda

.4 Change Orders and Change Directives

.5 Shop Drawings and samples

.6 Other modifications to the Contract

.7 Site instructions

.8 Copy of approved work schedule

.9 Copy of manufacturer's installation instructions

.10 SDS sheets

.11 Contractor's health and safety policy

.12 Ministry of Labour Notice of Project

.13 Building permit

.2 Maintain documents in a clean, dry, legible condition and make documents available at all times for inspection by the Owner

1.11 Security and protection of construction site and equipment

.1 Protect the construction site and equipment from damage. Repair any damage to the construction site or equipment to the satisfaction of the Owner.

.2 Take precautions to protect the site and equipment until Completion.

.3 The Owner shall not be responsible for damaged, lost or stolen materials and equipment. Contractor is responsible for all materials and equipment left on site until the work is complete. Provide for proper security or storage of any material or equipment left on site.

.4 When not at the Place of the Work, ensure that the work area is secured, and that all tools and materials are locked up.

1.12 Existing utilities

.1 Protect all utilities at the Place of the Work for the duration of the work.

.2 Maintain all existing services including power and data to the entire building and occupied areas of the suites used by the Region. Any and all shutdowns or disruptions in service are to be approved by the Owner or building Owner.

.3 Have all utilities located and staked out and provide the Owner with all cable locations supplied by the utilities prior to commencing any excavation or demolition.

.4 Contact the local municipality, utilities or any other agencies for further information regarding the exact location of all existing utilities, to exercise the necessary care in excavation and demolition operations, and to take such precautions necessary to safeguard the utilities from damage.

.5 All utilities located within the limits of proposed excavations shall be exposed by hand excavation and carefully supported and protected by the Contractor.

.6 Removal, relocation, or supporting of existing utilities shall be carried out in consultation with the respective authorities:

.1 Bell Canada

.2 Elexicon Energy

.3 Enbridge Gas

.4 any other utility/contractor as required.

.7 Be responsible for paying charges by the Utilities or Agencies for locating cables and the Contractor shall pay any charges for repairs and lost revenue if utility equipment, cables, pipes or other assets are damaged and is responsible to make good any ground and surface damages as well.

.8 Prior to the commencement of demolition, provide a sign-off sheet from the existing water, gas, electrical, telephone, and sewer service providers.

.9 Verify that services are cut off, capped, diverted and/or removed as required by local regulating authorities. Ensure all services are in the proper state prior to commencing work.

.10 Ensure all utilities are capped off at the property line and identify the termination locations on reference drawings.

.11 No claims will be considered which are based on delays or inconvenience resulting from the removal or relocation of services not being completed before the start of this Contract.

1.13 Contact for after-hours or emergency services

.1 When after-hours work is permitted by the Owner, provide an after-hours phone or pager number to respond to emergencies or requirements that arise when offices are closed.

1.14 Road occupancy restrictions

.1 Obtain and pay for Road Occupancy Permits from the applicable road authorities required prior to any works being undertaken within a public road allowance.

.2 Do not close any lanes of road without prior approval of Owner and authorities having jurisdiction. Submit written request to Owner, including relevant information and details of closure requirements, a minimum of seven (7) days in advance of the date when road closure is required.

.3 Apply for and obtain a temporary street occupation permit sufficiently in advance of the required road closures so as to cause no delay in the progress of the Work.

.4 Costs for any delays in the Work caused as a result of failure to obtain the necessary road closure permits shall be borne by the Contractor at no increase in either the Contract Price or the Contract Time.

.5 The Owner reserves the right to not accept any personnel proposed by the Contractor or its Subcontractor(s) where a signed NDA form has been requested but not provided.

1.15 Signs and identification

.1 Display no signs or advertisements without the Owner's approval. When signs are permitted, maintain signs in good condition during the Work and remove signs as directed by the Owner upon completion of the Work.

2 Products – not used

3 Execution

3.1 Coordination

.1 Coordinate all construction operations to verify efficient and orderly installation of each part of Work.

.2 Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation with Subcontractors.

.3 Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.

.4 Coordinate installation of different components with Subcontractors to verify maximum accessibility for required maintenance, service, and repair.

.5 Make adequate provisions to accommodate items scheduled for later installation.

.6 Prepare memoranda where necessary, for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

.7 Prepare similar memoranda for Owner where coordination of Owner-installed Work is required.

.8 Ensure all Subcontractors coordinate scheduling and timing of required administrative procedures with other construction activities, and activities of other contractors and Subcontractors, if any, to avoid conflicts and to verify orderly progress of Work.

3.2 General installation provisions

.1 Ensure that installer of each major component inspects both substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

.2 Comply with manufacturer's installation instructions and recommendations, to extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.

.3 Inspect Materials immediately upon delivery and again prior to installation. Reject damaged and defective items and arrange for replacement.

.4 Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

.5 Supervise all Subcontractor work.

.6 Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect.

.7 Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.

.8 Coordinate temporary enclosures with required inspections and tests, to minimize necessity of uncovering completed construction for that purpose.

.9 Install individual components at standard mounting heights recognized within the industry for the applications indicated where mounting heights are not indicated. Confirm non-standard specified mounting heights with Consultant prior to installation.

.10 Coordinate construction activities to ensure that no part of Work completed or in progress is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

3.3 Layout of Work

.1 Be responsible for laying out the work in compliance with the Drawings, Shop Drawings and schedules.

.2 Rectify all errors resulting from failure to follow or verify Products, Drawings or the proper layout of any element of the installation.

3.4 Protection of existing facility and personnel

.1 Do not endanger in any way the personnel, equipment, offices and existing structures of the Owner. Exercise caution to keep the existing facilities free from damage due to the Contractor's work. If the measures observed by the Contractor are not considered sufficient, the Owner may order additional precautions to be taken.

.2 Take all necessary precautions to adequately protect the building and property from damage. Make good all damage at no extra cost.

.3 Erect suitable safety barriers as required for security and to make the site safe for pedestrians.

.4 Supply and erect temporary hoarding and barricades where required. Provide a temporary hoarding plan.

.5 Remove the barriers from the site at the completion of the work or when directed by the Owner.

.6 Adequately protect the Work at all stages and maintain the protection until the Work is completed. Remove and replace any work and materials damaged that cannot be satisfactorily repaired at no extra cost.

.7 Secure construction area by erecting dust proof barriers, hoarding, as necessary to the approval of the Owner and the building Owner.

.8 Motorized equipment shall be powered electrically or by battery only. Internal combustion powered equipment shall not be permitted within construction areas unless approved in writing by the Owner.

3.5 Cold weather construction

.1 Cold weather construction is required.

.2 Commence work immediately upon receipt of the Owner's Order to Commence Work and continue full scale operations throughout the winter months and thereafter until the work is completed and accepted by the Consultant.

.3 Unless it is explicitly specified that a winter shutdown period is acceptable, it is understood that the Contract Price includes sufficient funds for the provision of temporary heating, temporary shelters, insulation and all other

necessary cold weather measures to enable the Work to proceed without delay regardless of weather.

3.6 Restoration of disturbed areas

.1 Fill all holes left from mechanical and electrical services removed or relocated to maintain the required fire separations and to maintain the intended finished appearance of the surface.

.2 Patch and make good all existing floor, wall and ceiling materials and finishes disturbed by construction work.

3.7 Restoration work for uncovered site hazards

.1 Make restorations to uncovered or disrupted mechanical or electrical services where such services pose a potential health or safety risk.

.2 Restorations shall be an extra to the Contract only where such work could not have been reasonably foreseen by examination at the time of bidding in the sole opinion of the Owner.

End of section

1 General

1.1 Section includes

.1 Interference and coordination drawings and documents for effective coordination of mechanical and electrical work and with the work of other Sections, where applicable.

1.2 Related requirements

.1 Section 01 31 00 – Project Management and Coordination

1.3 Requirements

.1 Coordinate sequencing of Work, placement of Products and arrangement of services of various Subcontractors and other contractors to assure the best arrangement of pipes, conduits, ducts, equipment, supports and other items in the available space.

.2 Under no circumstances will any claim for extra cost be allowed due to the failure by the Contractor to coordinate Work.

.3 Prepare interference and coordination drawings, showing the work of various Subcontractors and submit drawings to the Consultant for approval before commencing Work.

.4 Take field dimensions relative to this Work.

.5 Fabricate and erect work to suit field dimensions and field conditions

.6 Provide all forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the Work and set in place or instruct the related Subcontractors as to their location.

.7 Pay any extra costs caused by, and make up time lost resulting from, failure to furnish the necessary cooperation, information or items to be fixed-to or built-in, in adequate time.

.8 Coordinate placement of equipment to ensure that components will be properly accommodated within spaces shown in the Contract Documents prior to commencement of Work.

.9 In areas where equipment and services are exposed exercise care to organize and layout services in an organized and orderly manner.

.10 Where possible services run services parallel or at right angles to one another as required.

.11 Consultant may request that service layout be reconfigured to suit sightline concerns during the interference and coordination drawings review phase. Revise drawings accordingly at no additional cost to the Owner.

1.4 Submittals

.1 Submit interference and coordination drawings for installation of mechanical and electrical Work, where applicable and all other applicable Divisions for efficient use of available space, for proper sequence of installation, and to resolve conflicts with the work of all Sections.

2 Products – not used

3 Execution

3.1 Interference and coordination drawings

.1 On interference and coordination drawings, show the following minimum information to demonstrate understanding and coordination of Work of various Sections with the Work of:

.1 Mechanical (fire suppression, plumbing, HVAC, building automation)

.2 Electrical (power distribution and generation, lighting, fire alarm, communications, security & access controls, and facility protection)

.3 Piping: indicate sizes, locations and arrangements, including valves, indicating instruments, pumps and other accessories. Allow for thickness of insulation, as specified, for various types of piping.

.4 Ductwork: sizes, locations and arrangement including accessories such as dampers (fire, balancing and operating).

.5 Conduits: show surface-mounted and embedded conduit pipes, elbows, boxes and other accessories for power distribution, power generation, control wiring, fire alarm system, building controls system and other related systems.

.6 Equipment:

.1 Flydronic specialties, boilers, water heaters, chillers, coolers, radiant panels, fan coil units, air handling units, fans, VAV terminal units, etc.

.2 Transformers, power distribution equipment, wiring devices, panelboards, lighting, equipment, fire alarm devices, etc.

.7 Sleeves: show size and location of penetrations through loadbearing and non-loadbearing elements.

.8 Inserts: Products or elements of assemblies to be cast into concrete and/or mortared into masonry elements.

.2 Show cross sections in key areas, as required, and as defined by Consultant. Show re-bar, structural elements, piping, air handling and heating systems distribution, sprinkler system distribution, lighting, wall and ceiling assemblies, acoustical and seismic isolation, Products and systems involving life safety, conveying systems, electrical distribution.

.3 Resolve areas of conflict or interference in a mutually agreed manner between affected Subcontractors and other contractors and resubmit interference and coordination drawings until such time as accepted by the Consultant.

.4 Submit interference and coordination drawings electronically in PDF format and AutoCAD “.dwg” files compatible with AutoCAD Architecture 2018.

.5 Submit interference and coordination drawings in uniform scale, with information assembled on separate layers within the electronic files to allow overlays to be assembled which show all components of various trades. Upon incorporation of details, Drawings shall be submitted jointly to the Consultant for review.

.6 Ensure that accesses and clearances required by jurisdictional authorities and/or for easy maintenance of equipment are indicated and accommodated in layout of equipment and services.

.7 Circulate interference and coordination drawings for review and mark-ups by Subcontractors responsible for work portrayed on the drawings.

.8 Coordinate preparation and submission of interference and coordination drawings with Shop Drawings.

End of section

1 General

1.1 Section includes

.1 Pre-construction meeting.

.2 Regular progress meetings.

1.2 Related requirements

.1 Section 01 29 00 – Payment Procedures

.2 Section 01 32 00 – Construction Progress Documentation

.3 Section 01 50 00 – Temporary Facilities and Controls

1.3 Pre-construction meeting

.1 Owner will arrange for a pre-construction meeting to discuss and resolve administrative procedures and responsibilities prior to the commencement of the Work. Owner's project team, the Consultant and a representative from the facility user department will participate in the pre-construction meeting.

.2 Coordinate and organize attendance at the pre-construction meeting by representatives of major Subcontractors and other parties in contract with the Contractor.

.3 Owner will arrange attendance of other interested parties not responsible to the Contractor.

.4 Agenda will include, but not be limited to, the following topics as are pertinent to the Contract:

.1 Introduction of key personnel participating in the project

.2 Status of permits, fees and requirement of authorities having jurisdiction. Action required.

.3 Requirements for Contract modification and interpretation procedures, including, but not limited to: requests for interpretation, proposed Change Orders, Change Orders, Change Directives, Supplemental Instructions, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.4 Requirements for notification for reviews. Allow a minimum of two (2) Working Days notice to Consultant for review of the Work.

.5 Review of schedules and scheduling procedures and requirements in accordance with Section 01 31 00 – Project Management and Coordination.

.6 Review of environmental requirements, restrictions on work hours, access, movement on site, and sustainable requirements.

.7 Appointment of inspection and testing agencies or firms.

.8 Commissioning requirements.

.9 Requirements for temporary facilities, signs, offices, storage sheds, utilities.

.10 Security requirements at and for the Place of the Work.

.11 Record drawings.

.12 Maintenance manuals.

.13 Take-over procedures, acceptance.

.14 Warranties.

.15 Progress claims, administrative procedures, holdbacks.

.16 Insurances, transcripts of policies.

.17 Cleaning/staging area for vehicles.

.18 Workplace Safety and Insurance Board Certificate.

.19 Reviewing the approved project schedule

.20 Identify any product availability problems and substitution requests and procedures

.21 Schedule for project meetings

.22 Emergency contact numbers

.23 Site-specific safety training

1.4 Pre-installation meetings

.1 During the course of the Work prior to Substantial Performance of the Work, schedule pre-installation meetings as required by the Contract Documents and coordinated with the Consultant.

.2 As far as possible, pre-installation meetings shall be scheduled to take place on the same day as regularly scheduled progress meetings.

.3 Agenda to include the following:

.1 Appointment of official representatives of participants in the Project.

.2 Review of existing conditions and affected work, and testing thereof as required.

.3 Review of installation procedures and requirements.

.4 Review of environmental and site condition requirements.

.5 Review of schedules and scheduling procedures and requirements of the applicable portions of the Work in accordance with Section 01 32 00 – Construction Progress Documentation, in particular:

.1 Schedule of submission of samples, mock-ups, and items for Consultant's consideration.

.2 Delivery schedule of specified equipment.

.3 Requirements for notification for reviews. Allow a minimum of two (2) Working Days notice to Consultant for review of the Work.

.6 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences, Section 01 50 00 – Temporary Facilities and Controls.

.7 Requirements for inspections and tests, as applicable.

.1 Schedule and undertake inspections and tests in accordance with Sections 01 32 00 – Construction Progress Documentation and Section 01 45 00 – Quality Control.

.8 Special safety requirements and procedures.

.4 The following shall be in attendance:

.1 Contractor.

.2 Subcontractors affected by the work for which the pre-installation meeting is being conducted.

.3 Consultant.

.4 Manufacturer's representatives, as applicable.

.5 Inspection and testing company, as applicable.

1.5 Progress meetings

.1 Consultant will schedule and administer bi-weekly project meetings throughout progress of Work.

.2 Provide physical space and make arrangements for meetings.

.3 Consultant will prepare agenda for meetings.

.4 Agenda will include, but not be limited to, the following topics as are pertinent to the Contract.

- .1 Review, approval of minutes of previous meeting.
- .2 Construction safety
- .3 Coordination
- .4 Review of Work progress since previous meeting.
- .5 Field observations, problems, conflicts.
- .6 Problems which impede construction schedule.
- .7 Review of off-site fabrication delivery schedules.
- .8 Revision to construction schedule.
- .9 Progress schedule, up to next scheduled meeting.
- .10 Review submittal schedules: expedite as required.
- .11 Maintenance of quality standards.
- .12 Review proposed changes for effect on construction schedule and on completion date.
- .13 Review site safety and security issues.
- .14 Requests for information/clarification
- .15 Contemplated changes
- .16 Other business.

.5 Inform the Consultant three (3) days in advance of meetings regarding any other items the Contractor wishes to be added to be added to the agenda.

.6 Ensure key project personnel attend regularly scheduled progress meetings to be held on site at times and dates that are mutually agreed to by the Region and Contractor.

.7 Coordinate and organize attendance of individual Subcontractors and material suppliers when requested. Relationships and discussions

between Subcontractor participants are not the responsibility of the Consultant and do not form part of the meetings content.

.8 Ensure that Contractor representatives in attendance at meetings have required authority to commit Contractor to actions agreed upon. Assign same persons to attend such meetings throughout the contract period.

.9 Consultant will preside at meetings.

.10 Consultant will record minutes.

.11 Consultant will reproduce and distribute copies of minutes within three (3) to five (5) business days after each meeting and transmit to meeting participants and affected parties not in attendance.

1.6 Pre-takeover meeting

.1 Prior to application for Substantial Performance of the Work, schedule a pre-takeover meeting.

.2 Agenda to include the following:

.1 Review, approval of proceedings of previous meeting.

.2 Review of items arising from proceedings.

.3 Review of procedures for Substantial Performance of the Work, completion of the Contract, and handover of the Work.

.4 Field observations, problems, conflicts.

.5 Review of outstanding Contract modifications and interpretations including, but not limited to: requests for interpretation and log, proposed Change Orders, Change Orders, Change Directives, Supplemental Instructions, for effect on construction schedule and on Contract Time.

.6 Problems which impede Substantial Performance of the Work.

.7 Review of procedures for deficiency review. Corrective measures required.

.8 Progress, schedule, during succeeding period of the Work.

.9 Review submittal requirements for warranties, manuals, and all demonstrations and documentation required for Substantial Performance of the Work.

.10 Review of status of as-built documents and record drawings.

.11 Other business.

1.7 Post-construction meeting

.1 Prior to application for completion of Contract, schedule a post-construction meeting. Four (4) days prior to date for meeting, Consultant shall confirm a date for meeting based on evaluation of completion requirements.

.2 Agenda to include the following:

.1 Review, approval of proceedings of previous meeting.

.2 Confirmation that no business is arising from proceedings.

.3 Confirmation of completion of the Contract, and handover of reviewed documentation from the Consultant to the Owner.

.4 Confirmation of completion of proposed Change Orders, Change Orders, Change Directives, and Supplemental Instructions.

.5 Problems that impede Contract completion.

.6 Identify unresolved issues or potential warranty problems.

.7 Confirmation of completion of deficiencies.

.8 Corrective measures required.

.9 Confirm submittal requirements for warranties, manuals, and demonstrations and documentation for Contract completion are in order.

.10 Review of procedures for communication during post-construction period.

.11 Handover of reviewed record documents by the Consultant to the Owner.

.12 Handover of Contract completion insurance policy transcripts by Contractor.

.13 Submission of final application for payment.

.14 Review and finalize outstanding claims, pricing, and allowance amounts.

.15 Status of commissioning and training.

.16 Demobilization and the Place of the Work restoration.

.17 Review of requests for interpretation log.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Progress photographs.

1.2 Related requirements

.1 Section 01 11 00 – Summary of work

.2 Section 01 32 00 – Construction Progress Scheduling

.3 Section 01 33 00 – Submittal procedures

.4 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Construction Progress Scheduling requirements

.1 Refer to Section 01 32 00 – Construction Progress Scheduling.

1.4 Submittals

.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.5 Progress photographs

.1 Digital photography:

.1 Submit electronic copy of colour digital photography in *.jpg format, minimum 6 Megapixel resolution.

.2 Identification: Name and number of project and date of exposure indicated.

.2 Submit digital photographs on a CD, DVD, USB flash drive or other Owner-approved electronic file transfer method.

.3 Number of viewpoints: Locations of viewpoints determined by Consultant.

.4 Submission Frequency: Submit progress photographs monthly with progress statement.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section Includes

.1 Documents and terminology.

.2 Associated requirements.

.3 Work expectations.

.4 Work by other parties.

.5 Premises usage.

1.2 Related Requirements

.1 Section 01 31 00 – Project Management and Coordination

.2 Section 01 41 00 – Regulatory Requirements

.3 Section 01 78 00 – Closeout Submittals

1.3 Definitions

.1 Activity Durations:

.1 Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods.

.2 Less than 2 percent of all non-procurement activities shall have Original Durations (OD) greater than 20 Working Days or 30 calendar days. Procurement activities are defined within this Section.

.2 Procurement Activities:

.1 The Construction Schedule must include activities associated with Submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies and supplies.

.2 Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days.

.3 Typical procurement sequences include the string of activities: submit, approve, procure, fabricate, and deliver.

.3 Contractor Quality Management (CQM) Activities:

.1 CQM Activities shall identify the Preparatory Phase and Initial Phase for each Definable Feature of Work identified in the Contractor's Quality Control Plan in accordance with Section 01 45 00.

.2 These activities shall be added to each Two-Week Look Ahead Schedule referenced in the paragraph entitled "Two-Week Look Ahead Schedule" and will also be included in each monthly update.

.3 The Follow-up Phase will be represented by the Construction Activities in the Baseline Schedule and in the schedule updates.

.4 Turnover and Closeout Activities:

.1 Include all testing, specialized inspection activities, Deficiency Inspections and Reviews, Final Inspection and Acceptance.

.2 Add a milestone for the Facility Turnover Planning Meeting at approximately 75 percent

.3 Contract completion or three to six months prior to turnover, whichever is sooner.

.5 Mandatory Tasks:

.1 The following tasks must be included and properly scheduled:

.2 Submission and approval of O & M manuals.

.3 Submission and approval of as-built drawings.

.4 Submission and approval of Testing, Adjusting and Air Balancing (TAB).

.5 Submission and approval of Building Envelope commissioning plans and data.

.6 Submission and approval of Mechanical commissioning plans and data.

.7 Submission and approval of Electrical commissioning plans and data.

.8 Controls testing plan submission.

.9 Controls testing.

.10 Performance Verification testing.

.11 Other systems testing, if required.

.12 Contractor's pre-occupancy deficiency inspection.

.13 Correction of items on Contractor's pre-occupancy deficiency inspection.

.14 Consultant's pre-occupancy deficiency review.

.15 Correction of items on Consultant's pre-occupancy deficiency review.

.16 Owner’s staff training in accordance with Section 01 79 00.

.17 Final review.

.6 Activity Responsibility Coding.

.1 Assign Responsibility Code for all activities to the party responsible for performing the activity.

.2 Activities shall not have more than one Responsibility Code.

.3 Acceptable Responsibility Code values are: CONS (for Consultant); GC (for General Contractor); ELEC (for Electrical Subcontractor); MECH (for the Mechanical Subcontractor); and OWNR (for the Owner).

.4 Unacceptable Responsibility Code values are abbreviations of the names of Subcontractors.

.7 Activity Work Area Coding.

.1 Assign Work Area Codes to activities based upon the Work area in which the activity occurs.

.2 Define Work Areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade, from working in more than one Work Area at a time due to restraints on resources or space.

.3 Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings.

.4 Activities shall not have more than one Work Area Code.

.5 Not all activities are required to be Work Area coded. A lack of Work Area coding will indicate the activity is not resource or space constrained.

.8 Contract Changes Coding.

.1 Assign Change Code to any activity or sequence of activities added to the Construction Schedule as a result of a Contract Modification, when approved by the Owner.

.2 Key all Change Code values to Consultant's modification numbering system.

.3 Approval to add these activities does not imply the Owner accepts responsibility and, therefore, liability for such activities and any associated impacts to the Construction Schedule, but rather the Owner recognizes such activities are appropriately added to the Construction Schedule for the purposes of maintaining a realistic and meaningful schedule.

.4 An activity shall not have more than one Change Code.

.9 Phasing of Work Coding.

.1 Assign Phase of Work Code to all activities based upon the phase of Work in which the activity occurs.

.2 Code activities to construction phases to allow filtering and organizing the schedule accordingly.

.3 Each activity shall be identified with a single project phase and have only one Phase of Work code.

.10 Definable Features of Work Coding.

.1 Assign a Definable Feature of Work Code to appropriate activities based on the Definable Feature of Work to which the activity belongs.

.2 Definable Feature of Work is defined in section 01 45 00.

.3 An activity shall not have more than one Definable Feature of Work Code.

.4 Not all activities are required to be Definable Feature of Work Coded.

.11 Owner's Total Float.

.1 Include a total of twenty (20) Working days of unassigned time on the Critical Path that Owner may assign, at their sole discretion, to mitigate costs arising from delays regardless of the reason for delay. Project schedule must include and identify additional days

lost due to typical Weather in all seasons, based on historical Weather data for the project site.

.2 Of the twenty (20) Working days, thirteen (13) are to be allocated to winter construction.

.3 Of the twenty (20) Working days, seven (7) are to be allocated to summer construction.

1.4 Submittals

.1 Preliminary Construction Schedule

.1 Submit Preliminary Construction Schedule within fifteen (15) Working Days of Award of Contract defining Contractor's planned operations for the first ninety (90) calendar days after Award of Contract.

.2 Construction Schedule

.1 Submit Construction Schedule in accordance with Section 01 33 00.

.2 Submit Construction Schedule defining Contractor's planned operations for the overall Project within forty-five (45) Working Days of Award of Contract.

.3 Log Report

.1 Submit Log Report in accordance with Section 01 33 00.

.2 Submit Log Report identifying Construction Schedule Changes.

.4 Narrative Report

.1 Submit Narrative Report in accordance with Section 01 33 00.

.2 Submit Narrative Report detailing information requirements specified in this Section with each Construction Schedule submission.

.5 Submittal Format

.1 Provide copies of all schedules in electronic format.

.2 Provide licensed full versions of scheduling software to Owner and Consultant.

1.5 Construction Schedule Requirements

.1 General Requirements

.1 The computer software system utilized to produce and update the Construction Schedule shall be Microsoft Project or similar, and capable of meeting all requirements of this Specification.

.2 Failure of the Contractor to meet the requirements of this Specification will result in the disapproval of the Construction Schedule.

.3 Include the complete sequence of construction activities, including provision for climate and weather.

.4 All activity durations and float values will be shown in days.

.5 Activity progress will be shown using Remaining Duration.

.6 Amend Construction Schedule to incorporate review by Owner and Consultant

.7 comments and resubmit finalized Construction Schedule.

.8 Finalized Construction Schedule is to be saved as a “baseline” for comparison purposes throughout the Work as the schedule is updated for progress achieved.

.2 Critical Path Method

.1 Use the Critical Path Method (CPM) of network calculation to generate the Construction Schedule.

.2 Prepare Construction Schedule in horizontal bar (GANTT) chart form.

.3 Include the following information for each activity:

.1 Activity ID.

.2 Work Breakdown Structure ID.

.3 Activity Description.

.4 Original Duration in Working Days.

.5 Remaining Duration.

.6 Percent Complete.

.7 Early Start Date.

.8 Early Finish Date.

.9 Total Float.

.10 Assigned Resources.

.3 Level of Detail Required

.1 Develop Construction Schedule to an appropriate level of detail. Failure to develop the Construction Schedule to an appropriate level of detail, as determined by the Consultant, will result in its disapproval. The Consultant will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

.1 Activity Durations.

.2 Procurement Activities.

.3 Mandatory Tasks.

.4 Activity Responsibility Coding.

.5 Activity Work Area Coding.

.6 Contract Changes.

.7 Phasing of Work.

.8 Definable Features of Work.

.9 Separate activities shall be created for each Phase, Area, Floor Level and Location the activity is occurring.

.10 Once an activity exists on the Construction Schedule it may not be deleted or renamed to change the scope of the activity and shall not be removed from the schedule logic without approval from the Consultant and Owner. The ID number for a deleted activity shall not be re-used for another activity.

.11 No more than twenty percent (20%) of the activities shall be critical or near critical.

.2 Critical is defined as having zero days of Total Float.

.3 Near Critical is defined as having Total Float of one to fourteen (1 to 14) days.

.4 Scheduled Project Completion and Activity Calendars

.1 The Construction Schedule interval shall extend from Award of Contract date to the required Contract completion date.

.2 The Contract completion activity (End Project) shall finish based on the required Contract Time, as adjusted for any approved Contract Time extensions.

.3 The first scheduled Work period shall be the day after Award of Contract is received by the Contractor.

.4 Schedule activities on a calendar to which the activity logically belongs.

.5 Schedule activities to a 7-day calendar.

.6 If the Contractor intends to perform Work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and statutory holidays.

.7 Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive.

.8 Original durations must account for anticipated normal adverse weather.

.9 The Owner will interpret all Work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform Work during those periods.

.5 Project Start Date

.1 The Construction Schedule shall start no earlier than the date on which the Award of

.2 Contract was acknowledged.

.3 Include as the first activity on the Construction Schedule an activity called "Start Project".

.4 The "Start Project" activity shall have an "ES" (Early Start) constraint date equal to the date that the Award of Contract was acknowledged, and a zero-day duration.

.6 Schedule Constraints and Open-Ended Logic

.1 Constrain completion of the last activity in the Construction Schedule by the Contract

.2 Deemed Complete date.

.3 Construction Schedule calculations shall result in a negative float when the calculated early finish date of the last activity is later than the Contract Deemed Complete date.

.4 Include as the last activity in the Construction Schedule an activity called "End Project".

.5 The "End Project" activity shall have an "LF" (Late Finish) constraint date equal to the Contract Deemed Complete date for the Project, and with a zero-day duration or by using the "project must finish by" date in the scheduling software.

.6 The schedule shall have no constrained dates other than those specified in the Contract Documents.

.7 The use of artificial float constraints such as "zero fee float" or "zero total float" are typically prohibited.

.8 There shall only be two (2) open ended activities: Start Project with no predecessor logic and End Project with no successor logic.

.7 Early Project Completion

.1 If the Preliminary Construction Schedule or Construction Schedule calculates an early completion date of the last activity prior to the Contract Deemed Compete date, identify those activities the Contractor intends to accelerate and/or those activities that are scheduled in parallel to support the Contractor's "early" completion.

.2 The last activity shall have a late finish constraint equal to the contract completion date and the schedule will calculate positive float.

.3 The Owner will not approve an early completion schedule with zero float on the longest path.

.4 The Owner is under no obligation to accelerate activities for which it is responsible to support a proposed early Contract completion.

.8 Interim Completion Dates

.1 Constrain contractually specified interim completion dates to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date.

.9 Phase Summary Task

.1 Include a Summary Task or “hammock type” activity for each Phase of the Work specified.

.2 Identify each Summary Task as "Phase X" where "X" refers to the Phase of the Work number.

.3 The Summary Task shall be logically tied to the earliest and latest activities in each Phase of the Work.

.10 Start Phase

.1 Include as the first activity for each Project phase an activity called "Start Phase X" where "X" refers to the Phase of the Work.

.2 The "Start Phase X" activity shall have an "ES" constraint date equal to the earliest date following the completion date of the previous phase, and a zero-day duration.

.11 End Phase

.1 Include as the last activity for each Project phase an activity called "End Phase X" where "X" refers to the Phase of the Work.

.2 The "End Phase X" activity shall have an "LF" constraint date equal to the specified completion date for that phase, and a zero-day duration.

.12 Milestones

.1 The Construction Schedule must include milestone activities for each significant project event including but not limited to:

.2 Foundation/substructure construction complete.

.3 Superstructure construction complete.

.4 Building dry-in or enclosure complete to allow the initiation of finish activities.

.5 Permanent power complete.

.6 Building systems Commissioning complete.

.7 Include appropriate time period, required in advance of indoor air quality testing, required for all corrective Work related to general deficiencies, Testing, Adjusting and Balancing, and Commissioning.

.8 Include 3 Working Days after all construction and final cleaning Work is complete, for

.9 Consultant to conduct indoor air quality testing, prior to building occupancy.

1.6 Schedule Software Settings and Restrictions

.1 Activity Constraints: Date/time constraint(s), other than those required by the Contract, will not be allowed unless accepted by the Consultant or Owner. Identify any constraints proposed and provide an explanation for the purpose of the constraint in the Narrative Report.

.2 Default Progress Data Disallowed

.1 Do not automatically update Actual Start and Finish dates with default mechanisms that may be included in the scheduling software.

.2 Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided from Contractor Quality Control Reports.

.3 Failure of the Contractor to document the AS and AF dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's updated schedule and the inability of the Consultant to evaluate Contractor progress for payment purposes.

.4 Updating of the percent complete and the remaining duration of any activity shall be independent functions.

.5 Disable program features which calculate one of these parameters from the other.

.3 Out-of-Sequence Progress

.1 Activities that have progressed before all preceding logic has been satisfied (Out-of- Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Consultant.

.2 Propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated Construction Schedule.

.3 Correct out of sequence progress that continues for more than two update cycles by logic revision, as approved by the Consultant.

.4 Negative Lags and Start to Finish Relationships

.1 Lag durations contained in the Construction Schedule shall not have a negative value.

.2 Do not use Start to Finish (SF) relationships.

.5 Calculation Mode

.1 Schedule calculations shall retain the logic between predecessors and successors even when the successor activity starts and the predecessor activity has not finished.

.2 Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") will not be allowed.

1.7 Reports

.1 The following reports shall be included with the schedule submittal:

.1 Log Report: Listing of all changes made between the previous Construction Schedule and current updated Construction Schedule, including revisions to reflect the impact of, and on, shop drawings and all other submittals.

.2 Narrative Report: Identify and justify the following:

.3 Progress made in each area of the Project.

.4 Critical Path.

.5 Date/time constraint(s), other than those required by the Contract.

.6 Changes in the following:

.1 Added or deleted activities.

.2 Original and remaining durations for activities that have not started.

.3 Logic, milestones.

.4 Planned sequence of operations and critical path.

.5 Pending items and status thereof, including permits, changes orders, and time extensions.

.6 Status of Contract Completion Date and interim milestones.

.7 Current and anticipated delays (describe cause of delay and corrective actions).

.8 Description of current and future schedule problem areas.

.9 Each entry in the narrative report will cite the respective Activity ID and Activity Description, the date and reason for the change, and description of the change.

2 Products – Not Used

3 Execution

3.1 Preliminary Construction Schedule Submission

.1 Submit the Preliminary Construction Schedule, defining the Contractor's planned operations for the first ninety (90) calendar days for review and acceptance within fifteen (15) calendar days after the Award of Contract is acknowledged.

.2 The approved Preliminary Construction Schedule will be used for payment purposes not to exceed ninety (90) calendar days after Award of Contract.

.3 Detail Construction Schedule for the first ninety (90) calendar days or Phase 0 completion; whichever is longer. It may be summary in nature for the remaining performance period.

.4 It must be early start “ES” and late finish “LF” constrained and logically tied as specified.

.5 The Preliminary Construction Schedule forms the basis for the Construction Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the Contract Documents including:

.1 Quality Control Plan.

.2 Safety Plan.

.3 Environmental Protection Plan.

.4 Other non-construction activities intended to occur within the first ninety (90) calendar days.

.5 Schedule any construction activities planned for the first 90 calendar days after Award of Contract.

.6 Activity code any activities that are summary in nature after the first ninety (90) calendar days with Responsibility Code and Definable Feature of Work code.

3.2 Construction Schedule Submission

.1 Submit the Construction Schedule for approval within forty-five (45) calendar days after the Award of Contract is acknowledged.

.2 The Construction Schedule shall demonstrate a reasonable and realistic sequence of activities which represent all Work throughout the Contract Time as previously specified, including information previously submitted on the Preliminary Construction Schedule.

.3 No Work will be permitted to take place beyond mobilization until Construction Schedule has been reviewed by Consultant and approved by the Owner.

3.3 Contract Modifications

.1 If a claim for delay is submitted, submit a Time Impact Analysis (TIA) with each cost and time proposal for a Proposed Change to substantiate the delay claim. TIA shall illustrate the influence of each change or delay on the Contract Time and/or Contract Completion Date or milestones.

.2 No time extensions will be granted, nor claims with respect to delay paid, unless a delay occurs which consumes all available Project Float, and extends the Projected Finish beyond the Contract Completion Date, and consumes the Owner’s total float as well.

.3 Each TIA shall be in both narrative and schedule form demonstrating the delay impact.

.4 The TIA shall identify the predecessors to the new activities and demonstrate the impacts to successor activities. The Contractor shall run the schedule calculations and submit the impacted schedule with the proposal or claim.

.5 The TIA schedule submitted with the proposal shall show all activity progress as of the date of the proposal.

.6 If the impact to the schedule occurs prior to the proposal submission, the TIA schedule shall be updated to show all activity progress as of the time of the impact.

.7 If the proposed change does not impact the CCD (Contract Completion Date), no TIA shall be required.

.8 Unless the Owner agrees otherwise, only approved Change Orders shall be added into the Construction Schedule.

3.4 As-Built Schedule

.1 As a condition precedent to the release of Finishing Holdback retention and making final payment, submit an "As-Built Schedule," as the last Construction Schedule update showing all activities at one hundred percent (100%) completion.

.2 This schedule shall reflect the exact manner in which the Project was actually constructed.

3.5 Schedule Updates

.1 Submit revised Construction Schedule with each progress billing. Show the following information:

.2 Show changes occurring since previous submission of the Construction Schedule:

.1 Major changes in scope.

.2 Change Orders and Change Directives.

.3 Activities modified since previous submission.

.4 Revised projections of progress and completion.

.5 Other identifiable changes.

.6 Include Log Report with each schedule update.

.7 Include Narrative Report with each schedule update.

End of Section

1 General

1.1 Section includes

.1 Shop Drawings and Product data.

.2 Samples.

.3 Certificates and transcripts.

1.2 Related requirements

.1 Section 01 32 00 – Construction Progress Documentation

.2 Section 01 78 00 – Closeout Submittals

.3 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Administrative

.1 Make submissions reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Work affected by submittal shall not proceed until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

.6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.

.10 Keep one reviewed copy of each submission on site.

.11 Submit all submittals other than samples as one (1) single electronic PDF file.

.1 Name Submittal PDF files as follows:

.2 Submittal#_Spec.Section_Revision#_Descriptor_Type of Submission

.3 (e.g. Submittal#001_092116_R3_Gypsum Wallboard_ProductData)

.1 Revision number within file name is to reflect the number of submissions with zero indicating the first submission.

.2 Submittals returned to the Contractor will have added text to the end of the file name indicating the review status of the Submittal. If the Submittal is to be resubmitted, maintain the original file name revising only the revision number.

1.4 Submissions schedule

.1 Within four (4) weeks after award of Contract submit a submittal schedule itemizing submittal for review by Consultant.

.2 If either the contractor or the consultant so requests, they shall jointly prepare a schedule fixing the dates for submission and return of submittals.

.3 Allow fourteen (14) days for Consultant's review of each submission.

1.5 Shop drawings and product data

.1 The term shop drawings means drawings, diagrams, illustrations, schedules, performance charts, product data, brochures and other data which are to be provided by the contractor to illustrate details of a portion of the work.

.2 Arrange for the preparation of clearly identified shop drawings as the consultant may reasonably request.

.3 Prior to submission to the consultant, review all shop drawings. By this review the contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data or will do so and that he has checked and coordinated each shop drawing with the requirements of the work and of the contract documents. Indicate the contractor's review of each shop drawing by stamp, date and signature of an authorized person.

.4 Submit shop drawings to the consultant for his review with reasonable promptness and in orderly sequence so as to cause no delay in the work or in the work of other contractors.

.5 Make changes in shop drawings which the consultant may require consistent with the contract documents and resubmit unless otherwise directed by the consultant. When resubmitting, notify the consultant in writing of any revision other than those requested by the consultant.

.6 Make shop drawings accurately to a scale sufficiently large to show pertinent features of the Work. Define the division of responsibility between different trades in the shop drawings.

.7 Show materials, methods of construction and attachment or anchorage, erection diagrams, connections and other details necessary to complete the work. Cross reference shop drawings to drawings and specifications.

.8 The review by the consultant is for the sole purpose of ascertaining conformance with the general design concept. The review shall not mean that the consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the contractor, and such review shall not relieve the contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the contract documents. The contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all subtrades and work of other contractors.

.9 Any adjustments made on the shop drawings by the consultant are not intended to change the contract price. If the contractor deems that such adjustments effect the value of the work, he shall so state in writing before proceeding with the fabrication and installation of the work.

2 Products

2.1 Transmittal letter

.1 Accompany submissions with transmittal letter, in duplicate, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Identification for initial submission or resubmission.
- .6 Other pertinent data.

2.2 Shop drawings

.1 Submissions shall include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.2 Shop Drawings: Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.

.3 Product Data: Submit one (1) electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.4 Delete information not applicable to project.

.5 Supplement standard information to provide details applicable to project.

.6 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.7 Shop drawings will be returned to the Contractor with one of the following notations:

.1 When stamped "REVIEWED", distribute additional copies as required for execution of the Work.

.2 When stamped "REVIEWED AS NOTED", ensure that all copies for use are modified and distributed, same as specified for "REVIEWED".

.3 When stamped "REVISE AND RE-SUBMIT", make the necessary revisions, consistent with the Contract Documents and submit again for review.

.8 Only use shop drawings bearing "REVIEWED" or "REVIEWED AS NOTED" on the Work unless otherwise authorized by the Consultant.

.9 Further revisions by Contractor on submittals bearing "REVIEWED" or "REVIEWED AS NOTED" are not permitted.

.10 Shop Drawings Indicating Engineering and Design to be Provided by the Contractor: Include seal and signature of a Professional Engineer registered in the Province of the Work.

2.3 Samples

.1 At each major milestone stage, assemble and submit all relevant samples in context, at one time, in the following groups:

.1 Exterior Materials and Finishes

.2 Interior Materials and Finishes

.3 Ceiling Systems and Light Fixtures.

.4 Door Hardware

.5 Cover plates, grilles, etc., of Mechanical and Electrical Sections.

.2 Submit for review samples in triplicate as requested in respective specification Sections and as Consultant may reasonably request. Label samples with origin and intended use.

.1 Technical specifications section.

.2 Product manufacturer’s name and address.

.3 Product supplier’s name and address.

.3 Deliver samples prepaid to Consultant's business address.

.4 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.5 Unless custom or precise colour and pattern is specifically described in the Contract Documents, whenever a choice of colour or pattern is available in a product, submit accurate colour charts from the manufacturer's standard range of colour and pattern charts to the Consultant for selection.

.1 Unless all available colours and patterns have identical costs and identical wearing capabilities and are identically suited for the installation, completely describe the relative costs and capabilities of each.

.6 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.7 Make changes in samples which Consultant may require, consistent with Contract Documents.

.8 Reviewed and accepted samples will become standard of quality of work and material against which installed Work will be verified.

2.4 Pre-construction certificates and transcripts

.1 Immediately after award of Contract and prior to commencing work, submit the following:

.1 Workplace Safety and Insurance Board status.

.2 Certified true copy of insurance.

2.5 Test Reports

.1 Clearly show on each test reports or certification, the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery, and name of manufacturer or fabricating company. Ensure certificates are signed by an authorized representative of the manufacturing or fabricating company.

.2 Submit four (4) hard copies, or one (1) electronic copy of all test reports submitted with certificates of compliance showing date or dates of testing, the specified requirements for which the testing was performed and results of the test or tests.

2.6 Certification of personnel

.1 Provide certificates to establish qualifications of personnel employed on the Work where such certification is required by authorities having jurisdiction, by the Consultant or by the Contract Documents.

3 Execution

3.1 Submission

.1 Make submittals well in advance of schedule dates for fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.

End of section

1 General

1.1 Section includes

.1 Health and safety administrative requirements for contractors performing work for the Region of Durham.

1.2 References

.1 Province of Ontario website

.1 Construction site health and safety during COVID-19

.1 https://www.ontario.ca/page/construction-site-health-and-safety-during-covid-19

.2 Resources to prevent COVID-19 in the workplace

.1 https://www.ontario.ca/page/resources-prevent-covid-19-workplace#construction

.2 Canadian Construction Association

.1 COVID-19 - Standardized Protocols for All Canadian Construction Sites

1.3 Health and safety policy

.1 Obtain copies of all Subcontractors' Health and Safety Policies and Programs prior to such Subcontractor commencing work on the site if and when requested.

.2 Provide a copy of Contractor's current Health and Safety Policies and Program, to implement that policy prior to the commencement of construction.

1.4 Health and safety legislation and requirements

.1 Comply with all Federal and Provincial laws relating to Health and Safety including Acts and Regulations as well as Lower Tier Municipality By-Laws.

.2 Comply with all applicable industry safety standards.

.3 Comply with 213/91 (Construction Projects) made under the Occupational Health and Safety Act (OHSA) and all amendments thereto. Copies of the Regulations may be obtained from the Ministry of Labour at their

Scarborough office, Publications Ontario at 880 Bay Street, Toronto, Ontario M7A 1N8 (Tel. 416-326-5300).

.4 Comply with legislative requirements for work performed including, but not limited to, qualifications of workers, training, supervision and use of onsite equipment.

.5 Provide any and all personal protective equipment for Contractor's own workers where prescribed by legislation.

1.5 COVID-19 Health and Safety

.1 Ensure that all workers comply with the Government of Ontario's guidelines for Construction Site Health and Safety During COVID-19 including but not limited to:

.1 washing hands often with soap and water or alcohol-based hand sanitizer

.2 sneeze and cough into sleeve

.3 avoid touching eyes, nose or mouth

.4 avoid contact with people who are sick

.5 stay home if you are sick

.6 avoid close contact with other people. Close contact includes being within two (2) metres of another person.

.2 The Contractor shall monitor the latest recommendations from public health officials related to protecting workers from COVID-19 and adjust work procedures and provide personal protective equipment as per those recommendations.

.3 All workers attending the Place of the Work shall complete a COVID-19 pre-screening checklist each day when arriving on site and before beginning any work. Provide completed checklists to the Region's representative each day.

.4 The Contractor is encouraged to follow the latest edition of the Canadian Construction Association's document "COVID-19 - Standardized Protocols for All Canadian Construction Sites."

1.6 Safety data sheets

.1 Provide to the Consultant a list of Designated Substances that will be brought to the site prior to commencing work. Safety Data Sheets (SDS) and the hazardous material inventory for each substance listed must be kept on the Project.

.2 Maintain copies of current SDS at the Place of the Work at a location accessible to all workers, the Consultant, the Owner and the building operators.

1.7 List of designated substances at the site

.1 In accordance with the requirements of Section 30(1) of the Occupational Health and Safety Act, the Bidder is hereby advised that the designated substances as listed hereunder are or may be present on the site and within the limits of this Contract:

Designated Substance	Identified on this Site?
Acrylonitrile	No
Arsenic	No
Asbestos	No
Benzene	No
Coke Oven Emissions	No
Ethylene Oxide	No
Isocyanate	No
Lead	No
Mercury	No
Silica	No
Vinyl Chloride	No

.2 Comply with the governing Ministry of Labour regulations respecting protection of workers, removal, handling and disposition of any

Designated Substances encountered in carrying out the Work proposed on this contract.

.3 Should a Designated Substance not herein identified be encountered, immediately notify the Consultant and the Owner of the Contractor's findings. Management of such substance shall be treated as extra work.

1.8 Health and safety warnings

.1 The Consultant and the Owner shall have the right to document all Contractors for all health and safety warnings and/or to stop any Contractor's work if the Contractor fails to comply with any requirements under this Section.

.2 Similarly, the Consultant and the Owner shall have the right to issue warnings and/or to stop work for any Contractor violations of the contract including Regional health and safety policy and programs and/or if the Contractor creates a health or safety hazard.

.3 Written warnings and/or stop work orders shall be given to the Contractor using the Owner's Contractor Health and Safety Warning / Stop Work Order Form.

.4 If the Contractor fails to adequately respond to the Consultant's or the Owner's order to correct a hazard, the Owner reserves the right to have the hazard corrected by a third party at the Contractor's expense. The Consultant's or the Owner's decision, as the case may be, as to the urgency for such correction shall be final.

1.9 Notice of project

.1 Notify all regulatory bodies required for construction activities, (i.e., Notice of Project, employer notification, etc.). Notifications shall include, but not be limited to, the notification requirements laid out in OHSA Sec 51-53 and the requirements of Ontario Regulation 213/91 for Construction Projects, Sections 5, 6 and 7. For the purpose of this contract the Contractor shall be the "Constructor".

1.10 Confined space

.1 Persons intended to work in confined spaces, as defined by the Owner, must have formal training in performing work in confined spaces.

.2 Provide proof of valid certificates of such training for all workers prior to entry of such workers into confined spaces.

.3 Provide all necessary safety equipment for entry into confined spaces.

.4 Where workers are required to enter a confined space, as defined by the OHSA, O. Reg. 632/05 Section 221.2, ensure that workers of the Contractor and all Subcontractors follow the requirements of the above legislation, including but not limited to:

.1 having a method for recognizing each confined space to which the program applies

.2 having a method for assessing the hazards to which workers may be exposed

.3 having a method for the development of confined space entry plans (which include on-site rescue procedures)

.4 having a method for training workers

.5 having an entry-permit system.

.5 Supply the necessary tools and equipment for workers to perform the confined space entry. These items include, but are not limited to, required documentation, gas detectors, breathing equipment, fall protection and rescue equipment.

1.11 Fire safety requirements

.1 Protect persons and properties.

.2 Maintain operable fire protection equipment.

.3 Maintain fire fighters' access.

.4 Provide temporary fire extinguishing equipment.

.5 Maintain existing and temporary fire exit.

.6 Where the work requires the Contractor to shut down fire and life safety systems, provide a fire watch for the duration of the shutdown.

.7 In occupied buildings, schedule the use of flame, such as torches and volatile substances well in advance with the approval of the Owner and the Consultant.

.8 Maintain a fire watch after all welding operations for a period of not less than seven (7) hours.

2 Products – not used

3 Execution

3.1 Pre-start health and safety

.1 Obtain and provide a Pre-Start Health and Safety Review (PSR) report and submit a copy of the report to the Consultant.

.2 Ensure the Products ordered are compliant with the approved PSR Report.

.3 The PSR report shall be signed by a Professional Engineer licensed to practice engineering in the Province of Ontario.

.4 Pay all costs associated with the preparation and completion of the PSR.

End of section

1 General

1.1 Section includes

.1 Laws, notices, permits and fees.

.2 Discovery of hazardous materials.

.3 Codes and standards.

.4 Regulations.

.5 Permits.

1.2 Related requirements

.1 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Laws, notices, permits and fees

.1 The laws of the Place of the Work shall govern the Work.

.2 The Owner will obtain and pay for the building permit, permanent easements and rights of servitude.

.3 The Contractor shall be responsible for obtaining all permits, licenses and certificates necessary for the performance of the Work which were in force at the date of executing the Agreement.

.4 Provide the required notices and comply with the laws, ordinances, rules, regulations or codes which are or become in force during the performance of the Work and which relate to the Work, to the preservation of the public health and to construction safety.

.5 Construction of the Work is subject to the approval, inspection, by-laws, and regulations of municipal, provincial and federal authorities and organizations concerned with roads, streets, railways, telephones, electrical supplies, gas supplies and other public services having jurisdiction in respect to any matter in the Contract.

.6 If the Contractor knowingly performs or allows work to be performed that is contrary to any laws, ordinances, rules, regulations or codes, the Contractor shall be responsible for and shall correct the violations thereof; and shall bear the costs, expenses and damages attributable to the failure

to comply with the provisions of such laws, ordinances, rules, regulations or codes.

.7 Determine detailed requirements of authorities having jurisdiction.

.8 Pay all fees associated with applications, permits and inspections required by authorities having jurisdiction.

.9 Pay construction damage deposits levied by municipality in connection with the issuance of a building permit.

.10 Keep a copy of all permits on site.

1.4 Hazardous material discovery

.1 Asbestos: If material resembling asbestos is encountered which has not been identified in the Contract Documents, immediately stop work and notify the Consultant.

1.5 Codes and standards

.1 Perform the Work in accordance with the requirements of the latest editions of the following statutes and codes in force at the time of the Agreement:

.1 Ontario Building Code

.2 Municipal building and fire codes and by-laws

.3 Electrical Safety Authority

.4 Ontario Electrical Safety Code

.5 National Fire Protection Association

.6 National Building Code

.7 Ontario Construction Safety Act

.8 Ontario Fire Code

.9 Ontario Hydro

.10 WHIMS

.11 Canadian Gas Association CSA/CGA B149.1-10 Natural Gas and Propane Installation Code

.12 Code book B139 for gas installations as per TSSA requirements.

.2 Comply with any applicable revisions to codes and regulations after the date of the agreement. Costs of such revisions shall be compensated for through a Change Order.

.3 Complete all required electrical connections and provide Electrical Safety Authority (ESA) approval on such work.

.4 Be responsible for all variances and submit application to Technical Standards & Safety Authority (TSSA).

.5 Revise the installation and engineered drawings at no additional cost to the Owner until they meet the requirements and approval of the TSSA, the ESA and Pickering Fire Department. Provide copies of all authority sign-offs.

.6 Review Contract Drawings and Specifications for any conflicts with the above regulations and where there are apparent discrepancies, notify the Owner in writing and obtain clarification before proceeding with the Work.

1.6 Precedence of standards

.1 Where applicable, ensure that all materials and equipment conform to the applicable standards listed.

.2 Canadian standards take precedence over American standards in the case of duplication or conflict.

1.7 Permits

.1 The Owner will obtain and pay for the Building Permit only.

.2 Obtain all other necessary permits and approvals required for this project from the authorities having jurisdiction for all completed work.

.3 Keep a copy of all permits on site.

2 Products

2.1 Equipment

.1 Provide electronically powered equipment, components, and supplies that are CSA and ULC approved.

3 Execution – not used

End of section

1 General

1.1 General requirements

.1 Requirements for Contractor's Quality Control Program (QCP) for Work performed in accordance with Contract Documents.

.2 Testing and inspecting services are required to verify compliance with specified requirements. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

.1 Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of products.

.2 Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality control procedures that facilitate compliance with the Contract Document requirements.

.3 Requirements for Contractor to provide quality assurance and quality control services required by Consultant, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

.3 Travel Expenses: Where it is necessary for the Consultant and Owner to visit places away from the Place of the Work in order to supervise, inspect or witness testing activities of items of the Work, for compliance with the Contract Documents, the Contractor shall pay the travelling, lodging and food expenses of Consultant and Owner.

.4 Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Consultant for a decision before proceeding.

1.2 Definitions

.1 Quality Assurance: Activities, actions, and procedures performed before execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

.2 Quality Control: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Consultant.

.3 Sample Installations: Full-size, physical assemblies that are constructed on-site. Sample installations are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved sample installations establish the standard by which the Work will be judged.

.4 Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

.5 Testing Agency: An independent agency engaged to perform specific tests, inspections, or both.

.6 Experienced: An entity having successfully completed previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 Quality assurance

.1 General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

.2 Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

.3 Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

.4 Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

.5 Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

.6 Specialists: Contract Documents may require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated. Requirement for specialists shall not supersede requirements of authorities having jurisdiction.

.7 Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

.8 Manufacturer’s Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

.9 Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

.1 Contractor responsibilities include the following:

.1 Provide test specimens representative of proposed products and construction.

.2 Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

.3 Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately

demonstrate capability of products to comply with performance requirements.

.4 Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

.5 Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

.6 When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

.2 Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Consultant with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.4 Contractor's Quality Control Program (QCP) – Quality Control (QC) Plan

.1 Submit for acceptance by the Owner, a QC Plan submitted in a three-ring binder that includes a table of contents, with major sections identified with tabs, with pages numbered sequentially, and that documents the proposed methods and responsibilities for accomplishing Quality Control activities during the construction of the Project:

.1 QC Organization: Chart showing the QC organizational structure.

.2 Names and Qualifications: Names and qualifications, in resume format, for each person in the QC organization.

.3 Duties, Responsibility and Authority Of QC Personnel: Duties, responsibilities, and authorities of each person in the QC Organization.

.4 Appointment Letters: Letters signed by an officer of the Contractor appointing the QC Manager and Alternate QC Manager and stating that they are responsible for implementing and managing the QC program as described in this Contract. Include in this letter the responsibility of the QC Manager and Alternate QC Manager to implement and manage the Three Phases of Control, and their authority to stop work which is not in compliance with the Contract.

.5 Submittal Procedures and Initial Submittal Register: Procedures for reviewing, approving, and managing submittals. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval. Provide the initial submittal of the Submittal Schedule as specified in Section 01 32 16.

.6 Testing Plan and Log: Testing Plan and Log that includes the tests required, referenced by the Specification paragraph number requiring the test, the frequency, and the person responsible for each test.

.7 Procedures to Complete Deficiency Items: Procedures to identify, record, track, and complete deficiency items.

.8 List of Definable Features: Definable Feature of Work (DFOW) is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. DFOW is identified by different trades or disciplines and is an item or activity on the construction schedule. Include in the list of DFOWs, but not be limited to, all critical path activities on the Construction Schedule. Include all activities for which this Section requires QC Specialists or specialty inspection personnel.

.9 Personnel Matrix: Personnel matrix showing for each Section of the Specifications who will review and approve Submittals, who will perform and document the Three Phases of Control, and who will perform and document the testing.

.10 Procedures for Completion Inspection: Procedures for identifying and documenting the completion inspection process including responsible party for punch out inspection, pre-final inspection, and final acceptance inspection.

.11 Training Procedures and Training Log: Procedures for coordinating and documenting the training of Owner’s personnel required by the Contract. Include a sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed and who attended the training.

1.5 Contractor's Quality Control Program (QCP) – Organization

.1 QC Manager:

.1 Duties: Provide a QC Manager at the Place of the Work to implement and manage the QC program. The only duties and responsibilities of the QC Manager are to manage and implement the QC program of this Contract.

.1 The QC Manager is required to attend the QC Plan Meetings, Coordination Meetings.

.2 Conduct the QC meetings.

.3 Perform the Three Phases of Control except for those Phases of Control or portions of the Work designated to be performed by QC Specialists.

.4 Perform Submittal review and approval.

.5 Ensure testing is performed and provide QC certifications and documentation required in this Contract.

.6 Be responsible for managing and coordinating the Three Phases of Control and documentation performed by the QC Specialists, Testing and Inspection Agency personnel and any other inspection and testing personnel required by this Contract.

.7 The QC Manager is the manager of all QC activities.

.2 Qualifications:

.1 An individual with a minimum combined experience, no less than that submitted as a part of the General Contractor's pre-qualification submission, in the following positions: Project Superintendent, QC Manager, Project Manager, Project Engineer or Construction Manager on similar size and type construction projects which included the major trades that are part of this Contract.

.3 Establish hours of work for QC Manager to allow minimum 1 hour of overlap each Working Day for communication and coordination with Assistant QC Manager. QC Manager to be full time on site, dedicated solely to this project, on the regular day shift.

.2 QC Specialists

.1 Duties: Provide an QC Specialist for Mechanical and Electrical Work at the Place of the Work to perform the Three Phases of Control, perform Submittal review, ensure testing is performed, and prepare QC certifications and documentation required by this Contract.

.2 Qualifications:

.1 An individual with combined experience in the following positions: Licenced Plumber, Sheet Metal Mechanic and/or Electrician, Mechanical/Electrical Project Foreman, QC Specialist, Project Manager or Project Engineer on similar size and type construction projects which included the major systems that are part of this Contract.

.3 The QC Specialists must be present at Place of the Work for a minimum of fifty percent (50%) of regular work hours.

.1 If critical portions of Mechanical or Electrical Work are being performed during a supplemental work shift, adjust or supplement the QC Specialist hours at the Place of the Work to accommodate these requirements.

1.6 Contractor's Quality Control Program (QCP) – Meeting

.1 Prior to submission of the QC Plan, the QC Manager will meet with the Owner to discuss the QC Plan requirements of this Contract. Meeting is to develop a mutual understanding of the QC Plan requirements prior to plan development and submission and to agree on the Contractor's list of DFOWs.

1.7 Contractor's Quality Control Program (QCP) – Submittals

.1 Quality Control Plan (QCP): Prior to commencement of construction, submit QCP documenting procedures specified in this Section for implementation and measurement of Contractor's Quality Control Procedures.

.2 Contractor's Quality Control (CQC) Report

.1 Submit Contractor's Quality Control Report in accordance with this section

.2 E-mail or post on Project FTP site CQC Report by 10:00 AM the next Working Day after each day that Work is performed and for every seven consecutive calendar days that Work is not performed.

1.8 Contractor's Quality Control Program (QCP) – Three phases of control

.1 Adequately cover both on-site and off-site work with the Three Phases of Control and include the following for each DFOW:

.2 Preparatory Phase

.1 Notify the Owner minimum two (2) Working Days in advance of each preparatory phase meeting.

.2 Meeting will be conducted by QC Manager and attended by the QC Specialists, the Project Superintendent, CxA, and Subcontractor's foreman responsible for the DFOW.

.3 Document the results of the preparatory phase actions in the Preparatory Phase Checklist.

.4 Perform the following prior to beginning Work on each DFOW:

.1 Review each paragraph of applicable Specifications Sections.

.2 Review the Drawings.

.3 Verify that field measurements are as indicated on Drawings and/or Shop Drawings before confirming Product orders to minimize waste due to excessive materials.

.4 Verify that appropriate Shop Drawings and Submittals have been made and reviewed. Verify receipt of approved factory test results, when required.

.5 Review Testing Plan and Log to ensure that provisions have been made for required QC testing.

.6 Examine the Work area to ensure that the required preliminary Work has been completed.

.7 Coordinate Product delivery schedule to designated prepared areas to minimize site storage time and potential damage to stored materials.

.8 Arrange for return of shipping/packaging materials such as wood pallets, where economically feasible.

.9 Examine required Products and sample Work to ensure that they are on hand and conform to reviewed Shop Drawings and Product Data Sheets.

.10 Discuss specific controls used and construction methods, construction tolerances, workmanship standards, and the approach that will be used to ensure quality construction by planning ahead and identifying potential problems for each DFOW.

.11 Review APP and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.

.12 Review Cx Plan and ensure all preliminary Work items have been completed and documented.

.3 Initial Phase

.1 Notify the Owner minimum two (2) Working Days in advance of each initial phase.

.2 When construction crews are ready to start work on a DFOW, conduct the initial phase with the QC Specialists, the Project Superintendent, and the Subcontractor's foreman responsible for that DFOW.

.3 Observe the initial segment of the DFOW to ensure that the Work complies with Contract Documents.

.4 Document the results of the initial phase in Initial Phase Checklist.

.5 Repeat the initial phase for each new crew to work on-site, or when acceptable levels of specified quality are not being met.

.6 Perform the following for each DFOW:

.1 Establish the quality of workmanship required.

.2 Resolve conflicts.

.3 Ensure that testing is performed by the approved laboratory.

.4 Check Work procedures for compliance with APP and the appropriate AHA to ensure that applicable safety requirements are met.

.5 Review the Cx Plan and ensure all preparatory Work items have been completed and documented.

.4 Follow-Up Phase

.1 Perform the following for on-going work daily, or more frequently as necessary, until the completion of each DFOW and document in the daily CQC Report:

.1 Ensure the Work is in compliance with Contract Documents.

.2 Maintain quality of workmanship required.

.3 Ensure that testing is performed by the approved laboratory.

.4 Ensure that rework items are being corrected.

.5 Assure manufacturers representatives have performed necessary inspections if required and perform safety inspections.

.6 Review the Cx Plan and ensure all Work items, testing, and documentation have been completed.

.5 Additional Preparatory and Initial Phases

.1 Conduct additional preparatory and initial phases on the same DFOW as follows:

.1 If the quality of on-going Work is unacceptable.

.2 If there are changes in applicable QC organization.

.3 If there are changes in on-site production supervision or work crew.

.4 If work on a DFOW is resumed after substantial period of inactivity.

.5 As required if other problems develop.

.6 Notification of Three Phases of Control for Off-Site Work

.1 Notify the Owner minimum two (2) weeks prior to the start of the preparatory and initial phases.

1.9 Contractor's Quality Control Program (QCP) – Documentation

.1 Maintain current and complete records of on-site and off-site QC program operations and activities.

.2 Construction Documentation

.1 Reports are required for each day that work is performed and must be attached to the Contractor Quality Control Report prepared for the same day.

.2 Maintain current and complete records of on-site and off-site QC program operations and activities.

.3 The forms identified under the Contractor's Quality Control Program (QCP) – Submittals will be used.

.4 Reports are required for each day work is performed. Account for each calendar day throughout the Contract.

.5 Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces.

.6 The Project Superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively.

.7 The reporting of work must be identified by terminology consistent with the construction schedule.

.8 In the "remarks" sections of the reports, enter pertinent information including:

.1 Directions received.

.2 Problems encountered during construction.

.3 Work progress and delays.

.4 Conflicts or errors in the Contract Documents.

.5 Field changes.

.6 Safety hazards encountered.

.7 Instructions given and corrective actions taken.

.8 Record of visitors to the work site.

.9 Quality control problem areas.

.10 Deviations from the QC Plan.

.11 Construction deficiencies encountered.

.12 Meetings held.

.13 For each entry in the report(s), identify the Schedule Activity No. that is associated with the entered remark.

.3 Quality Control Validation

.1 Establish and maintain the following in a series of three ring binders. Binders shall be divided and tabbed as shown below. These binders must be readily available to the Owner, Consultant and CxA during all business hours:

.1 All completed Preparatory and Initial Phase Checklists, arranged by Specifications Section.

.2 All milestone inspections, arranged by Activity Number.

.3 An up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by Specifications Section.

.4 Copies of all Contract modifications, arranged in numerical order. Also include documentation that modified Work was accomplished.

.5 An up-to-date copy of the Rework Items List.

.6 Maintain up-to-date copies of all Contractor Deficiency Lists issued by the QC Manager to Subcontractors and all Deficiency Lists issued by the Consultant.

.7 Commissioning documentation including Cx checklists, schedules, tests, and reports.

.4 Reports from the QC Specialist(s)

.1 Reports are required for each day that Work is performed in their area of responsibility.

.2 QC Specialist reports shall include the same documentation requirements as the CQC Report for their area of responsibility.

.3 QC Specialist reports are to be prepared, signed and dated by the QC Specialists and shall be attached to the CQC Report prepared for the same day.

.5 Testing Plan and Log

.1 As tests are performed, the QC Manager will record on the "Testing Plan and Log" the date the test was performed and the date the test results were forwarded to the Consultant and Owner.

.2 Attach a copy of the updated Testing Plan and Log to the last daily CQC Report of each month.

.3 Include Testing Plan and Log in Operations and Maintenance Manual.

.6 Rework Items List

.1 The QC Manager must maintain a list of Work that does not comply with the Contract.

.2 Identify the following information:

.1 Items that need to be reworked.

.2 Date the item was originally discovered.

.3 Date the item will be corrected by.

.4 Date the item was corrected.

.5 There is no requirement to report a rework item that is corrected the same day it is discovered.

.6 Attach a copy of the "Rework Items List" to the last daily CQC Report of each month.

.7 The Contractor is responsible for including those items identified by the Consultant and Owner.

1.10 Contractor's Quality Control Program (QCP) – Notification of non-compliance

.1 The Consultant and Owner will notify the Contractor of any observed non-compliance with the Contract Documents.

.2 Take immediate corrective action after receipt of such notice.

.3 Such notice, when delivered to the Contractor at the construction site, shall be deemed sufficient for the purpose of notification.

.4 If the Contractor fails or refuses to comply promptly, the Consultant or Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken.

.5 No part of the time lost due to such stop orders will be made the subject of claim for extension of Contract Time for excess costs or damages by the Contractor.

1.11 Quality control – owner's testing

.1 General: The Owner may require, during progress of the Work, testing and inspection by an independent testing company as directed by the Consultant, or as required in Contract Documents, to determine if Work meets the specified requirements.

.1 Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

.2 If upon examination work is found in non-conformance to Contract Documents, Contractor shall correct such Work and pay cost of retesting and reinspection.

.3 If such Work is found in conformance to Contract Documents, Owner shall pay cost of examination and replacement.

.4 Cost of indoor air quality (IAQ) testing services will be paid by Owner.

.5 Other 3rd party testing and inspection indicated in technical specification will be paid out of cash allowance. Pay testing agency charges authorized by the Consultant from the cash allowance included for these services.

.6 Retesting and Reinspection: When initial tests indicate non-compliance with the Contract Documents, costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be the responsibility of the Contractor. Retesting and resinpsection shall be performed by the same testing agency as the initial tests.

.7 If Contractor covers or permits to be covered Work that has been designated for tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.2 Testing Agency Responsibilities

.1 Cooperate with Consultant and Contractor in performance of duties. Provide qualified personnel and equipment to perform required tests and inspections.

.2 Notify Consultant and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

.3 Determine the location from which test samples will be taken and in which in-situ tests are conducted.

.4 Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

.5 Submit certified written report, in triplicate, of each test, inspection, and similar quality-control service to the Consultant.

.6 Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

.7 Do not perform any duties of Contractor.

.3 Contractor Responsibilities

.1 Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

.1 Access to the Work.

.2 Incidental labour and facilities necessary to facilitate tests and inspections.

.3 Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

.4 Facilities for storage and field curing of test samples.

.5 Delivery of samples to testing agencies.

.6 Preliminary design mix proposed for use for material mixes that require control by testing agency.

.7 Security and protection for samples and for testing and inspecting equipment at Project site.

.2 Coordination: Coordinate sequence of activities to accommodate required quality assurance and control services with a minimum of

delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

.1 Schedule times for tests, inspections, obtaining samples, and similar activities.

.3 Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality assurance and quality control services required. Submit schedule within [30] days of date established for commencement of the Work.

.1 Distribution: Distribute schedule to Owner, Consultant, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

.2 Establishing Schedule: Determine the time required for the agencies to perform their duties and the time required for the issuance of resulting reports. Allow for the times in the construction schedule.

.3 Schedule Revisions: Co-ordinate revisions with the testing and inspection agencies when changes to the construction schedule are necessary.

.4 Schedule Adherence: Provide advance notice to the testing laboratory and to the inspection company of when testing of the Work is required. If the testing laboratory is ready to perform its functions according to the schedule and is prevented from doing so due to incompleteness of the work, extra costs for testing attributable to the delay will be back charged to the Contractor.

1.12 Quality control - Code and contract Compliance, and Contractor's Convenience Testing

.1 Code Compliance Testing: Inspection and tests required by codes or ordinances, or by an authority having jurisdiction shall be the responsibility of the Contractor and shall be paid for by the Contractor.

.2 Contract Compliance Testing: Inspection and tests required by Contract Documents shall be the responsibility of the Contractor and shall be paid

for by the Contractor. These services include and not limited to the following:

.1 Mill Tests.

.2 Mix Designs.

.3 Building Systems Performance, Adjustments and Balancing Reports.

.3 Contractor's Convenience Testing: Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor and paid for by Contractor as part of the Contractor.

.4 Engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

.5 Submit a certified written report, in triplicate, of each quality-control service.

.6 Submit additional copies of each written code compliance report directly to authorities having jurisdiction, when they so direct.

.7 Retesting/Reinspecting: Provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with code requirements and Contract Documents. Retesting and resinpsection shall be performed by the same testing agency as the initial tests.

.8 Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field-assembled components and equipment installation, including service connections.

1.13 Sample installations

.1 Construct sample installations for Work specifically requested in specifications. Include for Work of all Sections required to provide sample, installations. Obtain Consultant's approval of sample installations before starting work, fabrication, or construction.

.2 Construct in locations acceptable to Consultant with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.3 Failure to construct sample installations in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.4 If requested, Consultant will assist in preparing a schedule fixing dates for sample installation construction.

.5 Maintain sample installations during construction in an undisturbed condition as a standard for judging the completed Work.

.6 Specification Sections identify whether sample installations may remain as part of Work or to be removed.

2 Products

2.1 Test and inspection log

.1 Prepare a record of tests and inspections. Include the following:

.1 Date test or inspection was conducted.

.2 Description of the Work tested or inspected.

.3 Date test or inspection results were transmitted to Consultant.

.4 Identification of testing agency or special inspector conducting test or inspection.

.2 Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Consultant's reference during normal working hours.

3 Execution

3.1 Repair and protection

.1 On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

.2 Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend

restoration into adjoining areas with durable seams that are as invisible as possible.

.3 Protect construction exposed by or for quality-control service activities.

.4 Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

3.2 Rejected work

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace in accordance with Contract Documents.

.2 Make good other contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.

End of section

1 General

1.1 Section includes

.1 Storage of Products and materials.

.2 Consultant’s field office.

.3 Contractor’s site office.

.4 Temporary sanitary facilities and shelter for Contractor’s workers.

.5 Temporary building enclosures and storage areas.

.6 Temporary fire protection

.7 First aid

.8 Security of construction site

.9 Maintenance of sewerage flows, storm sewers and drainage.

1.2 Related requirements

.1 Section 01 51 00 – Temporary Utilities

.2 Section 01 57 13 – Temporary Erosion and Sediment Control

.3 This section describes requirements applicable to all Sections within Divisions 02 to 48.

2 Products

2.1 Consultant's field office

.1 Supply and maintain a reasonably new field office trailer, in good condition, for exclusive use of Consultant for duration of Contract.

.2 Field office trailer shall be equipped with the following features:

.1 Minimum size, 30 m² with minimum ceiling height of 2.4 m.

.2 Weatherproof, insulated, electrically heated and electrically lighted.

.3 Minimum two windows to open complete with shades and fly screens.

.4 Temperature to be mechanically controlled at 20 °C to 24 °C year-round including air conditioning in summer and furnace-heated in fall/winter.

.5 Adequate lighting and ventilation.

.6 Doors to be fitted with cylinder locks with consultant in possession of all keys.

.7 Exterior pressure treated wooden stairs and landing at each entrance.

.8 Provide the following items, in good condition, inside field office:

.1 A plan table with sloping top, approximately 1800 mm L x 900 mm W x 960 mm H with smooth plywood top

.2 Two (2) drafting chairs (Global Tacker Economy Stool Model 5174 or reviewed equivalent) for use at the plan table;

.3 Two (2) double pedestal desks with lockable drawers, approximately 1825 mm L x 915 mm W x 740 mm H (72" L x 36" W x 29" H)

.4 One (1) low back, multi-tilter task chair with height and width adjustable arm rests (Global Malaga Task Chair or reviewed equivalent)

.5 One (1) legal-size, 4 drawer file cabinet with lock and key;

.6 A 2.5 m x 1 m table with folding legs;

.7 Six (6) additional chairs of the stacking type for use during project meetings;

.8 Adequate lighting with supplementary lighting over the plan table and desks;

.9 Shelves, hat racks, plan racks, and a lockable steel wardrobe and storage cabinet, approximately 1900 mm H x 900 mm W x 500 mm D for storing instruments and clothing;

.10 One (1) meeting table, approximately 2400 mm L x 900 mm W x 740 mm H;

.11 Six (6) padded stackable chairs;

.12 One (1) mini-refrigerator;

.13 One (1) combination hot and cold water cooler;

.14 One (1) single-party land line telephone including installation, rental and reasonable long-distance calls;

.15 One (1) digital answering machine (may be included with phone service provider's package);

.16 One (1) all-in-one small office printer/scanner/copier with legal size, flatbed scanner, Ethernet or wireless network connection, 250 sheet paper tray, capable of 24 ppm or higher black and white printing;

.17 One (1) Class A-B-C fire extinguisher, wall mounted;

.18 One (1) first aid kit (St. John Ambulance, Ontario Level 1 Workplace Plastic Kit or reviewed equivalent) including replacement supplies as ordered by the Consultant; and

.19 One (1) waste basket

.3 Provide high speed internet service with either a modem and separate wireless router or a combination modem/wireless router. Internet service to be minimum 30 Mbps download and 5 Mbps upload. Router to be capable of wireless-N at 450 Mbps with WPA2 security protocol.

.4 Provide flush-type sanitary facilities for exclusive use of Consultant. Facilities to include sink with pumpable water supply, hand sanitizing gel dispenser, latch and padlock on door.

.5 Provide and maintain services including power, telephone line, paper supplies for scanner/copier, and garbage removal.

.6 Provide security protection as required.

.7 Provide Property and Contents Insurance. All contents shall be insured for replacement value up to $ 25,000.

2.2 Contractor's site office

.1 Provide temporary Contractor site office, lighted and ventilated, of sufficient size to accommodate site meetings and furnished with drawing layout table.

.2 Temperature to be mechanically controlled at 20 °C to 24 °C year-round including air conditioning in summer and furnace-heated in Fall/winter.

.3 Provide a clearly marked and fully stocked first-aid case in a readily available location.

.4 Provide eight (8) padded stackable chairs for site meetings.

.5 Subcontractors may provide their own offices as necessary. Direct location of these offices subject to approval of the Owner.

3 Execution

3.1 General

.1 All schedules must indicate contingency and alternate date and times in the event of postponement for any reason, or breakdown of temporary by-pass equipment during the shutdown.

.2 Comply with local Police, Fire Department and Paramedic requirements regarding notification of all interested parties concerning the construction work and provisions for traffic movement.

3.2 Storage of products, materials and equipment

.1 Storage areas are defined on the Drawings, or as designated by the Consultant. Store materials to ensure the preservation of their quality and fitness for the work. Store materials on wooden platforms or other hard, clean surfaces off the ground or in a watertight storage shed of sufficient size for the storage of materials that might be damaged by storage in the open. Provide the shed with a wood floor raised a minimum of 150 mm clear of the ground.

.2 Store materials to ensure the preservation of their quality and fitness for the work. Store materials on wooden platforms or other hard, clean surface off the ground. Locate stored materials to facilitate prompt inspection.

.3 Provide weathertight heated storage sheds with raised floors for the storage of equipment, as required by the Consultant and/or equipment manufacturers. Provide all storage instructions from equipment suppliers well in advance of the scheduled delivery dates.

.4 Handle and store products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions.

.5 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in the work.

.6 Store products subject to damage from weather in weatherproof enclosures.

.7 Store cementitious products clear of earth or concrete floors, and away from walls.

.8 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.9 Store sheet materials, lumber, etc. on flat, solid supports and keep clear of ground. Slope to shed moisture.

.10 Store and mix paints in a heated and ventilated room. Remove oily rags and other combustible debris from the site daily. Take every precaution necessary to prevent spontaneous combustion.

.11 Remove and replace damaged products to the satisfaction of the Consultant.

.12 Do not use private property for storage purposes without the written permission of the property owner. Pay rental charges and damages associated with occupying private lands.

3.3 Setup and removal of Consultant's field office

.1 Set up Consultant's field office trailer in approved location within seven (7) calendar days of issuance of Commence Work Order or actual work commencement whichever occurs first. Failure to comply may result in the Owner providing the required trailer and back-charging the Contractor.

.2 Remove field office from site upon completion of the Work or earlier upon approval of the Consultant.

3.4 Temporary shelter and sanitary facilities for Contractor's workers

.1 Provide suitable sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Keep sanitary facilities clean, properly maintained and fully stocked with the necessary supplies at all times.

.3 Provide and maintain drinking water and washing facilities in accordance with governing regulations and ordinances.

.4 Post notices and take such precautions as required by local health authorities.

.5 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building.

.6 Except where connected to municipal sewer system, periodically remove wastes from Site.

.7 New permanent facilities may not be used.

.8 Provide shelter for workers.

3.5 Location of temporary facilities

.1 Coordinate the location of temporary facilities with the facility operators subject to the satisfaction of the Consultant.

3.6 Installation and removal of temporary facilities

.1 Provide temporary facilities and controls to execute the work expeditiously.

.2 Remove temporary facilities and controls at the conclusion of the Work, unless otherwise directed by Consultant.

.3 Site to be left in tidy and clean condition after removal of all temporary facilities.

3.7 Temporary building enclosures

.1 Provide temporary weathertight enclosures and protection for exterior openings until permanent sash and glazing, exterior doors, louvers, etc., are installed.

.2 Provide temporary enclosures for the work as required for weather protection and heating purposes.

.3 Erect enclosures to allow accessibility for installation of materials and working inside the enclosure.

.4 Keep temporary buildings in a clean and sanitary condition at all times and do not permit to become a health hazard or a nuisance to adjoining properties.

3.8 Temporary fire protection

.1 During the entire construction period provide fire extinguishers in each construction shed and temporary office, as well as in other locations reasonably required, and all other fire protection necessary to protect the project and to comply fully with the requirements of insurance underwriters for the project and local, provincial and federal authorities.

3.9 Temporary first aid facilities

.1 Provide and maintain the necessary first aid items and equipment as required.

.2 Designate employees who are properly instructed to be in charge of first aid. Ensure that at least one such employee is always available on the site while work is being conducted.

3.10 Maintaining existing sewerage flows

.1 Maintain existing sanitary sewerage flows, where applicable, and provide alternative interim service utilizing duplicate portable sewage pumps, tank trucks and other approved means. Prevent interruption to service throughout the construction period and until the new works are placed in service.

.2 Provide and install all temporary sumps, bulkheads and/or other works in existing sewers, maintenance holes and service connections and provide temporary pumps in duplicate and pipelines to dewater and control the sewage.

.3 Discharge sewerage flows only to those sanitary sewers remaining in service or to tank trucks for approved disposal. Under no circumstances

shall contaminated water be discharged or permitted to enter any drainage or natural watercourse.

.4 Temporarily drain or pump any leakage to permit work to be performed in the dry. The Contractor's method shall be subject to the approval of the Consultant.

3.11 Drainage ditches and storm sewers

.1 All ditches, drainage channels and/or storm sewer systems, which may be affected by construction shall have their flows maintained at all times during construction, unless permission to the contrary has been obtained from the Consultant. No extra cost shall be incurred by the Owner for this work.

.2 Make allowance in prices for any problems that may be encountered because of ditch flows or storm sewer flows. Drainage shall not be impeded, nor shall blockages or water backups be permitted. Any damage because of water or flooding shall be the responsibility of the Contractor.

3.12 Security for construction site

.1 Be responsible for the security of construction site materials, tools, equipment, temporary facilities and storage and all construction.

3.13 Removal and restoration of temporary facilities and controls

.1 Remove temporary facilities and controls from the site on completion of the works, or as otherwise ordered in writing by the Consultant. Unless specifically stated otherwise in the Contract Documents, maintain ownership over the temporary facilities including furnishings.

.2 As each portion of the work is completed, as determined by the Consultant, restore disturbed areas, roadways, fences, building, etc. equal to or better than the initial condition and clean up the construction area as instructed by the Consultant.

.3 Leave clean and in good order, roads, parking areas, walks, grassed areas and other areas disturbed by the construction and Contractor's activities. Failure to make satisfactory progress in the execution of this work within 48 hours of receipt of written notice from the Consultant may result in the Consultant having the surplus material removed, or re-grading

any area or performing any work necessary to leave the site in a satisfactory condition and having the costs deducted from payments due under the Contract.

End of section

1 General

1.1 Section includes

.1 Temporary utilities.

.2 Salvaging products for reuse.

1.2 Related requirements

.1 Section 01 52 00 – Construction Facilities

.2 Section 01 53 00 – Temporary Construction

.3 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Temporary utilities

.1 Make arrangements for the supply of water, electrical power, gas, sanitary facilities, heat, and any other temporary services required during construction.

.2 Be responsible for all fees, permits and charges, including arrangements for all necessary applications, incurred throughout the construction period until the date of Substantial Performance.

.3 Provide power generators as required to maintain construction activities and all temporary facilities, if temporary electrical power supply is delayed or unavailable from the local authority at no extra cost to the Owner.

.4 Permanent utilities installed as part of the Work may be used for construction requirements provided that no warranties or guarantees are affected thereby. Make good any damage.

.5 Operate equipment according to the requirements of the Ontario Ministry of Labour under the Occupational Health and Safety Act and Regulations for Construction Projects.

.6 Arrange, pay for and maintain temporary electrical power supply until Substantial Performance as follows:

.1 Temporary facilities for power, where required outside the plant, such as pole lines and underground cables with the approval of the local utility company.

.2 Connection to the existing power supply system in accordance with the Ontario Electrical Safety Code. Provide meters and switchgear as required by the utility company and the Consultant.

1.4 Installation and removal

.1 Provide temporary utilities and controls to execute work expeditiously.

.2 Salvage and assist in recycling products for potential reuse.

.3 Remove from site all such work after use.

1.5 Dewatering

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.6 Water supply

.1 Provide continuous supply of potable water for construction use.

.2 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.

.3 Pay for utility charges at prevailing rates.

1.7 Temporary heating and ventilation

.1 Provide all temporary heat and ventilation used during the course of construction and include all costs of installation, fuel, operation, maintenance and removal of equipment.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Ventilating:

.1 Prevent accumulation of dust, fumes, mist, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.5 Maintain strict supervision of operation of temporary heating and ventilating equipment, to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to the outside.

.6 Maintain temperatures of minimum 10 °C in areas where construction is in progress.

.7 Owner will pay utility charges when temporary heat source is existing building equipment.

.8 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.9 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.8 Temporary power and light

.1 Arrange, pay for and maintain temporary electrical power supply until Substantial Performance as follows:

.1 Provide temporary facilities for power, where required outside the facility, such as pole lines and underground cables with the approval of the local utility company.

.2 Connect to the existing power supply system in accordance with the Ontario Electrical Safety Code.

.3 Provide meters and switchgear as required by the utility company and the Consultant.

.2 Provide and maintain temporary lighting throughout project.

.3 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Consultant provided that warranties are not affected. Make good damage to electrical system caused by Contractor's use and replace lamps which have been used for more than three (3) months.

.4 Provide power generators as required, at no extra cost to the Owner, to maintain construction activities and all temporary facilities, if temporary electrical power supply is delayed or unavailable from the local authority.

.5 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Construction aids.

1.2 Related requirements

.1 Section 01 50 00 – Temporary Facilities and Controls

.2 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Installation and removal

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.4 Scaffolding

.1 Provide and maintain temporary scaffolding required to perform the Work.

1.5 Hoisting

.1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment.

.2 Cranes and hoists, if used, shall be operated by qualified operator.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Site enclosure.

.2 Guardrails and barriers.

.3 Weather enclosures.

.4 Dust tight barriers.

.5 Protection for off-site and public property.

.6 Protection of applied finishes.

.7 Protection of surrounding Work.

1.2 Related requirements

.1 Section 01 51 00 – Temporary Utilities

.2 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Reference standards

.1 Ontario Provincial Standards

.1 OPSD 220.010 (November 2019) Barrier for Tree Protection

1.4 Installation and removal

.1 Provide temporary controls to execute Work expeditiously.

.2 Remove from site all such work after use.

1.5 Hoarding design

.1 Design hoarding to meet bylaws and regulations of authorities having jurisdiction and obtain approvals from authorities having jurisdiction.

.2 Location and types of hoarding as indicated on Drawings.

.3 Design and install hoarding to withstand wind loads at the Place of the Work without collapse, permanent deformation, or other failure of the hoarding system.

1.6 Site enclosure

.1 Low-security temporary site enclosure:

.1 Erect enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence, posts spaced at 2.4 m on centre.

.2 Provide one (1) lockable truck gate.

.3 Maintain fencing in good repair.

.4 Provide barriers around trees and plants designated to remain. Protection to be according to latest edition of OPSD 220.010 – Barrier for Tree Protection.

.5 Protect from damage by equipment and construction procedures.

1.7 Guard rails and barriers

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

1.8 Protection of open trenches and excavations

.1 In addition to the provisions of Ontario Regulation 213/91 made under the Occupational Health and Safety Act, R.S.O. 1990, and in particular Part III - Excavations, employ the following protection measures for trenches and excavations left open at the end of the work day or where, during any work day, a trench or excavation is left unattended by the Contractor:

.2 Where the public has access to the perimeter of an excavation, install a barrier at least 1.1 m high around the complete perimeter of the excavation. Vertical supports must be secure, have a spacing of not more than 1.1 m and be a minimum distance of 300 mm from the top of the wall of the excavation. The barrier shall include a fencing fabric, with openings not exceeding 100 mm, securely attached to the vertical supports at the top, center and bottom and spacing not exceeding 100 mm. If the excavation is greater than 0.3 m in depth, install toe board with the fencing fabric securely fastened to it to prevent persons from slipping under the fabric and into the excavation. If an excavation is adjacent to a sidewalk or an area commonly used by the public as a walkway or recreation area, the fencing fabric shall be a metal mesh.

.3 Where an excavation is greater than 1.0 m in depth, and the public has access to the perimeter, signs shall be posted indicating “Danger Due to Excavation”.

.4 Ensure barriers are in good condition and stable prior to vacating the project at the end of each work day.

.5 A Crowd Control Barrier meeting the requirements of Region of Durham Standard Drawing S-301.030 will be deemed an acceptable barrier for this purpose provided the barriers are satisfactorily secured to the ground so that they cannot be moved.

1.9 Weather enclosures

.1 Provide weather-tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.10 Dust-tight barriers

.1 Provide dust-tight barriers and screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

.3 Arrange dust-tight barriers and screens or insulated partitions in such manner so as not to eliminate fire exit-egress ways and provide safety directional signage to Owner's and Authorities’ approval.

.4 Protect existing ventilation systems and ductwork interiors from dust contamination from construction area by placing filter media over all duct openings, grilles, diffusers and replacing filters in air handling units upon completion of the work.

1.11 Protection for off-site and public property

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.12 Protection of applied finishes

.1 Provide protection for finished and partially finished surfaces and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Consultant locations and installation schedule three (3) days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

1.13 Protection of surrounding work

.1 Provide protection for finished and partially finished Work from damage.

.2 Provide necessary cover and protection.

.3 Be responsible for damage incurred due to lack of or improper or inappropriate protection.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Access to site.

.2 Working on public roadways.

.3 Informational and warning devices.

.4 Traffic control on public roadways.

.5 Temporary parking.

.6 Fire routes.

.7 Road closure procedures.

1.2 Related requirements

.1 Section 01 14 00 – Work Restrictions

.2 Section 01 50 00 – Temporary Facilities and Controls

.3 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Reference standards

.1 Ontario Traffic Manual (OTM), Book 7 - Temporary Conditions, current revision.

1.4 Access to site

.1 Do not obstruct entrances, stairs or fire exits.

.2 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to the work.

.3 Obtain approval from the Consultant before constructing temporary roads. Keep temporary road surfaces over backfilled excavations free from potholes.

.4 Provide for mud and snow removal and dust suppression, as required during the construction period.

.5 Maintain vehicular access to all properties within and adjacent to the Place of the Work at all times except when Contractor’s operations reasonably

necessitate a temporary restriction. Such restrictions shall be kept to a minimum and shall be coordinated with the affected property owner or occupant.

.6 All traffic arrangements shall be subject to the approval of the Consultant and the authority having jurisdiction.

.7 Plan and schedule the routes of vehicles transporting all materials to, from or within the Place of the Work, so that vehicular movements are accomplished with minimum interference and interruptions to traffic.

.8 The Owner reserves the right to alter or reject proposed delivery and trucking routes as considered necessary. The Contractor shall notify suppliers of materials and equipment of the above requirements.

1.5 Working on public roadways

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of or storage of vehicles, materials and equipment on public roadways.

.2 When working on public-travelled way:

.1 Obtain Road Occupancy Permit from authority having jurisdiction.

.2 Prepare and submit a Traffic Control Plan acceptable to the Consultant.

.3 Erect temporary traffic control signs and devices according to OTM Book 7.

.4 Place equipment and materials in position to present minimum of interference and hazard to traveling public.

.5 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.

.6 Do not leave equipment on travelled way overnight. Store equipment outside the roadway “clear zone” when not in use

.7 Do not close any lanes of road without approval of Consultant and the authority having jurisdiction.

.8 Keep travelled way graded, free of pot holes and of sufficient width for required number of lanes of traffic.

.3 Provide minimum 7.0 m wide temporary roadway for traffic in two-way sections (3.5 m per traffic direction) through Work and on detours.

.4 Provide minimum 5.0 m wide temporary roadway for traffic in one-way sections through Work and on detours.

.5 Access to adjacent properties:

.1 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, unless other means of road access exist that meet approval of Consultant and authority having jurisdiction.

1.6 Informational and warning devices

.1 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from the Contractor's operations which requires road user response.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in OTM Book 7.

.3 Place signs and other devices in locations recommended in OTM Book 7.

.4 Meet with Consultant prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list for approval of Consultant.

.5 Continually maintain traffic control devices in use by:

.6 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.7 Removing or covering signs which do not apply to conditions existing from day to day.

1.7 Traffic control on public roadways

.1 Provide traffic control according to the current revision of Ontario Traffic Manual (OTM), Book 7 - Temporary Conditions, and guidelines of the Infrastructure Health and Safety Association.

.2 Provide competent, properly equipped flag persons:

.1 When public traffic is required to pass working vehicles or equipment which block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.7 At each end of restricted sections where pilot cars are required.

.3 Delays to public traffic due to Contractor's operators: maximum five (5) minutes.

.4 Where roadway carrying two-way traffic is to be restricted to one (1) lane for twenty four (24) hours each day, provide portable traffic signal system as required by the Region of Durham.

.5 Adjust as necessary, and regularly maintain system during period of restriction.

.6 Provide secure, rigid guardrails and barricades around deep excavations and open shafts as required by governing authorities.

.7 Provide paid duty police officers for traffic control in or near intersections where traffic is required to move against normal traffic signal cycles.

.8 Submit a traffic control and staging plan for review by the Consultant at least two (2) weeks prior to commencement of construction activities and material deliveries.

.9 Include both a narrative description of the proposed construction methods and a dimensioned drawing showing typical layout of traffic control measures in each stage of the work and how the Contractor intends to

maintain traffic as specified in the Contract Documents providing specific references to appropriate typical layouts in the OTM.

.10 Traffic control plan shall consider the movement of both vehicular and pedestrian traffic and the impacts on abutting properties and businesses. Ensure that properties with more than one entrance have at least one (1) entrance maintained at all times.

.11 Design roadway work zones with specific consideration for worker safety, road user and pedestrian safety, and community mobility, with proper advanced warning of the work zone and proper site identification.

.12 If the Contractor requires any temporary deviations from the above the Contractor must receive approval from the Consultant. Provide a minimum of three (3) working days' notice prior to the Contractor's proposed temporary deviations.

.13 Maintain all traffic lanes in good condition, free of mud and dirt.

.14 Unless otherwise specified, surface all temporary and existing traffic lanes with hot mix asphalt. Immediately repair any rutting, potholes or other significant surface deterioration.

.15 The Owner reserves the right to order the Contractor to retain the services of an acceptable traffic control specialist firm if, in the Consultant's sole opinion, the Contractor continually fails to provide acceptable traffic control measures.

.16 The Consultant may issue a Stop Work Order to the Contractor if the Contractor's operations jeopardize the safety of the public. In such case, the Contractor shall immediately make the Work Area safe and comply with the Stop Work Order. The Contractor shall not be permitted to continue working until he can demonstrate to the satisfaction of the Consultant that traffic control shall be carried out in an acceptable manner.

.17 Issuance of a Stop Work Order for this, or any other cause, shall be at the sole expense of the Contractor. The Consultant shall not consider an extension of the time to substantially perform or complete the Work due to issuance of any Stop Work Order with regards to traffic control.

1.8 Operational Requirements

.1 Maintain existing conditions for traffic throughout period of Contract except that, when required for construction under this Contract and when measures have been taken as specified and approved by Consultant to protect and control public traffic, existing conditions for traffic to be restricted as follows:

.2 Portion for public access roads may be reduced due to adjacent work by the developer for municipal infrastructure.

.3 Maintain existing conditions for traffic crossing right-of-way.

.4 Maintain existing conditions for traffic crossing right-of-way except when required for construction.

1.9 Parking for Consultant

.1 Locate and maintain in good order a parking area for the Consultant on the project site as directed by the Consultant.

.2 Provide parking space to accommodate minimum five (5) vehicles.

1.10 Parking for construction personnel

.1 Parking for Contractor's, Subcontractors, suppliers and/or their employee's vehicles shall be limited to restricted area as designated by the Owner.

.2 Parking for will be permitted on site provided it does not disrupt performance of Work and continuing operation of the facility.

.3 The Owner and their employees will not be responsible for parking fines incurred by the Contractor, Subcontractors, suppliers and/or their employees.

.4 Provide and maintain adequate access to project site.

.5 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.11 Fire routes

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.12 Road closure procedure

.1 Apply these procedures for any work requiring the temporary closure of a Regional Road.

.2 Provide the Owner and Consultant a minimum of fifteen (15) working days advanced notice of a planned road closure where such closure is permitted in the Contract.

.3 The Owner will notify Emergency Services, School Boards, Durham Region Transit and Local Municipalities before the Contractor may close any roadway to traffic. The Region will arrange for public notices and detour signing.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Erosion and sediment control plan.

.2 Prevent loss of soil by storm water runoff and wind erosion.

.3 Protect stockpiled topsoil.

.4 Prevent sedimentation of storm water and receiving streams.

.5 Prevent pollution of the air with dust and particulate matter.

.6 Documentation and monitoring provisions

1.2 Related requirements

.1 Section 01 81 13 – Sustainable Design Criteria

.2 Section 31 11 00 – Clearing and Grubbing

.3 Section 31 22 13 – Rough Grading

.4 Section 31 23 33 – Excavating, Trenching, and Backfilling

1.3 Reference standards

.1 Ontario Provincial Standards, available for download at https://www.library.mto.gov.on.ca/SydneyPLUS/TechPubs/Portal/tp/opsViews.aspx?lang=en-US

.1 OPSS.MUNI 805, November 2018, Temporary Erosion and Sediment Control Measures.

.2 OPSS.MUNI 1860, November 2018, Geotextiles

.2 Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) for Building Design and Construction, Version 4 Green Building Rating System.

1.4 Definitions

.1 Reference Section 805.03 of OPSS.MUNI 805.

.2 Abbreviations and Acronyms

.1 ESC – Erosion and Sediment Control

.2 CAPP – Construction Activity Pollution Prevention

.3 LEED – Leadership in Energy and Environmental Design

.4 NPDES – National Pollutant Discharge Elimination System

.5 OPSS – Ontario Provincial Standard Specifications

.3 Definitions

.1 Downstream: means downhill and down-gradient

.2 Upstream: means uphill and up-gradient

.3 Waterbody: means a lake or pond where water is without current

.4 Watercourse: means a river, stream, or creek and associated wetlands

1.5 Administrative requirements

.1 Coordination: Provide sub-contractor orientation, including a clear delineation of responsibilities for the sitework sub-trades and what is required to implement the proposed ESC Program.

1.6 Submittals

.1 Pre-Construction Submittals

.1 Provide digital photographs showing the condition of existing vegetation, grading, and any improvements that may be misconstrued as damaged caused by site clearing. Submit photos to the Consultant for review.

.2 Construction Submittals

.1 Installation Photo Record

.1 Take detailed photos of CAPP measures as they are being installed, documenting how geotextiles are anchored, and how the placement of materials is as stipulated on the contract drawings. Submit photos to the Consultant for review.

.2 Schedule C1

.1 The Contractor is to carry out weekly inspections of all CAPP measures to verify compliance with the requirements of this specification section. The Contractor is to Complete Schedule C1 to document each inspection. This schedule

must be completed and supported by digital photos from the time CAPP measures are in place to final landscaping is complete.

.3 Monthly LEED Construction Report

.1 Within 10 working days after the end of each month, the Contractor is to submit the following items as part of the Monthly LEED Construction Report required in specification Section 01 81 13 – Sustainable Design Criteria:

.1 Schedule C1 and supporting photos

2 Products

2.1 Erosion and sediment control measure – general

.1 Reference Section 805.05 of OPSS.MUNI 805.

2.2 Geotextile

.1 Provide geotextile free of holes, tears, and punctures.

.1 Silt Fence Geotextile – Provide geotextile for silt fence according to OPSS.MUNI 1860, Table 3.

.2 Rock Flow Check Dam Geotextile – Provide geotextile for rock flow check dams consisting of woven, Class II geotextile according to OPSS.MUNI 1860. Ensure the filtration opening size (FOS) no greater than 300 µm.

.3 Provide geotextile made of woven material. Ensure filtration opening size (FOS) is no greater than 300 µm, meeting CAN/CGSB 148.1, No. 10.

2.3 Stakes & control measure support

.1 Ensure stakes are of sufficient strength to satisfy control measure performance and maintenance requirements. Stakes for light-duty sediment barriers and anchoring straw bales to be a minimum of 0.6 m in length. Stakes for all other control measure applications to be a minimum of 1.2 m in length.

.2 Control Measure Support – Provide control measure support as separate product or one bonded to silt fence geotextile and be either plastic or wire mesh.

3 Execution

3.1 Examination

.1 Verification of Conditions - Review site conditions to ensure that the Construction Activity Pollution Prevention measures are adapted to respond to site specific issues and configuration.

.2 Existing Vegetation – document the condition of existing vegetation according to the submittal requirements herein. Wherever possible preserve existing vegetation and utilized as buffer strips on the site.

3.2 Construction erosion and sediment control measures

.1 Construct temporary erosion and sediment control measures according to Contract Drawings and Section 805.07 of OPSS.MUNI 805.

.2 Prevent cleared topsoil and excavated earth stockpiled on site from being eroded by rain storm, snow melt or wind.

.3 Install erosion and sediment control measure prior to commencing any excavation.

.4 Limit operation of vehicles on site to minimize disturbing soil.

.5 Clean vehicle tires before leaving Place of the Work in order to minimize tracking of soil onto roadways. Contractor is responsible for costs to clean roadway of tracked soil and debris.

.6 Establish Construction Activity Pollution Prevention measures in conjunction with initial removal of soil and vegetation. Ensure the measures are constructed as indicated in the contract documents and stipulated herein. The construction and removal times for temporary Construction Activity Pollution Prevention measures as specified in the Contract Documents.

.7 Dewatering

.1 Control dewatering effluent to prevent passage of sediment into a waterbody.

.2 Control discharge of dewatering effluent to dewatering traps to avoid exceeding trap capacity and to limit scour and washout.

.8 Dewatering Traps

.1 Construct dewatering traps as specified in the Contract Documents to prevent sediment passage beyond the perimeter of the trap.

.2 Construct dewatering traps as part of a single control measure consisting of an excavated basin, surrounded by a sediment barrier, with a rock flow check dam at the point of water outlet.

.9 Sediment Barriers, General

.1 Sediment barriers are straw bale barriers or silt fence barriers.

.2 Construct sediment barriers and maintained as specified in the Contract Documents.

.3 Construct sediment barriers as specified in the Contract Documents, without gaps and without undermining to prevent sediment passage through, under, or around the barrier.

.4 When sediment barriers are specified in the Contract Documents, the Contractor has the option to select either of the sediment barriers or any combination of them. When a specific sediment barrier is specified in the Contract Documents, substitution are not permitted for the control measure.

.5 Provide sediment barriers including protection placed against the downstream side at the low points of the barrier so that any overflow of the barrier is prevented from causing soil scour and erosion.

.10 Silt Fence Barriers

.1 Construct silt fence barriers as specified in the Contract Documents.

.2 Excavate trench to anchor the geotextile along the entire length of the barrier.

.3 Attach geotextile firmly, without sagging, to the upstream side of the stakes. Place silt fence barrier without gaps or breaks along its

length. Where the geotextile is joined to provide a continuous run, with the ends securely fastened and overlapped a minimum of 500 mm.

.4 Backfill trench (either with native material or gravel) and compact to existing grade to hold the base of the geotextile firmly in place.

.11 Catch Basin Protection

.1 Double-wrapped using geotextile cloth catch basin grates (both onsite or offsite) that could be impacted by the construction activities.

.2 Maintain catch basins so that sediment build-up does not restrict the flow of water or damage the wrapped filtration cloth.

.3 Remove sediment after all storm events and replace any damaged or weakened filtration media.

.4 Anchoring of filtration media using clearstone gravel may be required in addition to the weight of the catch basin under major flow conditions.

.12 Stabilized Construction Entrance

.1 Instate a stabilized construction entrance at all points of ingress or egress to or from the site respectively. All site entrance/access locations during construction to be approved by the Engineer.

.2 Construct stabilized construction entrance according to Contract Documents.

.3 Ensure filtration media is installed after the entrance has been excavated, and prior to backfilling with clearstone and rip rap.

.4 Wash sediment, add clearstone and/or riprap to ensure that entrance continues to operate effectively

.5 In wet sites augment stabilized construction entrance with a truck wash station (using water or compressed air) to ensure no soil leaves the site.

.13 Stockpiled Soil

.1 Stockpiled soil that remains onsite for more than 14 days and that does stabilize naturally from seeds and plant material contained in

the existing soil must be stabilized using one of the following methods:

.1 Tarp soil and ring perimeter with a light-duty silt fence

.2 Seed stockpiled soil, water as required to establish grass.

.3 Compact stockpiled soil into piles less than 3 meters tall, monitor to ensure compaction is sufficient to prevent erosion.

.2 Remove or use stockpiled soil in a timely manner to minimize erosion risk.

.14 Driveway and Roadway Maintenance

.1 The Contractor is responsible to maintain the entrance and adjacent roadway free of mud, silt and dirt from the site works. This may include (daily) sweeping or washing of the adjacent roadway at the direction of the Engineer and/or Contract Administrator.

.2 When site asphalt is installed, undertake a street cleaning schedule on a minimum weekly basis, or as directed by the Municipality or Conservation Authority.

.3 Provide mud mats as indicated on drawing.

.15 Storm Water Services Protection

.1 During installation of piped storm water services, the open ends of all pipes in trenches are to be filter wrapped or capped at the end of each work day to prevent sedimentation in the event of a precipitation event.

3.3 Onsite quality control

.1 Site Inspections: monitored to ensure temporary erosion and sediment control measures are in effective working order. Monitor the condition of these measures prior to any forecast storm event and following a storm event, and on a weekly basis. Document results of inspections using Schedule C1 and indicate condition of measures.

.2 Non-Conforming Work: Remediate as required where one or more measures have been jeopardized, and reinstate the measure immediately.

.3 Special Inspection Coordination: Consultant inspections will take place intermittently throughout construction and provide feedback to the Contractor as to the status of the CAPP measures.

3.4 Maintenance of erosion and sediment control measures

.1 Each Week: Inspect for erosion and sediment control measures, to ensure proper function.

.2 Remove accumulated sediment according to Subsection 805.07.15 of OPSS.MUNI 805.

.3 Maintain temporary erosion and sediment control measures constructed under this specification in an effective, functioning, stable condition until such time that the final landscaping is being installed.

.4 Sediment Removal

.1 Remove sediment that is accumulated by the temporary Construction Activity Pollution Prevention measures in a manner that avoids release of the sediment to the downstream side of the control measure and avoids damage to the control measure.

.2 Remove sediment to the level of the grade existing at the time the control measure was constructed according to the following requirements:

.1 Remove sediment for silt fencing, if the depth of sediment against the fence is 0.3 m or greater.

.2 Remove accumulated sediment for check dams, once a depth of one-half the effective height of the control measure is reached. Determine the effective height relative to the lowest point of the flow check dam.

.3 Remove accumulated sediment for all control measures, as necessary to perform maintenance repairs.

.4 Removed immediately accumulated sediment prior to the removal of the control measure.

.5 Management of Excess Material

.1 Management excess material according to the Contract Documents.

.2 Manage sediment removed from temporary erosion and sediment control measures as excess earth material

3.5 Removal of erosion and sediment control measures

.1 Remove temporary erosion and sediment control measures according to Subsection 805.07.16 of OPSS.MUNI 805 when no longer required on the project and as follows.

.2 As final landscaping work is completed, remove temporary Construction Activity Pollution Prevention measures and associated excavations backfilled and compacted when the measures are no longer required.

.3 Remove materials and reused offsite, or recycled/composted to minimize waste going to landfill.

.4 Ditch, permanent slope, and any other embankment cover specified elsewhere in the Contract Documents is to be placed within the area controlled by the temporary Construction Activity Pollution Prevention measure. Place and establish prior to the removal of such control measure.

.5 Any seeding and mulching, temporary cover, sod, other surface application, or original turf cover disturbed by removal or backfilling of Construction Activity Pollution Prevention measures and removal of accumulated sediment, and bring to final grade and restored as specified in the Contract Documents

End of section

1 General

1.1 General Product Requirements

.1 Products refer to materials, manufactured components and assemblies, fixtures and equipment incorporated in the work.

.2 As far as practical, favour use of products of Canadian manufacture unless such products are not manufactured in Canada, are specified otherwise, or are not competitive.

.3 Products for use in the Project and on which the Bid was based shall be in production at time of tender date, with a precise model and shop drawings available for viewing.

.4 Where equivalent products are specified, or where alternatives are proposed, these products claimed by the Contractor as equivalent shall be comparable in construction, type, function, quality, performance, and, where applicable, in appearance. Where specified equivalents are used in the Stipulated Price for the work, they shall be subject to final approval.

.5 Incorporate products in the work in strict accordance with Manufacturers' directions, instructions and specifications, where reference is made to them, shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, and other matters concerning the materials that are pertinent to their use and their relationship to materials with which they are incorporated.

.6 Products delivered to the Project site for incorporation in the work shall be considered the property of the Owner. Maintain protection and security of products stored on the site after payment has been made for them.

.7 Do not install permanently incorporated labels, trademarks and nameplates, in visible locations unless required for operating instructions or by authorities having jurisdiction.

1.2 Product handling

.1 Manufacture, pack, ship, deliver and store products so that no damage occurs to structural qualities and finish appearance, nor in any other way detrimental to their function or appearance, or both.

.2 Ensure that products, while transported, stored or installed, are not exposed to an environment which would increase their moisture content beyond the maximum specified.

.3 Schedule early delivery of products to enable work to be executed without delay. Before delivery, arrange for receiving at site.

.4 Deliver and store products at site where directed by the Contractor.

.5 Brace work such as door frames, large window units and similar products to prevent distortion or breakage in handling.

.6 Deliver packaged products, and store until use, in original unopened wrapping or containers, with manufacturer's seals and labels intact.

.7 Label packaged products to describe contents, quantity and other information as specified.

.8 Label fire-rated products to indicate approval of Underwriters' Laboratories.

.9 Product handling requirements may be repeated, and additional requirements specified, in other Sections.

1.3 Storage and protection

.1 Store products on site with secure protection against all harmful environmental conditions. Prevent damage, adulteration, staining and soiling of materials while stored.

.2 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup specified in Section 01 74 00 - Cleaning and Waste Management. Protection shall be easily removable under work of Section 01 74 00 - Cleaning and Waste Management without damage to finishes.

.3 Store manufactured products in accordance with manufacturers' instructions.

.4 Store steel, lumber, masonry units, and similar products on platforms raised clear of ground.

.5 Store finished products and woodwork under cover at all times.

.6 Do not store products at locations or in such a manner that they damage previously completed work.

.7 Storage and special protection requirements may be repeated and additional requirements specified, in other Sections.

1.4 Scheduling of product delivery

.1 In accordance with Section 01 65 00 - Product Delivery Requirements and as specified in this section.

.2 Verify that products supplied by all Sections are ordered from suppliers in sufficient time to ensure delivery for incorporation in the work within the time limits established by approved construction schedule.

.3 Obtain confirmed delivery dates from product suppliers.

.4 Immediately inform the Consultant should supplier's confirmation of delivery dates indicate that Project completion may be delayed.

.5 Submit copies of purchase orders and confirmations of delivery dates for products as may be requested.

.6 A schedule of product delivery shall be established and reviewed at each job site meeting.

.7 When deemed necessary, plant visits shall occur by the General Contractor to ensure delivery dates given are true and accurate.

1.5 Defective products and work

.1 Products and work found defective; not in accordance with the Specifications; or defaced or injured through negligence of the Contractor, his employees or Subcontractors, or by fire, weather or any other cause will be rejected for incorporation in the work whether or not incorporated in the work.

.2 Remove rejected products and work from the premises immediately.

.3 Replace rejected products and work with no delay after rejection. Provide replacement products and execute replacement work precisely as required by the Specifications for the defective work replaced. Previous inspection and payment shall not relieve the Contractor from the obligation of providing sound and satisfactory work in compliance with the Specifications.

.4 Testing and retesting of any part of the work as directed by the Owner, Consultant or Contractor to establish its conformance to the Contract Documents shall be performed at no addition to the Contract Price.

1.6 Workers, suppliers and subcontractors

.1 Assign work only to workers, suppliers, and Subcontractors who have complete knowledge, not only of the conditions of the Specifications, but of jurisdictional requirements, and reference standards and specifications.

.2 Give preference to use of local workers, suppliers and Subcontractors wherever possible.

.3 Certified and qualified installers of a specific product line shall be used when called for in these Specifications.

2 Products

2.1 Specified products

.1 Products used for temporary facilities may have been previously used, providing they are sound in structural qualities.

.2 Specified Options: The Work is based on materials, Products and systems specified by manufacturer's catalogued trade names, references to standards, by prescriptive specifications and by performance specifications.

.1 Where only one manufacturer's catalogued trade name is specified for a Product, the Product is single sourced and shall be supplied by the specified manufacturer.

.2 Where more than one manufacturer's catalogue trade name is specified for a Product, supply the Product from any one of those manufacturers specified.

.3 When a Product is specified by reference to a standard, select any Product from any manufacturer that meets or exceeds the requirements of the standard.

.4 When a Product or system is specified by prescriptive or performance specifications, Provide any Product or system which meets or exceeds the requirements of the prescriptive or performance specifications.

.5 The onus is on the Contractor to prove compliance with governing published standards, prescriptive specifications and with performance specifications.

.3 Products, materials, equipment and articles (referred to as Products throughout the Contract Documents) incorporated in the Work shall be new, not damaged or defective, and of the quality standards specified, for the purpose intended. If requested, furnish evidence as to type, source and quality of Products Provided.

.4 Where Contract Documents list acceptable Products or acceptable manufacturers, select as applicable, any one Product from any one manufacturer meeting performance of specifications.

.5 Where Contract Documents require design of a Product or system, and minimum material requirements are specified, the design of such Product or system shall employ materials specified within applicable section. Where secondary materials or components are not specified, augment with materials meeting applicable code limitations, and incorporating compatibility criteria with adjacent work.

.6 Defective Products, whenever identified prior to completion of the Work, will be rejected, regardless of previous reviews. Review of the Work by the Consultant or inspection and testing companies does not relieve the Contractor of the responsibility for executing the Work in accordance with the requirements of the Contract Documents, but is a precaution against oversight or error. Remove and replace defective Products and be responsible for delays and expenses caused by rejection at no additional cost to the Owner.

.7 Should any dispute arise as to quality or fitness of Products, the decision rests strictly with Consultant based upon the requirements of the Contract Documents.

.8 Unless otherwise indicated in the Contract Documents, maintain uniformity of manufacturer for any like item, material, equipment or assembly for the duration of the Work.

.9 Products exposed in the finished work shall be uniform in colour, texture, range, and quality, and be from one production run or batch, unless otherwise indicated.

.10 Permanent labels, trademarks and nameplates on Products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical, electrical, machinery or like rooms.

.11 Owner retains right to select from choices available within specified Products for colours, patterns, finishes or other options normally made available. Submit full range of Product options in accordance with 01 33 00 for such selection.

.12 Quality Control:

.1 Implement a system of quality control to ensure compliance with Contract Documents.

.2 Notify Consultant of defects in the Work or departures from intent of Contract Documents that may occur during construction. Consultant will recommend appropriate corrective action in accordance with requirements of the Contract.

3 Execution

3.1 Manufacturer's instructions

.1 Unless otherwise indicated in the Contract Documents, install or erect Products in accordance with manufacturer's printed instructions. Do not rely on labels or enclosures supplied with Products. Obtain printed instructions directly from manufacturers.

.2 Notify Consultant in writing, of conflicts between the Contract Documents and manufacturer's instructions.

.3 Improper installation or erection of Products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no additional cost to the Owner.

.4 Manufacturers’ representatives shall have access to the Work at all times. Contractor shall render assistance and facilities for such access in order that the manufacturers’ representatives may properly perform their function.

3.2 Galvanic/dissimilar metal corrosion

.1 Insulate dissimilar metals from each other by suitable plastic strips, washers or sleeves to prevent galvanic corrosion where conductive liquid or electrolyte exists.

3.3 Workmanship

.1 General:

.1 Execute the Work using workers experienced and skilled in the respective duties for which they are employed.

.2 Do not employ an unfit person or anyone unskilled in their required duties.

.3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with Consultant, whose decision is final.

.4 Upon request by the Consultant, submit proof, in the form of CCDC 11 - Contractor's Qualification Statement, of qualifications of Subcontractors to verify Subcontractor’s qualifications and experience meet or exceed the requirements of the Contract Documents.

.1 If, upon review of the Contractor’s Qualification Statement, it is found that the Subcontractor does not meet the qualification requirements specified in the Contract Documents pertaining to the parts of the Work for which the Subcontractor has been retained, the Contractor shall replace the unqualified Subcontractor with a qualified Subcontractor, satisfactory to the Contractor and the Owner, at no additional cost to the Owner and at no increase in the Contract Time.

.2 Coordination:

.1 Ensure cooperation of workers in layout of the Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

.3 Cutting and Remedial Work:

.1 Perform cutting and remedial work required to make parts of the Work come together. Coordinate the Work to ensure this requirement is maintained. Obtain permission from Consultant before commencing any cutting.

.4 Fastenings:

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action and corrosion between dissimilar metals and materials.

.5 Protection of work in progress:

.1 Take reasonable and necessary measures, including those required by authorities having jurisdiction, to Provide protection.

.2 Adequately protect parts of the Work completed or in progress. Parts of the Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Consultant, at no additional cost to the Owner.

.3 Do not cut, drill or sleeve any load bearing structural member without written permission of Consultant, unless specifically indicated.

.4 Keep floors free of oils, grease or other materials likely to discolour them or affect bond of applied surfaces.

.5 Protect work of other Subcontractors from damage while doing subsequent work. Damaged work shall be made good by appropriate Subcontractors but at expense of those causing damage.

.6 Protect existing buildings, curbs, roads and lanes. If, during the Work, any buildings, curbs, roads or lanes are damaged, bear costs for repairs.

.6 Existing Utilities:

.1 When breaking into or connecting to existing services or utilities, execute the Work at times approved by Owner, with a minimum of disturbance to Owner’s ongoing operations, the Work, and traffic.

.2 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service.

.7 Operational requirements: Operable Products shall be Provided fully operational and ready for intended use.

End of section

1 General

1.1 Section includes

.1 Product options.

.2 Procedures for substitution requests submitted after award of the Contract.

1.2 Related requirements

.1 Appendix B – Supplementary Conditions to CCDC 2 General Conditions

1.3 General product requirements

.1 All Products and materials supplied shall have a low V.O.C. rating.

1.4 Specified product options

.1 Performance or prescriptive standards:

.1 Select any product, assembly or component material that meets or exceeds the specified standards for products specified only by referenced standards and performance criteria.

.2 Acceptable products:

.1 Products specified by component material name, manufacturer, catalogue number, model number, or similar reference establishing the standard of acceptance that the Consultant will consider appropriate for the Work. Select any named Product, assembly or component material contained in the listing of Acceptable Products.

.3 Acceptable manufacturers:

.1 Select any product, assembly or component material manufactured by the listed Manufacturers that meets or exceeds the specified standards and performance criteria.

.2 Submit required Shop Drawing and Product data submissions before starting any work of the relevant Specification Section for review by Consultant.

1.5 Product substitutions

.1 Submit proposals for substitute Products or groups of Products in accordance with Section 01 25 00 – Substitution Procedures, and Appendix B – Supplementary Conditions.

.2 Owner is under no obligation to accept proposed substitute Products unless the Contractor can provide evidence satisfactory to the Consultant that such proposed substitute Product meets or exceeds the specified performance and other criteria.

1.6 Incorporation of specified Products

.1 Coordinate the installation of the selected Products into the Work:

.1 Make any changes in the Work as may be required to accommodate the selected Products.

.2 Notify Consultant where a selected Product is inconsistent with the layouts and configurations indicated on Drawings and Schedules.

.3 Bear costs and waive claims for additional compensation for costs that are implicit in the use of the selected Products.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Product delivery requirements and conditions.

1.2 Delivery requirements and conditions

.1 Fully indemnify the Owner for all damages to persons or property resulting from the services and operations performed by employees of the Contractor and all Subcontractors and suppliers, and all contracted agents or carriers, including the delivery and unloading of goods or equipment at (and transfer and unloading of bulk chemicals or fuels to) Regional facilities.

.2 Employ delivery vehicles that are suitably licensed, insured, operated and maintained in accordance with the Contract requirements, the Contractor's (and its agent's or carrier's) applicable policies and procedures, and all applicable federal, provincial and municipal legislation, statutes and by-laws.

.3 Ensure that the Contractor's forces receive and sign off on all deliveries and shipments required for the Work. The Owner will not be responsible for the sign off on any deliveries for the Contractor.

.4 Equip all delivery vehicles with any other material handling equipment required for the delivery person to safely unload the shipment at the receiving location(s) at the Place of the Work and move the Products to the designated receiving area(s) identified in the Contract.

.5 Equip delivery vehicles, where required, with a hydraulic tailgate for unloading heavy equipment, packages, drums, pallets and similar large, heavy items at receiving locations which are not equipped with a truck loading dock.

2 Products – not used

3 Execution – not used

End of section

1 General

1.1 Section includes

.1 Progressive cleaning.

.2 Cleaning prior to application for Substantial Performance.

.3 Cleaning prior to Completion.

1.2 Related Requirements

.1 Section 01 74 19 – Construction and Demolition Waste Management

.2 Section 01 81 13 – Sustainable Design Requirements

.3 Section 01 81 19 – Construction IAQ Requirements

.4 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Submittals

.1 Provide disposal plan according to Section 01 74 19 – Construction and Demolition Waste Management.

.2 Submit a disposal plan to the Owner and do not commence work prior to the Owner's approval of the disposal plan.

2 Products

2.1 Cleaning materials

.1 Cleaning agents and materials: Low VOC content according to Section 01 81 13 – Sustainable Design Requirements, and Section 01 81 19 – Construction IAQ Requirements.

3 Execution

3.1 Progressive cleaning

.1 Maintain site in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other contractors.

.2 Remove waste materials from site or dispose of waste materials as directed by Consultant. Do not burn waste materials on site.

.3 Clear snow and ice from area of construction, bank or pile snow in designated areas only.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Make every reasonable effort to recycle or otherwise salvage the materials removed from the site.

.6 Separate and recycle waste materials and dispose of them in accordance with local municipal requirements and policies.

.7 Dispose of unused paint material at official hazardous material collections site approved by Owner.

.8 Remove waste material and debris from site, or deposit in waste container(s), at end of each working day.

.9 Waste containers, if allowed:

.1 Provide on-site steel framed, hinged lid containers for collection of waste materials and debris.

.2 Provide and use clearly marked, separate bins for recycling.

.3 Place waste containers in an area directed by the Owner. Pay for all associated costs and permits. Do not locate bins on a structural slab.

.4 Remove and replace waste containers promptly when full and upon completion of the work.

.10 Storage of waste material and debris outside of the waste containers is not be permitted.

.11 Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations.

.12 Store volatile waste in covered metal containers and remove from premises at end of each working day.

.13 Provide adequate ventilation during use of volatile or noxious substances. Use of enclosure ventilation systems is not permitted for this purpose.

.14 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.15 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

3.2 Cleaning prior to application for Substantial Performance

.1 Prior to applying for Substantial Performance of the Work, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others and leave Work clean and suitable for occupancy.

.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by Owner or other contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors, washroom accessories, hardware, and all other work exposed to view.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Clean and polish surface finishes, as recommended by manufacturer.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep roofs, gutters, areaways, and sunken wells.

.16 Sweep and wash clean paved areas.

.17 Clean equipment and fixtures to a sanitary condition; replace all filters of mechanical equipment.

.18 Clean roof surfaces, down-spouts, and drainage components.

.19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.20 Remove snow and ice from access to facilities.

3.3 Cleaning prior to Completion

.1 Execute final cleaning prior to Completion acceptance review.

.2 Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

.3 Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

.4 Replace all filters of operating equipment.

.5 Clean site; sweep paved areas, rake clean landscaped surfaces.

.6 Remove waste and surplus materials, rubbish, and construction facilities from the site.

3.4 Waste management and disposal

.1 Preform construction and demolition waste management and disposal according to Section 01 74 19 – Construction and Demolition Waste Management.

End of section

1 General

1.1 Section includes

.1 Salvaging nonhazardous demolition and construction waste.

.2 Recycling nonhazardous demolition and construction waste.

.3 Disposing of nonhazardous demolition and construction waste.

1.2 Related Requirements

.1 Section 01 74 00 – Cleaning and Waste Management

.2 Section 01 81 13 – Sustainable Design Criteria

1.3 Definitions

.1 Alternative Daily Cover (ADC): Cover material other than soil placed on the surface of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging.

.2 Commingled Waste: Single-stream recycling of material waste, considered as one material waste steam unless diversion rates can be provided by the recycling facility for specific materials.

.3 Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging. Hazardous materials are not included.

.4 Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations. Hazardous materials are not included.

.5 Disposal: Removal off-site of demolition and construction waste and subsequent deposit in landfill or incinerator acceptable to authorities having jurisdiction.

.6 Diversion: To remove, or have removed, from the site for recycling, reuse, salvage, or return of materials that might otherwise be sent to a landfill. Diversion from landfill does not include burning, incinerating, thermally destroying waste, or waste-to-energy processes.

.7 Return: To send back reusable or unused products to vendors or manufacturers.

.8 Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

.9 Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

.10 Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

.11 Segregation: To place similar waste materials together for collection in a designated site area, trash bin, or roll-off container.

.12 Waste: Waste includes salvageable, returnable, recyclable and reusable material as well as material sent to landfill or incineration facilities. Hazardous materials are not included.

.13 Waste Management Plan: A project-specific plan for the collection, transportation, recycling, salvage, and disposal of waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material that is disposed of in landfills or incineration facilities.

.14 Waste Material Stream: A flow of materials from a job site into markets for building materials, comprised of a material category (or mixture of several material categories) combined with a diversion method. A material stream must constitute at least five percent (by weight or volume) of total diverted materials for the Project. Examples include source separated materials sent to specific recycling facilities, commingled waste sent to a mixed-waste recycling facility, deconstructed materials sent back to a manufacturer as part of a take-back program, or salvaged materials reused on site.

.15 Waste-To-Energy: The conversion of non-recyclable waste materials into usable heat and/or fuel through a variety of processes such as combustion, not including the combustion of wood into wood-derived fuel.

1.4 Performance requirements

.1 Project Diversion Goals: The Owner has established a goal to achieve the following total end-of-Project waste diversion rates (by weight or volume)

of total non-hazardous solid waste generated by the demolition and construction Work:

.1 Required: Minimum 75 % diversion

.2 Target: 95 % diversion

.2 General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, as applicable to the Work:

1.5 Action submittals

.1 Waste Management Plan: Submit plan prior to mobilization on site.

.1 Waste generated by on-site workers, such as plastic and metal beverage containers.

.2 All fluorescent lamps, HID lamps, and mercury-containing thermostats removed from the site shall be recycled.

.2 Alternative Daily Cover: Alternative Daily Cover (ADC) may not be included as diverted material used to meet Project diversion rate goals.

.3 Waste Management Plan: The Contractor shall be responsible for the development and implementation of a Construction Waste Management Plan for the Project.

.1 Final Construction Waste Management Plan: The plan shall contain the following:

.1 Estimate of the total proposed jobsite waste to be generated, including types and quantities.

.2 Proposed alternatives to Landfilling: A list of each material proposed to be salvaged, reused, or recycled during the course of the Project, the proposed destination for each material, and the projected amount (by weight or CY)

.3 Materials handling procedures: A description of the means by which any waste materials identified in Performance Requirements above will be separated (either sorted on-site or commingled on-site and sorted off-site) and protected from contamination, and the means to be employed in recycling the above materials consistent with the

requirements for acceptance by recycling processors to be utilized.

.4 If waste materials are sorted and separated on-site, include anticipated sizes and quantity of containers, container labeling, and location(s) on the Project site.

.5 List of documentation to be provided in Progress Reports.

.6 Identification of material streams, as defined in the Section.

.2 Prior to request for Substantial Completion, provide final approved Waste Management Plan and summary table indicating site-separated waste, by diverted material type, that indicates the total percentage of construction waste diverted from landfill and the identified waste material streams.

1.6 Informational submittals

.1 Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit a monthly Waste Management Report including a current Waste Tracking Form. Contractor may use their own Waste Tracking Form format or a sample form can be provided upon request. Include the following information:

.1 Project title, name of company completing report, and dates of period covered by the report

.2 Report on the disposal of all jobsite waste, including:

.1 Recycled materials. For each material stream, provide the following:

.1 Amount (in tonnes or cubic metres)

.2 Dates removed from the jobsite

.3 Receiving Party

.2 Reused or salvaged materials. For each material stream, provide the following:

.1 Amount (in tonnes or cubic metres)

.2 Description of intended or actual use

.3 Market value of materials

.3 Landfilled materials. Provide the following:

.1 Amount (in tonnes or cubic metres)

.2 Dates removed from the jobsite

.3 Identity of the transfer station or landfill

.4 Gross total quantity of waste generated during the period.

.5 Include a breakdown of diverted waste for each of the identified waste material streams and major material categories as follows:

.1 Concrete

.2 Steel or Metals

.3 Wood

.4 Gypsum Wallboard

.5 Crushed Asphalt

.6 Masonry

.7 Cardboard

.8 Blue box

.6 Provide the quantity of land clearing debris and excavation soil. Note that these categories do not qualify as diverted waste for LEED projects.

.7 Provide the name and location of the recycling or disposal facility that accepted the material.

.8 Provide the percentage of total diverted waste generated as a percentage of total waste for the current period and cumulative project-to-date.

.3 Records:

.1 Legible copies of on-site logs, weight tickets and receipts. Receipts shall be from recycling, processing and/or disposal site operators who can legally accept the materials for the purpose of reuse, recycling or disposal.

.2 If mixed construction and demolition waste is sorted off-site, provide a letter from the processor stating that reported quantities will reflect actual project values, and not average percentage of mixed C&D waste they recycle. Subcontractor shall save such original documents (as above) for the life of the project plus seven (7) year(s).

.3 Records of salvaged materials donated to charitable organizations. Indicate whether organization is tax-exempt.

.4 Waste Reduction Final Report: Submit final report prior to the final Application for Payment.

.2 Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

.1 Exclude excavation soil, land clearing debris and hazardous material.

.2 Calculations may be performed using either weight or volume, but shall be done consistently throughout the duration of the Project. Where exact materials weights or volumes are not available, use the following Conversion Factors, which are acceptable for LEED projects:

.1	Cardboard	59 kg/m^3
.2	Gypsum wallboard	297 kg/m^3
.3	Mixed waste	208 kg/m^3
.4	Rubble	831 kg/m^3
.5	Steel	593 kg/m^3
.6	Wood	178 kg/m^3

.3 Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

.4 Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

.5 Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

.6 Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

.7 Records of Returns: Indicate receipt and acceptance by vendors or manufacturers who have accepted waste materials as part of their take-back programs. Include receipts.

.8 Records of Commingled Waste: If mixed construction and/or demolition waste will be commingled on-site and separated, sorted, and diverted off-site, provide monthly summaries of diversion rates from Recycler/Processor based on one of the following:

.1 *Project-specific diversion rate based on actual measurement of each component waste material*. Note that visual inspection is not an acceptable method of evaluation for documenting this percentage.

.2 If Recycler/Processor provides facility-wide aggregated, annual averaged diversion rates in lieu of Project-specific diversion rates, provide documentation that the Recycler/Processor's method of recording and calculating these rates is regulated by a local or state government authority.

.9 LEED Submission: At end of construction submit required documentation for LEED v4 MR prerequisite Construction and Demolition Waste Management Planning and MR credit Construction and Demolition Waste Management, including:

.1 Completed LEED Online credit forms.

.2 Completed LEED v4 Construction and Demolition Waste Management Calculator (Excel file). The Excel source file can be provided on request or downloaded from http://www.usgbc.org/resources/construction-and-demolition-waste-calculator

.3 All required supporting documentation uploaded to LEED Online.

.10 Qualification Data: For refrigerant recovery technician (if applicable).

.11 Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 Quality assurance

.1 Waste Management Coordinator Qualifications: Experienced, with a record of successful waste management coordination of projects with similar requirements. LEED-Accredited Professional, certified by GBCI.

.1 Project LEED Coordinator may serve as the Waste Management Coordinator.

.2 Contractor is responsible for maintaining the LEED Representative throughout the Project duration. If there are staff changes, the Contractor and that that Designated Representatives shall be responsible for transitioning the knowledge base and tracking items to the new Representative.

.2 Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

.3 Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

.4 Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 – Project Management and Coordination. Review methods and procedures related to waste management including, but not limited to, the following:

.1 Review and discuss waste management plan including responsibilities of waste management coordinator.

.2 Review requirements for documenting quantities of each type of waste and its disposition.

.3 Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

.4 Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

.5 Review waste management requirements for each trade.

.5 Project Meetings: The Waste Management Plan and implementation shall be discussed at the following meetings:

.1 Pre-demolition meeting (if applicable).

.2 Pre-construction meeting.

.3 Regular job-site meetings.

.4 Sub-contractor job-site coordination meetings.

1.8 Waste management plan

.1 General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

.2 Waste Identification: Indicate all anticipated types and quantities of demolition, site clearing, and construction waste generated by the Work, including identifying at least five (5) materials streams targeted for diversion on the Project. Include estimated quantities and assumptions for estimates.

.3 Waste Reduction Work Plan: For each waste material stream, list the means of disposal and whether it will be diverted (salvaged, recycled, and/or reused) or sent to landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, identification or receiving facilities, and handling and transportation procedures.

.1 Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.

.2 Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

.3 Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

.4 Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

.5 Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

.6 Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

.7 Alternative Daily Cover: Include a statement affirming that alternative daily cover or other excluded materials were not included in calculations used to meet Project diversion rate goals.

2 Products – not used

3 Execution

3.1 Plan implementation

.1 General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

.1 Comply with operation, termination, and removal requirements in Section 01 50 00 – Temporary Facilities and Controls.

.2 Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

.3 Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

.1 Distribute waste management plan to everyone concerned within three days of submittal return.

.2 Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

.4 Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

.1 Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

.2 Comply with Section 01 50 00 – Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.

.5 Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by distance determined by the Architect or more.

3.2 Salvaging demolition waste

.1 Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

.1 Clean salvaged items.

.2 Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.

.3 Store items in a secure area until installation.

.4 Protect items from damage during transport and storage.

.5 Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

.2 Salvaged Items for Sale and Donation: Not permitted on Project site, unless otherwise indicated.

.3 Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

.1 Salvage items indicated on the drawings.

.2 Clean salvaged items.

.3 Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.

.4 Store items in a secure area until delivery to Owner.

.5 Transport items to Owner's storage area off-site, designated by Owner.

.6 Protect items from damage during transport and storage.

.4 Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

.5 Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

.6 Plumbing Fixtures: Separate by type and size.

.7 Lighting Fixtures: Separate lamps by type and protect from breakage.

.8 Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 Recycling demolition and construction waste, general

.1 General: Recycle paper and beverage containers used by on-site workers.

.2 Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.

.3 Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

.4 Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

.1 Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

.1 Inspect containers and bins for contamination and remove contaminated materials if found.

.2 Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

.3 Stockpile materials away from construction area. Do not store within drip line of remaining trees.

.4 Store components off the ground and protect from the weather.

.5 Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 Recycling demolition waste

.1 Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

.2 Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

.3 Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

.4 Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

.5 Metals: Separate metals by type.

.1 Structural Steel: Stack members according to size, type of member, and length.

.2 Remove and dispose of bolts, nuts, washers, and other rough hardware.

.6 Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

.7 Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

.8 Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

.9 Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

.10 Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

.1 Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

.11 Carpet Tile: Remove debris, trash, and adhesive.

.1 Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

.12 Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

.13 Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 Recycling construction waste

.1 Packaging:

.1 Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

.2 Polystyrene Packaging: Separate and bag materials.

.3 Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

.4 Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

.2 Wood Materials:

.1 Clean Cut-Offs of Lumber: Grind or chip into small pieces.

.2 Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

.3 Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

.1 Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 Disposal of waste

.1 General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

.1 Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

.2 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

.2 Burning: Do not burn waste materials.

.3 Disposal: Remove waste materials from Owner's property and legally dispose of them.

End of section

1 General

1.1 Section includes

.1 Adjusting products and equipment required by all Specifications Sections for this Contract.

1.2 Related requirements

.1 Section 01 74 00 – Cleaning and Waste Management

.2 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Purpose

.1 Perform testing adjusting and balancing of operating systems in Contract by an agency that will be selected by the Owner and consigned to this Contract.

.2 Prior to start of balancing, ensure systems are:

.1 Piped, ducted, wired and wireless services and systems, including components and equipment forming part thereof.

.2 Manually and mechanically operated, including components and equipment forming any part.

.3 Testing, adjusting and balancing will not be started until after all static checks have been completed for the system being balanced and signed off on the commissioning report forms.

.4 Contractor to ensure systems are operated at designated times, under conditions required for proper testing, adjusting, and balancing.

.5 Report any deficiencies or defects which may effect the balancing or noted during testing, adjusting and balancing, which cannot be promptly corrected.

2 Products – not used

3 Execution

3.1 Preparation

.1 Prepare each system and item of equipment for testing, adjusting and balancing.

.2 Verify that each system and equipment installation is complete and in functional operation.

.3 Verify appropriate ambient conditions.

3.2 Testing

.1 Tests will be conducted to confirm compliance with requirements of Contract Documents. Take corrective action as necessary.

3.3 Adjusting

.1 Adjust operating Products and equipment to ensure smooth and unhindered operation.

.2 Provide equipment required to ensure proper, efficient and safe operation of all equipment including belts and sheaves.

3.4 Balancing

.1 Cooperate with and assist the balancing agent to ensure that the various parts of system are in a proper state of equilibrium.

End of section

1 General

1.1 Section includes

.1 Inspections and declarations.

.2 Spare parts, maintenance materials and special tools.

.3 Operation and maintenance manual

.4 Recording actual site conditions.

.5 Record (as-built) documents and samples.

.6 Record documents.

.7 Final survey.

.8 Extended Warranties.

1.2 Related requirements

.1 Section 01 31 00 – Project Management and Coordination

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 45 00 – Quality Control

.4 Section 01 79 00 – Demonstration and Training

.5 Section 01 91 00 – General Commissioning Requirements

.6 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Inspections and declarations

.1 **Contractor's inspection**: Contractor and all Subcontractors shall conduct an inspection of the Work, identify deficiencies and defects, issue list of deficiencies and repair as required to conform to the Contract Documents.

.2 Notify the Consultant in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made.

.3 Request the Consultant's Inspection.

.4 **Consultant's inspection**: Consultant and Contractor will perform an inspection of the Work to identify obvious defects or deficiencies.

Consultant will generate a list of deficiencies. Correct defective and deficient Work accordingly.

.5 Consultant will identify in inspection report all items deemed to affect issuance of Substantial Performance.

.6 **Substantial Performance**: Contractor shall submit a written certificate that the following has been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted, balanced, Commissioned and are fully operational.

.4 Certificates required by authorities having jurisdiction have been submitted.

.5 Statements for verifying LEED credit application.

.6 Operation of systems have been demonstrated to Owner's personnel.

.7 All required documentation has been submitted.

.8 Work is complete and ready for Substantial Performance Inspection.

.7 **Substantial Performance inspection**: When items noted in 1.3.6 above are completed, request Substantial Performance Inspection of the Work by the Consultant and the Owner. If Work is deemed incomplete by Consultant or Owner, complete all such outstanding items and request re-inspection.

.8 **Declaration of Substantial Performance**: When the Owner considers deficiencies and defects have been corrected and it appears requirements of the Construction Act with respect to Substantial Performance, as amended by the Supplementary Conditions, have been met, make application for Substantial Performance of the Work.

.9 **Commencement of warranty period**: The date of Substantial Performance of the Work, as certified by the Owner, shall be the date for commencement of the warranty period.

.10 **Commencement of lien period**: The date of publication of the certificate of Substantial Performance of the Work shall be the date for commencement of the lien period.

.11 **Release of basic (statutory) holdback**: After issuance of certificate of Substantial Performance of the Work, submit an application for payment of the basic holdback retained by the Owner under the Construction Act.

.12 **Payment of finishing holdback**: After issuance of Certificate of Completion, submit an application for payment of finishing holdback retained by the Owner under the Construction Act.

.13 **Final inspection**: Consultant and Owner will conduct a Final Inspection within three (3) months of the end of the warranty period. If deficient or defective Work is identified by Owner, correct deficient or defective Work and request re-inspection.

.14 **Final payment**: When the Owner considers that all deficiencies and defects have been corrected and it appears all Contractor obligations under the Contract have been fulfilled, the Owner will issue a Final Acceptance Certificate and issue final payment.

1.4 Operation and maintenance manual

.1 Prepare an operation and maintenance manual during the course of construction for all equipment installed.

.2 Prepare instructions and data using personnel experienced in maintenance and operation of described Products and systems.

.3 At least two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, two (2) hard copies, and one (1) electronic copy of the draft Operation and Maintenance Manual in Canadian English.

.4 Operation and Maintenance Manual shall include copies of the manufacturer’s Product data sheets and operating and maintenance manuals for all equipment installed. PDF file shall not have any security protection applied (i.e. no passwords).

.5 Consultant will return a copy after the Substantial Performance inspection with Consultant's and Owner’s comments.

.6 Revise content of documents of the Operation and Maintenance Manual as required prior to final submittal.

.7 Provide **a single PDF file** of the complete, final Operation and Maintenance Manual after acceptance by the Owner. The PDF file shall not have any security protection applied (i.e. no passwords).

.8 Substantial Performance will not be granted until an acceptable Operation and Maintenance Manual has been submitted to the Consultant and Owner.

1.5 Operation and maintenance manual format

.1 Hard copy binders:

.1 Organize data in the form of an instructional manual.

.2 Provide vinyl, hard covered, 3 'D' ring, 8.5 inch x 11 inch binder with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover:

.1 Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: Manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.2 Electronic files:

.1 Single file in PDF format duplicating hard copy manual.

.2 Organize PDF file same as hard copy binders.

.3 Use PDFs from original electronic files, combined into a single file. Avoid scanning hard copy documents to PDF files.

1.6 Operation and maintenance manual contents

.1 Each volume of the operation and maintenance manual shall include each item specified in this article.

.2 Provide table of contents including:

.1 Title of project.

.2 Date of submission.

.3 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.

.4 Schedule of products and systems, indexed to content of volume.

.5 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data

.1 Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 – Quality Control.

.4 Drawings

.1 Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Certificates of Acceptance

.1 Provide relevant certificates issued by Authorities Having Jurisdiction, including life safety systems performance certificate.

.6 Training Manuals

.1 Refer to Section 01 79 00 – Demonstration and Training.

.7 Copy of Pre-Start Health and Safety Reports.

1.7 Recording actual site conditions

.1 Record information on set of black line drawings, and within the project manual, provided by Owner.

.2 Annotate with red coloured felt tip marking pen, for recording changed information. As requested by the Consultant, use multiple colored marking pens to differentiate between systems.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is accurately recorded.

.4 Drawings and Shop Drawings

.1 Legibly mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications

.1 Legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents

.1 Maintain manufacturer's certifications, field test records, inspection certifications, required by individual specifications sections.

1.8 As-built documents and samples

.1 In addition to requirements in Section 01 31 00 – Project Management and Coordination, maintain at the site one record copy of:

.1 Reviewed shop drawings, product data, and samples.

.2 Field test records.

.3 Inspection certificates.

.4 Manufacturer's certificates.

.2 Store as-built documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label as-built documents and file in accordance with technical specification section number. Label each document “As-Built Documents” in neat, large, printed letters.

.4 Maintain as-built documents in clean, dry and legible condition. Do not use as-built documents for construction purposes.

.5 Keep as-built documents and samples available for inspection by Consultant.

.6 Prior to Substantial Performance of the Work, provide final draft redline mark-up As-Built Drawings to Consultant with as-built dimensions and spatial arrangements.

.7 Consultant will review the As-Built Drawings and provide comments to the Contractor with a copy to the Owner.

.8 Revise As-Built Drawings taking the comments from the Consultant into account.

.9 Submit final As-Built Drawings to the Consultant prior to requesting Substantial Performance.

.10 **Substantial Performance will not be granted until final, acceptable As-Built Drawings have been submitted to the Consultant and Owner**.

1.9 Extended warranties

.1 Refer to Section 01 78 37 – Extended Warranties.

2 Products

2.1 Materials and finishes

.1 Building Products, Applied Materials, and Finishes: Provide product data, with catalogue number, size, composition, and colour and texture

designations. Provide information for re-ordering custom manufactured products.

.2 Provide instructions for cleaning agents and methods; precautions against detrimental agents and methods; and recommended schedule for cleaning and maintenance.

.3 Moisture-Protection and Weather-Exposed Products: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Building Envelope: Include copies of drawings of building envelope components, illustrating the interface with similar or dissimilar items to provide an effective air, vapour and thermal barrier between indoor and outdoor environments. Include an outline of requirements for regular inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.

.5 Additional Requirements: as specified in individual specifications sections.

2.2 Spare parts, maintenance materials and special tools

.1 Receive and catalog all items. Check inventory against operation and maintenance manual. Include approved listing in operation and maintenance manual.

.2 If requested, furnish evidence as to type, source and quality of products provided.

.3 If requested, provide receipts for delivered spare parts, materials and tools prior to Substantial Performance of the Work.

.4 Defective products will be rejected regardless of previous inspections. Replace defective products at own expense.

.5 Pay all costs of transportation, duties, tariffs, etc.

.6 Spare parts

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide identical items of same manufacturer, dye-lot or production run as items in the Work

.3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in operation and maintenance manual.

.4 Obtain receipt for delivered products and submit prior to final payment.

.7 Maintenance materials

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in operation and maintenance manual.

.4 Obtain receipt for delivered products and submit prior to final payment.

.8 Special tools

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in operation and maintenance manual.

3 Execution

3.1 Deliver to site

.1 Deliver spare parts, maintenance materials, and special tools to location as directed; place and store.

3.2 Storage, handling and protection

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

End of section

1 General

1.1 Section includes

.1 The Section includes the requirements related to submission of extended warranties.

1.2 Related requirements

.1 CCDC 2 – General Conditions

.2 Appendix B – Supplementary Conditions to CCDC 2 General Conditions

.3 Section 01 31 00 – Project Management and Coordination

.4 Section 01 78 00 – Closeout Submittals

.5 Extended Warranties for specific Products and systems are specified in the relevant Technical Specification Sections of Divisions 02 through 48 as applicable.

1.3 Definitions

.1 Extended Warranty: Unless otherwise specified, an extended warranty is a full labour and materials product or system warranty which is required beyond the expiry of the two (2) year Contract warranty period. Extended warranties shall commence upon the expiry of the Contract warranty period; therefore, the total warranty period is two (2) years plus the extended warranty period.

1.4 Administrative requirements

.1 Inform all manufacturers providing extended warranties of all obligations required under such extended warranties.

1.5 Submittals

.1 Provide the following information with each extended warranty:

.1 Name and address of manufacturer

.2 Warranty description and length of warranty

.3 Procedure for failure or malfunction

.4 Instances which will affect warranty

.5 Certification of Contractor's installation

.6 Manufacturer's certification

.2 Extended warranties shall be submitted to the Consultant no later than thirty (30) calendar days after the date of Substantial Performance of the Work. **After Substantial Performance of the Work, the Owner will retain $2,000 until satisfactory extended warranty documents are provided.**

1.6 Payment

.1 Payment for this Section shall be made only upon submission of extended warranty documentation satisfactory to the Owner for all specified extended warranties. No partial payment will be made for submission of individual extended warranties.

2 Products

2.1 Extended warranties

.1 Extended Warranties are required for the following Products and systems. Reference the specific section specification for details.

.2 Extended Warranties for the specified components and Sections will remain in effect for the number of years as follows:

Product / System	Section	Length of Extended Warranty (years)	Total Length of Product / System Warranty (years)
Solid Surfacing Fabrication – Materials and Workmanship	06 61 16	8	10
Cold Fluid-Applied Waterproofing – Manufacturer's Warranty	07 14 16	8	10
Metal Roof Panels – Finishes	07 41 13	18	20
Metal Roof Panels – Weather Tightness	07 41 13	3	5

Product / System	Section	Length of Extended Warranty (years)	Total Length of Product / System Warranty (years)
Aluminum Plank Panels	07 46 17	13	15
Metal Wall Panels	07 46 19	3	5
Cold Adhesive Applied Modified Bituminous Membrane – Manufacturer's Warranty	07 52 23	18	20
Sealants	07 92 00	3	5
Sealants – Material Warranty on Silicone Sealants	07 92 00	18	20
Wood Doors	08 14 00	3	5
Electric Operating Equipment for Aluminum Framed Sectional Doors – Manufacturer's Warranty	08 36 16	3	5
Aluminum Framed Entrances and Storefronts System	08 41 13	3	5
Aluminum Framed Entrances and Storefronts – Metal Finishes	08 41 13	8	10
Glazed Aluminum Curtain Wall System	08 44 13	3	5
Glazed Aluminum Curtain Wall – Metal Finishes	08 44 13	8	10
Door Hardware – Manufacturer's Warranties – Hinges	08 70 00	Lifetime	Lifetime
Door Hardware – Manufacturer's Warranties – Electrified Hinges	08 70 00	1	3

Product / System	Section	Length of Extended Warranty (years)	Total Length of Product / System Warranty (years)
Door Hardware – Manufacturer's Warranties – Mortised Locksets	08 70 00	7	9
Door Hardware – Manufacturer's Warranties – Electrified Locksets	08 70 00	2	4
Door Hardware – Manufacturer's Warranties – Exit Devices & Electric Strikes	08 70 00	5	7
Door Hardware – Manufacturer's Warranties – Door Closers	08 70 00	10	12
Glass Glazing – Insulated Glass Unit	08 80 00	8	10
Fixed Metal Louvers – Special Finish Warranty	08 90 00	8	10
Tiling	09 30 00	3	5
Resilient Flooring and Accessories	09 65 00	3	5
Resinous Flooring	09 67 23	3	5
Tile Carpeting	09 68 13	8	10
Signage – Manufacturer's Warranty	10 14 00	3	5
Signage – Finishes	10 14 00	8	10
Demountable Premanufactured Partition Systems	10 22 19	3	5
Operable Partitions - Hinges	10 22 26	Lifetime	Lifetime
Roller Window Shades	12 24 13	8	10
Manufactured Metal Casework	12 31 00	3	5

Product / System	Section	Length of Extended Warranty (years)	Total Length of Product / System Warranty (years)
Entrance Mats – Polyvinyl Chloride	12 48 29	3	5
Fabricated Metal Gates – System Failure	32 31 13	3	5
Fabricated Metal Gates - Finish	32 31 13	18	20
Variable Frequency Drives	20 05 15	3	5
Piping Expansion Compensation	20 05 16	3	5
Domestic Water Pumps	22 11 23	3	5
Domestic Water Heaters and Packaged Water Heating Systems	22 30 05	3	5
Domestic Water Heaters – Heater Tanks	22 30 05	1	3
Air Terminal Units	23 36 00	3	5
Heating Boiler Vessels	23 52 00	3	5
Split Air Conditioning Systems - Compressors	23 70 00	3	5
Water Source Heat Pumps - Compressors	23 81 40	3	5
Radiant Heating – Crosslinked Polyethylene Pipe	23 83 00	23	25
Radiant Heating – Manifolds and Fittings	23 83 00	3	5
Controls – Valves	25 01 00	3	5
Photovoltaic Collectors – Modules – Manufacturer’s Warranty	26 31 00	3	5

Product / System	Section	Length of Extended Warranty (years)	Total Length of Product / System Warranty (years)
Photovoltaic Collectors – Minimum 90% Power Output Guarantee	26 31 00	8	10
Photovoltaic Collectors – Minimum 80% Power Output Guarantee	26 31 00	18	20
Photovoltaic Collectors – Module Mounting System – Manufacturer's Warranty	26 31 00	8	10
Photovoltaic Collectors – Combiner Boxes, Inverters, and Charge Controllers	26 31 00	3	5
Lighting – LED Luminaires	26 50 00	3	5
Emergency Lighting and Exit Signs – LED Lamps in Exit Signs	26 52 00	8	10
Emergency Lighting and Exit Signs – Emergency Lighting Unit Equipment Batteries	26 52 00	8	10
Direct Geo-Exchange Ground Heat Exchanger – Pipe	23 57 33	48	50

3 Execution

3.1 Contractor requirements

.1 Inform all manufacturers providing extended warranties of all obligations required under such extended warranties.

.2 Provide access to the work site to all manufacturers required to provide extended warranties for such manufacturers to witness installation of

equipment and systems requiring an extended warranty as well as related and interconnected products and systems.

3.2 Warrantor requirements under extended warranties

.1 Manufacturers shall provide extended warranties.

.2 Extended warranties shall provide the Owner with the same rights as the original contract warranty.

.3 All work performed under an extended warranty shall be subject to the same warranty as the original work of the Contract, and such warranty shall remain in effect until the expiry of the extended warranty

.4 Upon notification of defects in product or services under an extended warranty, remedy any defect identified by the Owner during the period specified in Clause 3.2.3.

.5 Remedy any damage to Owner-owned or controlled real or personal property, when such damage is the direct result of any defect of equipment, material, workmanship, or design furnished.

.6 Commence repairs and replacements within seven (7) calendar days of notification of defect unless a shorter response time is specified elsewhere in the Contract Documents.

.7 Supplier’s/manufacturer’s standard disclaimers and limitations on product and services warranties shall not relieve the warrantor of their obligations required under the specific extended warranty.

.8 The warrantor shall not be liable for the repair of any defects of material nor resultant damage where such defect or damage results from any defect in Owner-furnished material or design.

End of section

1 General

1.1 Section includes

.1 Procedures for demonstration and instruction of Products, equipment and systems to Owner's personnel.

.2 Seminars and demonstrations.

1.2 Related requirements

.1 Section 01 75 19 – Testing and Balancing

.2 Section 01 91 00 – General Commissioning Requirements

.3 This section describes requirements applicable to all Sections within Divisions 02 to 48.

1.3 Description

.1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel a minimum of two (2) weeks prior to handover.

.2 Owner will provide list of personnel to receive instructions and will coordinate their attendance at agreed-upon times.

1.4 Component demonstration

.1 Manufacturer to provide authorized representative to demonstrate operation of equipment and systems.

.2 Coordinate training with commissioning agent as required in Section 01 91 00 – General Commissioning Requirements.

.3 Instruct Owner's personnel and provide written report that demonstration and instructions have been completed.

1.5 Submittals

.1 Submit schedule of times and dates for demonstration of each item of equipment and each system two weeks prior to designated dates, for Consultant's approval.

.2 Submit reports within one (1) week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.3 Submit video record of demonstration and training together with report. Engage professional videographer to edit and direct training video. Ensure video quality is minimum 1080pHD, camera stabilizing equipment is used, and sound is recorded on duel channel noise cancelling microphones.

.4 Give time and date of each demonstration, with list of persons present.

1.6 Conditions for demonstration

.1 Equipment has been inspected and put into operation in accordance with technical specification division 02 to 48.

.2 Testing, adjusting, and balancing have been performed in accordance with Section 01 75 19 – Testing and Balancing, and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

2 Products – not used

3 Execution

3.1 Preparation

.1 Verify that suitable conditions for demonstration and instructions are available.

.2 Verify that designated personnel are present.

.3 Prepare agendas and outlines.

.4 Establish seminar organization.

.5 Explain component design and operational philosophy and strategy.

.6 Develop equipment presentations.

.7 Present system demonstrations.

.8 Accept and respond to seminar and demonstration questions with appropriate answers.

3.2 Preparation of agendas and outlines

.1 Prepare agendas and outlines including the following:

.1 Equipment and systems to be included in seminar presentations.

.2 Name of companies and representatives presenting at seminars.

.3 Outline of each seminar's content.

.4 Time and date allocated to each system and item of equipment.

.5 Provide separate agenda for each system.

3.3 Seminar organisation

.1 Coordinate content and presentations for seminars.

.2 Coordinate individual presentations and ensure representatives scheduled to present at seminars are in attendance.

.3 Arrange for presentation leaders familiar with the design, operation, maintenance and troubleshooting of the equipment and systems. Where a single person is not familiar with all aspects of the equipment or system, arrange for specialists familiar with each aspect.

.4 Coordinate proposed dates for seminars with Owner and select mutually agreeable dates.

3.4 Explanation of design strategy

.1 Explain design philosophy of each system. Include following information:

.1 An overview of how system is intended to operate.

.2 Description of design parameters, constraints and operational requirements.

.3 Description of system operation strategies.

.4 Information to help in identifying and troubleshooting system problems.

3.5 Demonstration and instructions

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.

.2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.3 Instruct personnel on control and maintenance of sensory equipment and operational equipment associated with maintaining energy efficiency and longevity of service.

.4 Review contents of manual in detail to explain all aspects of operation and maintenance.

.5 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

3.6 Time allocated for instruction

.1 Ensure amount of time required for instruction of each item of equipment or system is adequate. Provide training for the following as a minimum:

.1 Aluminum Framed Sectional Doors

.2 Operable Partitions

.3 Hardware and Access Control System

.4 Plumbing System

.5 Heating System

.6 Cooling System

.7 Geothermal System

.8 Ventilation System

.9 Electrical System

.10 Photovoltaic Collector

.11 Diesel Power Generator

.12 Clock System

.13 Fire Alarm System

.14 Security System

.15 CCTV System

.16 Building Automation BAS System

End of section

1 General

1.1 Related documents

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

.2 Section 01 74 19 – Construction and Demolition Waste Management

.3 Section 01 81 19 – Construction Indoor Air Quality Requirements

.4 LEED Reference Guide for Building Design and Construction (BD+C), version 4, U.S. Green Building Council

1.2 Description of work

.1 Section includes general, administrative, procedural, and product requirements for compliance with the prerequisites and credits of the US Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) for Building Design and Construction, Version 4 Green Building Rating System.

.1 The owner has established that this Project shall achieve at a minimum LEED Silver.

.2 Several LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

.3 Additional LEED prerequisites and credits required to obtain the selected LEED certification are contingent on the Project design and other aspects of Project that are not part of the Work of the Contract.

.4 Any discrepancies between the LEED Requirements outlined in this Section and those in other Sections require notification of the Architect and the Architect's approval of the resolution.

1.3 Sustainable building requirements

.1 The Owner requires the Contractor to implement practices and procedures to meet the project's environmental performance goals, which include achieving LEED v4 Silver. Specific project goals that may impact this area of work include: use of high performance materials; use of locally-manufactured materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the Articles below, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the aforementioned environmental goals and LEED certification.

1.4 Reference standards

.1 ANSI/ASHRAE/IESNA 90.1-2010 – Energy Standard for Buildings Except Low-Rise Residential Buildings

.2 ANSI/ASHRAE 52.2-2007 – Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

.3 ANSI/ASHRAE 62.1-2010 – Ventilation for Acceptable Indoor Air Quality

.4 ASHRAE 52.2-2007 – Filtration Minimum Efficiency Reporting Value (MERV)

.5 ASTM C1371-04 (R2010) – Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

.6 ASTM C1549-04 – Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

.7 ASTM D1003-11 – Haze and Luminous Transmittance of Transparent Plastics

.8 ASTM E408-13 – Methods for Total Normal Emittances of Surfaces Using Inspection-Meter Techniques

.9 ASTM E903-12 – Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres

.10 ASTM E1918-06 – Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

.11 ASTM E1980-11 – Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces

.12 ATSM/BIFMA Standard Method M7.1-2011, Standard Test Method for Determining Emissions from Office Furniture Systems, Components and Seating – Furniture evaluation standard for VOC emissions

.13 ATSM/BIFMA e3-2011 Furniture Sustainability Standard Section 7.6.1 and 7.6.2 – VOC emission limits for office furniture, components and seating

.14 California Air Resources Board (CARB) Airborne Toxic Measure to Reduce Formaldehyde Emissions from Composite Wood Products Regulation

.15 CARB Suggested Control Measure for Architectural Coatings, 2007

.16 California Title 24-2013, Part 6 – Building Energy Efficiency Standards

.17 California Dept. of Public Health Standard Method v1.1-2010, Standard Method for The Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers

.18 CRI – Carpet and Rug Institute Green Label and Green Label Plus Testing Program

.19 EPA ENERGY STAR – Qualified Products

.20 EPA Construction General Permit (CGP): 2012

.21 EPA Clean Air Act, Title VI, Section 608, Compliance with the Section 608 Refrigerant Recycling Rule

.22 EPA – Energy Policy Act (EPAct) of 1992 (and as amended), Fixture Flow Requirements

.23 EPA – Energy Policy Act (EPAct) of 2005, Fixture Flow Requirements

.24 EPA – Water Sense Label

.25 EPA 832-R-92-005 – Storm Water Management for Construction Activities, Chapter 3

.26 EPA PB90200288 – Compendium of Methods for the Determination of Air Pollutants in Indoor Air

.27 FSC – Forest Stewardship Council's Principles and Criteria

.28 Greenguard Certification Program – Greenguard Environmental Institute

.29 ISO 14021-1999 – Environmental Labels and Declarations, Self-Declared Environmental Claims (Type II Environmental Labeling)

.30 South Coast Air Quality Management District (SCAQMD) Rule #1113 – VOC Limits for Architectural Coatings, effective June 3, 2011

.31 SCAQMD Amendment to South Coast Rule #1168 – VOC Limits for Adhesives, Sealant and Sealant Primers, effective October 6, 2017

.32 USGBC – LEED Version 4 BD&C Reference Guide

1.5 Definitions

.1 Chain-of-Custody: A tracking procedure to document the status of a product from the point of harvest or extraction to the ultimate end use.

.2 Chain-of-custody certification: Awarded to companies that produce, sell, promote, or trade forest products after audits verify proper accounting of material flows and proper use of the Forest Stewardship Council name and logo. The COC certificate number is listed on invoices for non-labeled products to document that an entity has followed FSC guidelines for product accounting.

.3 Chlorofluorocarbons (CFCs): Hydrocarbons that deplete the stratospheric ozone layer.

.4 Composite wood: Consists of wood or plant particles or fibers bonded by a synthetic resin or binder. Examples include particleboard, medium-density fiberboard (MDF), plywood, oriented-strand board (OSB), wheatboard, and strawboard.

.5 Composite Wood Evaluation: Composite wood, as defined by the "California Air Resources Board, Airborne Toxic Measure to Reduce Formaldehyde Emissions from Composite Wood Products" Regulation, which has been documented to have low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde (NAF) resins.

.6 Declare Product: Products with a Declare transparency label that indicates all ingredients have been evaluated and disclosed down to 1,000 ppm as administered by the International Living Future Institute (http://living-future.org).

.7 Environmental Product Declaration (EPD):

.1 Product-specific declaration: Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope are valued as one quarter (1/4) of a product for the purposes of credit achievement calculation.

.2 Environmental Product Declarations which conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

.1 Industry-wide (generic) EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator are valued as one half (1/2) of a product for purposes of credit achievement calculation.

.2 Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator are valued as one whole product for purposes of credit achievement calculation.

.8 Extended Producer Responsibility (EPR): Program implemented by a product manufacturer to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life. Alternatively known as a manufacturer's take-back program.

.9 Forest Stewardship Council (FSC) is an independent, non-governmental, not for profit organization established to promote the responsible management of the world's forests. FSC provides certifications to award forest managers who adopt environmentally and socially responsible forest management practices and to companies that manufacture and sell products that directly support responsible forest management.

.10 Furniture: For the purposes of LEED credits, furniture and furnishings:

.1 Include the stand-alone furniture items purchased for the Project, including individual and group seating; open-plan and private-office workstations; desks and tables; storage units, credenzas, bookshelves, filing cabinets, and other case goods; wall-mounted visual-display products (e.g., marker boards and tack boards) and miscellaneous items, such as easels, mobile carts, freestanding screens, installed fabrics, and movable partitions. Hospitality furniture is included as applicable to the Project.

.2 Exclude electronic displays; office accessories, such as desktop blotters, trays, tape dispensers, waste baskets; and all electrical items, such as lighting and small appliances.

.11 Furniture Evaluation: New furniture and furnishing items tested in accordance with ANSI/BIFMA Standard Method M7.1–2011 and compliant with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach. Testing must be modeled using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate. For classroom furniture, use the standard school classroom model in California Dept. of Public Health (CDPH) Standard Method v1.1. Documentation submitted for furniture must indicate the modeling scenario used to determine compliance.

.12 General Emissions Evaluation: Building product testing in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The manufacturer's or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area. Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1: 0.5 mg/m3 or less; between 0.5 and 5.0 mg/m3; or 5.0 mg/m3 or more.

.13 Health Product Declaration (HPD): Products with a published, complete HPD with full disclosure of known hazards and residuals disclosure at no less stringent than 1,000 parts per millions (ppm), in compliance with the Health Product Declaration Open Standard as maintained by the Health Product Declaration Collaborative (www.hpd-collaborative.org).

.14 Hydrochlorofluorocarbons (HCFCs): Refrigerants used in building equipment that deplete the stratospheric ozone layer, but to a lesser extent than CFCs.

.15 Inherently Non-emitting Materials: Naturally occurring materials and products made from inorganic materials that emit either very low or no VOCs. Products that are inherently non-emitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant with the Low-Emitting Materials credit without any VOC emissions testing, if they do not include integral organic based surface coatings, binders, or sealants.

.16 Life Cycle Assessment: An evaluation of the environmental effects of a product from cradle (resource extraction) to grave (product disposal), as defined by ISO 14040–2006 and ISO 14044–2006.

.17 Material Cost: For the purposes of LEED calculations and tracking, the dollar value of a product furnished for the Project including the cost of materials, shop labor, Contractor markups, taxes, fees, delivery costs, and all expenses incurred by the Contractor to bring the product to the Project site. Material cost excludes any cost for site labor and site equipment required for installation on the Project site.

.18 Point of Harvest/Extraction/Recovery: Location where raw material is gathered for use in production.

.19 Point of Manufacturing (Final Assembly): Location where individual components are assembled into a product that is furnished and installed on site.

.20 Point of Purchase: Location of the purchase transaction for a product. For online or other transactions that do not occur in person, the point of purchase is considered the location of product distribution.

.21 Pre-Consumer Recycled Content: Defined as material diverted from the waste stream during the manufacturing process. Examples in this category include planer shavings, plytrim, sawdust, chips, bagasse, sunflower seed hulls, walnut shells, culls, trimmed materials, print overruns, over-issue publications, and obsolete inventories. Excluded is reutilization of materials such as rework, regrind or scrap generated in a

process and capable of being reclaimed within the same process that generated it. (Previously referred to as Post-industrial Content.)

.22 Post-Consumer Waste: Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of materials from the distribution chain. Examples of this category include construction and demolition debris, materials collected through curbside and drop-off recycling programs, broken pallets, discarded products (e.g., furniture, cabinetry and decking) and urban maintenance waste (e.g., leaves, grass clippings, tree trimmings, etc.).

.23 Solar Reflectance Index (SRI): A measure of a material's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.9) is equal to 0, and a standard white (reflectance 0.80, emittance 0.90) is equal to 100.

.24 Vendor: A Vendor of certified wood is the organization that sells/supplies wood products to contractors or subcontractors. A vendor must have a FSC Chain of Custody (CoC) certificate if it is selling FSC-certified products for which its packaging or form will be modified and/or products that are not individually labeled; this includes most lumber.

.25 Volatile Organic Compounds (VOCs): Carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at normal room temperatures.

1.6 Administrative requirements

.1 Respond to questions and requests from Architect and Sustainability/LEED Consultant regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its final determination on the project's LEED certification application. Document responses as informational submittals.

1.7 Submittals

.1 General: Submit additional LEED documents required by other Specification Sections.

.2 LEED Product Submittals:

.1 Projects seeking LEED certification must track and record product, material, and cost information for LEED credit documentation. The contractor shall complete and submit the following forms included with product submittals:

.2 Low-Emitting Materials Reporting Form: for all permanently installed products and materials related to the work of any Section installed on the interior of the building (i.e. inside the weatherproofing system) and falling within one of the product categories listed below. The Contractor shall submit:

.1 Completed Low-Emitting Materials Reporting Form. A sample Form for this project has been included in the Appendix of this Section.

.2 For each building product and material listed on the Form, provide information and support documentation for the product as defined in this Section to support all environmental claims listed in the Form. Submittal requirements for the support documentation can be found in the “LEED Credit-Specific Submittal” part of this Section.

.3 Applicable product categories: flooring; composite wood; ceilings, walls, and thermal or acoustic insulation; field-applied adhesives, sealants, paints, and coatings; and furniture products.

.3 BPDO Materials Reporting Form: for all permanently installed products and materials specified. The Contractor shall submit:

.1 Completed BPDO Materials Reporting Form. A sample Form for this project has been included in the Appendix of this Section.

.2 For each building product and material listed on the Form, provide information and supporting documentation for the product as defined in this Section to support all

environmental claims listed on the Form. Submittal requirements for the support documentation can be found in the “LEED Credit-Specific Submittal” part of this Section.

.3 LEED Credit-Specific Submittals

.1 General

.1 For detailed explanation of credit requirements, refer to LEED v4 BD+C Reference Guide.

.2 For all MR Credits Building Product Disclosure and Optimization (BPDO) listed below:

.1 Submittals apply to permanently installed products and materials specified in CSI MasterFormat 2012 Edition Divisions 3-12, 31.60.00, 32.10.00, 32.30.00, and 32.90.00.

.2 For all Credit Options outlined below, submit the following for any regionally sourced products that have raw materials extracted and are manufactured and purchased/distributed within 160 kilometer radius of the Project site: Cut sheet or a written affidavit from the manufacturer indicating,

.1 Location (city, state/province) for points of raw material extraction, product manufacturing (final assembly), and product purchase/distribution.

.2 Breakdown of product component materials that are extracted, manufactured, and purchased within 160 kilometers of the project site and the material percentage of each component by weight.

.3 Distance in miles from the points of raw material extraction, product manufacturing, and product purchase/distribution to the Project site location, measured as the most direct route between points.

.3 For EQ Credit - Low-Emitting Materials, submittals apply to permanently installed products and materials related to the

work of any Section on the interior of the building (i.e. inside the weatherproofing systems) and falling within one of the applicable product categories.

.1 Applicable product categories are listed under “LEED Product Submittals” under the Submittals part of this Section.

.2 Note that LEED v4 publishes a list of approved third-party product certifications and labels, available for download at http://www.usgbc.org/resources/low-emitting-materials-third-party-certification-table.

.4 For further explanation of credit requirements, refer to LEED v4 BD+C Reference Guide.

.2 MR Credit - BPDO – Environmental Product Declarations (EPD): submit the following documentation.

.1 Credit Option 1 (EPD), either:

.1 Manufacturer’s product specific declarations, publicly available, conforming to ISO 14044, and having cradle-to-gate scope.

.2 Environmental Product Declarations (product-specific or industry-wide). Third party verified Type III EPD conforming with ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and having cradle to gate scope.

.2 Credit Option 2 (Multi-Attribute Optimization): manufacturer’s third-party certified life cycle assessments (LCA), demonstrating the required environmental impact reductions compared to industry average.

.3 MR Credit - BPDO – Sourcing of Raw Materials: submit the following documentation.

.1 Credit Option 1 (Raw Material Source & Extraction Reporting), submit either:

.1 Manufacturer’s third-party verified corporate sustainability reports (CSR) addressing the raw materials supply chain and conforming with one of the following acceptable frameworks:

.1 Global Reporting Initiative (GRI) Sustainability Report

.2 Organization for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises

.3 U.N. Global Compact: Communication of Progress

.4 ISO 26000: 2010 Guidance on Social Responsibility

.2 Manufacturer's self-declared reports addressing the raw materials supply chain.

.2 Credit Option 2 (Leadership Extraction Practices): submit the following as applicable.

.1 Products purchased from a manufacturer (producer) that participates in an Extended Producer Responsibility (i.e., take-back) program: submit company brochure or similar describing the program, including contact information and verification that the product is included in the program.

.2 Products containing Bio-based Materials: submit documentation from the raw-material manufacturer stating conformance to the Sustainable Agricultural Network’s Sustainable Agriculture (SANSA) Standard in the form of a signed letter on company letterhead and testing per ASTM Test Method D6866.

.3 Products containing Recycled Content: submit product cut sheet or a written affidavit on company letterhead (email is not acceptable) from the manufacturer indicating the percentages, by material weight, of post-consumer and pre-consumer recycled content.

.4 Products that are salvaged, refurbished, or reused: submit statement of source of materials, including statement of costs. The cost of reclaimed materials is either the actual cost paid or the replacement value,

whichever is higher. Replacement cost is determined by pricing comparable materials in the local market, excluding labour and shipping, and shall reflect any price discounts if applicable.

.5 Permanently installed non-recycled wood and wood based material, submit the following:

.1 Forest Stewardship Council's Chain of Custody (CoC) Certification Number for each installed certified wood product, declaring conformance with FSC Guidelines for certified wood. COC numbers shall be obtained from the manufacturer and must be itemized on a line-item basis. When applicable, a COC number is required by the source forest, transportation entity, supplier/manufacturer, and vendors of the material.

.2 Vendor invoices, including all FSC-certified and non FSC-certified wood products purchased. Vendors are defined as those companies that sell products to the project contractor or subcontractors for installation on the Project site. Invoices must include:

.3 Itemization of each wood product identified as such on a line item basis

.4 FSC products identified as such on a line-item basis and must be identified as "FSC Pure, FSC Mixed Credit", or "FSC Mixed [NN] %"

.5 The dollar value of each line item

.6 The vendor's chain-of-custody (CoC) number must be shown on any invoice that includes FSC products.

.7 If it is impractical for a vendor to invoice wood products on a line-item basis because the invoice would be excessive in length, the invoice should indicate the aggregate value of wood products sold be the vendor.

.4 MR Credit - BPDO – Material Ingredients: submit the following documentation.

.1 Credit Option 1 (Material Ingredient Reporting), submit at least one of the following for the end use product:

.1 Manufacturer's publicly available ingredient inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) to at least 0.1% (1,000 ppm).

.2 Health Product Declaration (HPD) with full disclosure of known hazards to at least 0.1% (1,000 ppm).

.3 Cradle to Cradle certificate (minimum v2 Basic or v3 Bronze level).

.4 Declare Label indicating that all ingredients have been evaluated and disclosed to at least 0.1% (1,000 ppm).

.5 UL Product Lens certification.

.2 Credit Option 2 (Material Ingredient Optimization), submit at least one of the following for the end use product:

.1 GreenScreen v1.2 Benchmark, indicating full inventory of chemical ingredients to 100 ppm with no Benchmark 1 hazards. Identify whether ingredients have been assessed with the GreenScreen List Translator or full GreenScreen Assessment.

.2 Cradle to Cradle certificate (minimum v2 Gold or v3 Silver level).

.3 REACH compliance for materials that do not contain substances that meet REACH criteria for substances of very high concern. Identify any ingredients listed on REACH Authorization or Candidate lists.

.5 EQ Credit - Low-Emitting Materials: submit the following documentation, as applicable for products installed on site inside the building weatherproofing barrier.

.1 Interior composite wood and agrifiber products, including core materials: submit documentation of compliance with or exemption from the LEED v4 Composite Wood Evaluation,

such as a cut sheet or written affidavit from the manufacturer stating that they meet the applicable CARB ATCM requirements for ultra-low-emitting formaldehyde (ULEF) or no added formaldehyde (NAF) resins.

.2 Interior flooring products, including but not limited to carpet, resilient flooring, engineered wood, and mineral-based tile: submit documentation of compliance with LEED v4 General Emissions Evaluation (VOC emissions testing or approved third-party certification) for each installed product or system.

.3 Interior wet-applied, field installed interior products listed below: submit documentation of compliance with both VOC content limits and LEED v4 General Emissions Evaluation (VOC emissions testing or approved third-party certification).

.1 Adhesives/Sealants/Paints/Coatings: submit Material Data Safety Sheet (MSDS) or product data sheets highlighting VOC content measured in grams per liter (g/L) less water and exempt solvents, and LEED v4 General Emissions Evaluation documentation (VOC emissions testing or approved third-party certification).

.4 Interior ceiling assemblies, wall assemblies, and interior/exterior insulation (thermal or acoustic): submit documentation of compliance with LEED v4 General Emissions Evaluation (VOC emissions testing or approved third-party certification).

.5 Interior furniture and furnishings: submit documentation of compliance with LEED v4 Furniture Evaluation, including testing per ANSI/BIFMA Standard Method M7.1-2011 and compliance with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2.

.6 Inherently non-emitting materials: In lieu of above, submit manufacturer's certification stating that the product qualifies as inherently non-emitting, as defined in this Section.

.6 WE Prerequisite and Credit - Indoor Water Use Reduction: for plumbing fixtures, submit cut sheets with water consumption flow/flush rates highlighted.

.7 EQ Credit - Construction Indoor Air Quality Management Plan: for submittal requirements, refer to Section 01 81 19 - Construction Indoor Air Quality Requirements.

.8 MR Prerequisite and Credit - Construction and Demolition Waste Management: for submittal requirements, refer to Section 01 74 19 - Construction and Demolition Waste Management.

.4 LEED Submission Documentation:

.1 At or before substantial completion, the Contractor shall prepare supporting documentation for each LEED construction prerequisite and credit to be attempted, which have been assigned to the Contractor by the Owner or Architect.

.1 Sustainability/LEED Consultant shall prepare and distribute a LEED v4 Documentation List to the Contractor. The LEED v4 Documentation List outlines the deliverables required to adequately record that the project has met the intent of each credit.

.2 Contractor shall register and log-in to LEED Online (http://www.leedonline.com).

.3 Contractor shall complete LEED Online credit forms and upload associated required backup documentation for all the credits assigned in the LEED v4 Documentation Matrix. The LEED Online credit forms shall contain:

.1 All proper data fields completed declaring that the project has met the intent of the credit, including narrative(s) when applicable.

.2 Electronic signature of Contractor and date signed, where required.

.4 The Contractor shall notify Sustainability/LEED Consultant of completion of LEED Online documentation and availability for review.

2 Products

2.1 Unauthorized products

.1 Materials and products required for Work of this Section shall not contain asbestos, polychlorinated biphenyls (PCBs) or other hazardous materials identified by the Owner.

2.2 Materials, general

.1 Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

.2 LEED Performance Criteria: Products and Materials shall meet the following project-wide criteria as well as applicable product-specific criteria in Part 2 of this Section.

.1 MR Credit - BPDO - EPD, Option 1 (EPD):

.1 Install at least twenty (20) different permanently installed products (or an equivalent quantity of partially valued products) sourced from at least five (5) different manufacturers that meet criteria described in the LEED v4 BD+C Reference Guide. Examples of partially-valued products include non-product specific, industry-wide EPDs, which are valued as one-half of a product for the purposes of this LEED credit.

.2 For a list of specific products that have been identified as contributing towards this credit, refer to the Product Target Tables in the APPENDIX of this Section.

.2 MR Credit - BPDO - Sourcing of Raw Materials, Option 2 (Leadership Extraction Practices):

.1 Install products that meet at least one (1) of the LEED v4 responsible extraction criteria described in the LEED v4.0 Reference Guide and in aggregate comprise at least 25 percent, by cost, of the total value of permanently installed building products in the Project.

.3 MR Credit - BPDO - Material Ingredients, Option 1 (Material Ingredient Reporting):

.1 Install at least twenty (20) different permanently installed products sourced from at least five (5) different manufacturers that meet criteria described in the LEED v4 BD+C Reference Guide.

.2 For a list of specific products that have been identified as contributing towards this credit, refer to the Product Target Tables in the APPENDIX of this Section.

.4 EQ Credit - Low-Emitting Materials VOC-Containing Products: Install interior products that meet overall Project compliance levels, as listed below and described in the LEED v4 Reference Guide.

.1 Field-applied interior adhesives, sealants, paints, and architectural coatings:

.1 100 % compliance for VOC content criteria

.2 Minimum 90 % compliance (by volume) for VOC emissions criteria (General Emissions Evaluation).

.2 Flooring products: 100 % compliance (General Emissions Evaluation).

.3 Composite wood products: 100 % compliance (Composite Wood Evaluation).

.4 Ceiling assemblies, wall assemblies, and insulation (acoustic or thermal insulation): 100 % compliance (General Emissions Evaluation).

.5 Furniture included in Project scope of work: minimum 90 % compliance, by cost (Furniture Evaluation).

2.3 Adhesives

.1 Wet-applied adhesives used in the building interior (i.e. inside of the exterior moisture barrier) must comply with all of the following criteria:

.1 General Emissions Evaluation, as defined in this Section.

.2 Maximum VOC content limits and chemical content requirements established by SCAQMD Rule #1168, October 6, 2017, including, but not limited to, the following:

.3 Architectural Adhesives Applications:

.1 Indoor Carpet Adhesives: 50 g/L.

.2 Carpet pad adhesives: 50 g/L.

.3 Outdoor Carpet Adhesives: 150 g/L.

.4 Wood Flooring Adhesives: 100 g/L.

.5 Rubber Floor Adhesives: 60 g/L.

.6 Subfloor Adhesives: 50 g/L.

.7 Ceramic tile installation: 65 g/L.

.8 VCT and asphalt tile installation: 50 g/L.

.9 Dry Wall and Panel Adhesives: 50 g/L.

.10 Cove base installation: 50 g/L.

.11 Multipurpose Construction Adhesives: 70 g/L.

.12 Structural Glazing Adhesives: 100 g/L.

.4 Substrates:

.1 Metal to metal: 30 g/L.

.2 Plastic foams: 50 g/L.

.3 Porous material except wood: 50 g/L.

.4 Wood: 30 g/L.

.5 Fiberglass: 80 g/L.

.5 Specialty Applications:

.1 PVC welding: 510 g/L.

.2 CPVC welding: 490 g/L

.3 ABS welding: 325 g/L.

.4 Plastic cement welding: 250 g/L.

.5 Adhesive primer for plastic: 550 g/L.

.6 Contact Adhesive: 80 g/L.

.7 Special Purpose Contact Adhesives: 250 g/L.

.8 Structural Wood Member Adhesive: 140 g/L.

.9 Sheet Applied Rubber Lining Operations: 850 g/L.

.10 Top and Trim Adhesive: 250 g/L.

.6 Methylene chloride and perchloroethylene may not be intentionally added ingredients.

2.4 Sealants

.1 Wet-applied sealants used in the building interior (i.e. inside of the exterior moisture barrier) must comply with all of the following criteria:

.1 General Emissions Evaluation, as defined in this Section.

.2 Maximum VOC content limits and chemical content requirements established by SCAQMD Rule #1168, October 6, 2017, including, but not limited to, the following:

.1 Non-porous Architectural Sealant Primer: 250 g/L

.2 Porous Architectural Sealant Primer: 775 g/L

.3 Other Sealant Primers: 750 g/L

.4 Architectural Sealants: 50 g/L

.5 Other Sealants: 420 g/L

.3 Methylene chloride and perchloroethylene may not be intentionally added ingredients.

2.5 Paints

.1 Wet-applied paints used in the building interior (i.e. inside of the exterior moisture barrier) must comply with all of the following criteria:

.1 General Emissions Evaluation, as defined in this Section.

.2 Maximum VOC content limits established by the more stringent of SCAQMD Rule #1113, June 3, 2011 Amendment or California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings, including, but not limited to, the following:

.1 Flat paint and primer: 50 g/L

.2 Non-flat paint and primer: 50 g/L

.3 Non-flat, high gloss paint and primer: 150 g/L

.4 Rust-preventative paint and primer: 250 g/L

.3 Methylene chloride and perchloroethylene may not be intentionally added ingredients.

2.6 Architectural coatings

.1 Wet-applied architectural coatings used in the building interior (i.e. inside of the exterior moisture barrier) must comply with all of the following criteria:

.1 General Emissions Evaluation, as defined in this Section.

.2 Maximum VOC limits established by the more stringent of SCAQMD Rule #1113 VOC Limits for Architectural Coatings, June 3, 2011 Amendment or California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings, including, but not limited to, the following:

.1 Bond Breakers: 350 g/L

.2 Clear Wood Finishes

.1 Varnish: 275 g/L

.2 Sanding Sealers: 275 g/L

.3 Lacquer: 275 g/L

.3 Concrete-curing compounds (non-roadway): 100 g/L

.4 Concrete surface retarded: 50 g/L

.5 Dry-fog coatings: 150g/L

.6 Fire proofing coatings: 150 g/L

.7 Flat coatings: 50 g/L

.8 Floor coatings: 50 g/L

.9 Form release compound: 100 g/L

.10 Graphic arts (signs) coatings: 500 g/L

.11 Industrial Maintenance (IM) coatings: 100 g/L

.12 IM coatings (High temperature): 420 g/L

.13 IM primers (Zinc-rich): 100 g/L

.14 Japan/faux finishing coatings: 350 g/L

.15 Magnesite cement coatings: 450 g/L

.16 Mastic coatings: 100 g/L

.17 Metallic pigmented coatings: 150 g/L

.18 Multi-color coatings: 250 g/L

.19 Non-flat coatings: 50 g/L

.20 Pigmented lacquer: 550 g/L

.21 Pre-treatment wash primers: 420 g/L

.22 Primers, sealers, undercoaters: 100 g/L

.23 Recycled coatings: 250 g/L

.24 Rust preventative coatings: 100 g/L

.25 Shellac-Clear: 730 g/L

.26 Shellac-Pigmented: 550 g/L

.27 Specialty primers: 100 g/L

.28 Stains: 100 g/L

.29 Traffic coatings: 100 g/L

.30 Waterproofing sealers: 100 g/L

.31 Waterproofing concrete/masonry sealers: 100 g/L

.32 Wood preservatives: 350 g/L

.3 Methylene chloride and perchloroethylene may not be intentionally added ingredients.

2.7 Flooring systems

.1 Carpet systems or assemblies must meet or exceed the General Emissions Evaluations as described in the submittals part of this Section.

.2 Carpet adhesives must meet product requirements for Adhesives, as defined in this Section.

.3 Hard surface flooring must meet or exceed General Emissions Evaluations as described in the Submittals part of this Section.

.1 This requirement does not apply to mineral-based finish flooring products such as tile, masonry, terrazzo, and cut stone without integral organic-based coatings and sealants and unfinished/untreated solid wood flooring.

.2 Associated site-applied adhesives, grouts, finishes and sealers must meet applicable requirements for Adhesives, Sealants, or Coatings, as defined in this Section.

.4 Site-applied concrete, wood, bamboo and cork floor finishes such as sealer, stain and finish must meet applicable requirements for Adhesives, Sealants, or Coatings, as defined in this Section.

.5 Tile setting adhesives and grout must meet applicable requirements for Adhesives, Sealants, or Coatings, as defined in this Section.

2.8 Ceiling systems

.1 Ceiling systems such as overhead, structural elements (exposed, finished or unfinished), direct-applied, suspended, glazed skylights must meet General Emissions Evaluation as described in the Submittals part of this Section.

2.9 Wall systems

.1 Wall systems such as cabinetry, interior or exterior glazing, doors, interior columns, partial-height and full-height vertical structures (exposed, finished or unfinished) must meet General Emissions Evaluation as described in the Submittals part of this Section.

2.10 Acoustic and thermal insulation

.1 Insulation (interior or exterior) such as thermal and acoustical boards, batts, rolls, blankets, loose fill and spray foam insulation must meet General Emissions Evaluation as described in the Submittals part of this Section.

2.11 Wood and wood products

.1 New, non-recycled wood and wood based materials shall be certified in accordance with Forest Stewardship Council (FSC) Guidelines. This includes wood permanently installed in the project but is not limited to structural framing and dimensional lumber, blocking, flooring, finished woodwork, doors, millwork, casework, and elevator panels.

.2 No partial claims shall be made for products that contain FSC certified wood but are not sold with an FSC claim. A product that contains a mix of FSC-certified components with non-certified components is not considered an FSC Mixed product in an assembly and is not eligible to receive credit for the certified portion. The product shall only contribute to the MR LEED credit if the product complies with FSC Chain-of-Custody rules for Mixed products and the invoice carries a valid FSC claim and chain of custody number.

.3 Contractors and subcontractors that temporarily possess FSC-certified material prior to installation shall not mix FSC-certified material with non-FSC-certified material.

.4 Chain of Custody (CoC) Requirements:

.1 Transportation entities shall require a CoC when the transport to the next entity involves a change of ownership of the material or product. Shippers or transport companies handling goods owned by FSC CoC certified companies are exempt.

.2 Each wood products supplier and/or manufacturer that invoices FSC-certified wood products to a vendor must be certified by an FSC-accredited certifier.

.3 Each wood products vendor that invoices FSC-certified wood products to product contractors and subcontractors must be certified by an FSC-accredited certifier.

.4 Parties that manufacture products off-site and then install them on-site must be FSC CoC certified for the products to contribute to the LEED credit. This includes, but is not limited to, cabinetmakers and architectural millworkers.

.5 Parties that do not manufacture but install an FSC-certified product on the project site do not require FSC Chain of Custody certification as long as they do not modify the product packaging or form except for the purposes of installation. This includes, but is not limited to, contractors, subcontractors, and furniture installers.

.6 If a manufacturer places its FSC CoC label on product packaging used for individual sale (generally applying to fabricated products), then subsequent entities in the supply chain are not required to have CoC certification unless the product's packaging or form is changed before it reaches the end consumer.

.7 For products that are not individually packaged for sale to be sold as FSC certified, the vendor to the consumer is required to have CoC certification. Contractors and subcontractors are considered the end consumers and may demonstrate with copies of invoices (if requested) the quantity purchased for the job and their suppliers' CoC numbers.

2.12 Composite wood and agrifiber products

.1 Composite wood and agrifiber board products shall comply with the Composite Wood Evaluation by meeting Phase 2 CARB formaldehyde emission limits and CARB ATCM requirements for ultra-low-emitting formaldehyde (ULEF) or no added formaldehyde (NAF) resins.

2.13 Furniture and furnishings

.1 Furniture and furnishing items purchased and installed for the Project shall meet the Furniture Evaluation requirements as outlined in this Section.

2.14 Plumbing fixtures

.1 Plumbing fixtures must not exceed the following maximums as determined by the project team. If eligible, all newly installed tank-style toilets, urinals, and showerheads must be WaterSense labeled:

.1 Commercial

.1 Toilets: 4.2 Litres per flush (Lpf)

.2 Urinals: 0.5 Lpf

.3 Lavatory faucets: 1.3 Litres per minute (Lpm) at 60psi

.4 Kitchen faucet: 5.7 Lpm at 60psi

.5 Showerheads: 5.7 Lpm (per stall) at 80psi

.2 Appliances

.1 Residential dishwashers (standard and compact): Energy Star or performance equivalent

.2 Plumbing fixtures scheduled in the Construction Documents have been specified to meet a calculated aggregate reduction in potable water consumption by a minimum of forty percent (40%) compared to the LEED baseline. Substitutions shall not be allowed if such changes compromise the required reductions.

3 Execution

3.1 Metering

.1 EA Prerequisite - Building-Level Energy Metering: Install new building-level energy meters to provide data representing total building energy

consumption (electricity, natural gas, chilled water, steam, fuel oil, propane, biomass, etc.)

.2 WE Prerequisite - Building-Level Water Metering: Install new building-level water meters to provide data representing the total potable water consumption for the building and associated grounds.

.3 Coordinate the installation and verification of equipment with the Owner.

3.2 Construction activity pollution prevention (CAPP)

.1 Development a Construction Activity Pollution Prevention (CAPP) Plan. The Plan shall be developed by the Contractor and approved by the Owner and Civil Engineer. The Plan shall be implemented throughout the duration of the Project construction under the direction of the Contractor's LEED Representative and shall be documented per the Submittal Requirements in Part 1 of this Section. The Plan is part of the Project LEED Requirements.

.2 Contractor shall monitor CAPP measures throughout the construction period and provide weekly inspections to the Consultant that include photo documentation of the installed measures.

3.3 Construction and demolition waste management

.1 MR Prerequisite and Credit - Construction and Demolition Waste Management Planning: Comply with CWM Plan

3.4 Construction indoor-air-quality management

.1 EQ Credit - Construction IAQ Management Plan: Comply with Section 01 81 19 – Construction Indoor Air Quality Requirements.

.2 EQ Credit - Indoor Air Quality Assessment: Comply with the following credit option in accordance with Section 01 81 19 - Construction Indoor Air Quality Requirements:

.1 Option 2: Air Quality Testing

End of section

4 Appendices

.1 Appendix A –CAPP Inspection Log (Schedule C1)

.2 Appendix B – Low-Emitting Materials Reporting Form

.3 Appendix C – BPDO Materials Reporting Form

.4 Appendix D – LEED Checklist

APPENDIX A – CONSTRUCTION ACTIVITY POLLUTION PREVENTION (CAPP) LOG

Complete this schedule on a weekly basis and following major precipitation events. Submit completed schedule along with supporting digital photos to the Consultant at the end of each month.

Site Conditions – Seaton Paramedics

Record the rainfall and weather conditions in the table below:

Date of Inspection:		Rainfall in last week:	_____(mm)
		Rainfall in last 24 hrs:	_____(mm)
Current Weather:		Weather Forecast:	

Weekly Log

Complete this table by listing the types, locations, & conditions of CAPP measures implemented onsite this past week.

ESC Measure in Place	Location	Sediment Level (circle one)	Condition (circle one)	Repairs Done / Required
		Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good	
		Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good	
		Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good	
		Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good	
		Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good	
		Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good	

	Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good
	Empty | Full | ¼ | ½ | ¾ | NA |	Poor | Fair | Good

Company Name	Contact Name	Date

☐ I have provided photo documentation supporting the information provided on this schedule.

SECTION 01 81 13 - APPENDIX B

LEED v4 Materials Reporting Form - Low Emitting

Complete the following for each permanently installed material within the weatherproofing membrane of the project

Project Name:	Seaton Paramedics	Location:	Pickering, ON
Subcontractor:		Date:	
Completed by:		Spec Section:	
Product:		Manufacturer:	

Amount of product (Litres, estimate): _____ ☐ All relevant supporting documentation is attached

Is the product a wet-applied adhesive, sealant, paint, or coating?	Yes / No	If yes: VOC Content (g/L):		
		If yes, CDPH v1.1-2010 compliant?	Y	N
		Application:		

Is this a flooring product?	Yes / No	If yes, CDPH v1.1-2010 compliant?	Y	N
		If yes, is it mineral based (no emissions)?	Y	N

Does the product contain composite wood?	Yes / No	If yes, no added urea-formaldehyde?	Y	N
		If yes, ultra-low-emitting formaldehyde (ULEV)?	Y	N

Is the product a wall, ceiling, acoustic, or insulation product?	Yes / No	If yes, CDPH v1.1-2010 compliant?	Y	N
		Other certification:		

<u>Common Paint/Coating VOC limits:</u>

Concrete Curing	100 g/L
Dry Fog Coatings	50 g/L
Fire Proofing	150 g/L
Flat/Non-flat Coatings	50 g/L
Floor Coatings	50 g/L
Form Release	100 g/L
IM Coatings	100 g/L
Primers/Sealers/Undercoats	100 g/L
Stains	100 g/L
Waterproofing Sealers	100 g/L

<u>Common Adhesive/Sealant VOC limits:</u>

Indoor Carpet, Pad, VCT Adhesives	50 g/L
Wood Flooring Adhesives	100 g/L
Rubber Floor Adhesives	60 g/L
Ceramic Tile Adhesives	65 g/L
Multi-purpose Adhesives	70 g/L
PVC Welding	510 g/L
ABS Welding	325 g/L
Adhesive Primers for Plastic	550 g/L
Foam or Wood Substrate Adhesives	30 g/L
Architectural Sealants	50 g/L

SECTION 01 81 13 - APPENDIX C

LEED v4 Materials Reporting Form - BPDO

Complete the entire form for each permanently installed material

Project Name:	Seaton Paramedics	Location:	Pickering, ON
Subcontractor:		Date:	
Completed by:		Spec Section:	
Product:		Manufacturer:	
Material Cost:	$	☐	All relevant supporting documentation is attache

Does this product have an EPD?	Yes / No	If yes:	Product-specific (type III):	
			Industry-wide:	
			Other / not sure:	

Does the product have a Life Cycle Assessment (LCA)?	Yes / No

Does the manufacturer have a publically released report from their raw material suppliers?	Yes / No	If yes:	Self Declared:	
			3rd Party Verified CSR:	
			Other / not sure:	

Product / Manufacturer:	Extended producer program:	Y	N	Salvaged/reused material (%):	
	Contains bio-based material (%):			Post consumer recycled content (%):	
	FSC Certified Wood content (%):			Pre-consumer recycled content (%):	

Material Ingredients to at least 0.1% (1,000 ppm):	CASRN:		GreenScreen v1.2 Benchmark:	
	Health Product Declaration (HPD):		Cradle to Cradle (v2 Gold/Platinum):	
	Cradle to Cradle (v2 Basic or better):		Cradle to Cradle (v3 Silver/Gold/Platinum):	
	Cradle to Cradle (v3 Bronze or better):		No ingredients on REACH list:	
	Declare Label:		None of the above:	

POINTS PURSUED			LEED® Canada Building Design + Construction v4 Checklist
Yes	?	No	NEW SEATON PARAMEDIC STATION & TRAINING FACILITY (New Construction)
52	14	44	Certified 40-49 | **Silver 50-59** | Gold 60-79 | Platinum 80+
0	0	1	**Integrative Process (1 possible point)**
		1	**Integrative Process:** Support high-performance, cost-effective project outcomes through early analysis of interrelationships among systems.
1	0	15	**LT - Location and Transportation (16 possible points)**
		16	**LEED for Neighbourhood Development Location:** Avoid developing on inappropriate sites, reduce vehicle distance travelled, enhance livability, improve human health by encouraging daily physical activity.
		1	**Sensitive Land Protection:** Avoid the development of environmentally sensitive lands and reduce the environmental impact from the location of a building on a site.
		2	**High Priority Site:** Encourage project location in areas with development constraints and promote health of the surrounding area.
		5	**Surrounding Density and Diverse Uses:** Conserve land and protect farmland/wildlife habitat by developing in areas with existing infrastructure, promote walkability, transportation efficiency and reduce vehicle distance travelled.
		5	**Access to Quality Transit:** Reduce motor vehicle use, thereby reducing greenhouse gas emissions, air pollution, and other environmental and public health harms related to motor vehicle use.
		1	**Bicycle Facilities:** Promote transportation efficiency and reduce vehicle distance travelled, improve public health by encouraging physical activity.
		1	**Reduced Parking Footprint:** Minimize environmental harm linked to parking facilities (automobile dependence, land consumption, rainwater runoff).
1			**Green Vehicles:** Reduce pollution by promoting alternatives to conventionally fueled automobiles.
3	2	5	**SS - Sustainable Sites (10 possible points)**
•			**Construction Activity Pollution Prevention:** Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust.
1			**Site Assessment:** Assess site conditions before design to evaluate sustainable options and inform site design decisions.
	2		**Site Development - Protect or Restore Habitat:** Conserve existing natural areas and restore damaged areas to provide habitat and promote diversity.
1			**Open Space:** Create open exterior space that encourages social interaction, interaction with the environment, passive recreation, and physical activities.
		3	**Rainwater Management:** Reduce runoff volume and improve water quality by replicating the natural hydrology and water balance of the site.
		2	**Heat Island Reduction:** Minimize effects on microclimates, human habitats, and wildlife habitats by reducing heat islands.
1			**Light Pollution Reduction:** Increase night sky access, improve nighttime visibility, and reduce the consequences of development for wildlife and people.

7	0	4	WE - Water Efficiency (11 possible points)
•			**Outdoor Water Use Reduction:** Reduce outdoor water consumption.
•			**Indoor Water Use Reduction:** Reduce indoor water use consumption
•			**Building-Level Water Metering:** Support water management and identify opportunities for additional water savings by tracking water consumption.
2			**Outdoor Water Use Reduction:** Reduce outdoor water consumption.
4		2	**Indoor Water Use Reduction:** Reduce indoor water use consumption
		2	**Cooling Tower Water Use:** Conserve water used for cooling tower makeup while controlling corrosion, microbes, and scale in the condenser water system.
1			**Water Metering:** Support water management and identify opportunities for additional water savings by tracking water consumption.

22	6	5	EA - Energy and Atmosphere (33 possible points)
•			**Fundamental Commissioning and Verification:** Support the design, construction, and operation of a project that meets the owner's project requirements for water, energy, durability, and indoor environmental quality.
•			**Minimum Energy Performance:** Reduce economic and environmental harms of excessive energy use.
•			**Building-Level Energy Metering:** Support energy management and identify opportunities for additional energy savings by tracking building-level energy use.
•			**Fundamental Refrigerant Management:** Reduce stratospheric ozone depletion.
4		2	**Enhanced Commissioning:** Further support the design, construction, and operation of a project that meets the owner's project requirements.
13	4	1	**Optimize Energy Performance:** Achieve increased levels of energy performance beyond the prerequisite standard.
1			**Advanced Energy Metering:** Support energy management, identify opportunities for additional energy savings by tracking building and system level energy use.
		2	**Demand Response:** Increase participation in demand response technologies and programs, making energy generation and distribution systems more efficient, increase grid reliability, and decrease greenhouse gas emissions.
3			**Renewable Energy Production:** Increase self-supply of renewable energy to reduce the environmental and economic harms associated with fossil fuel energy. Points for 1%, 5%, and 10% by cost.
1			**Enhanced Refrigerant Management:** Reduce ozone depletion, support compliance with the Montreal Protocol while minimizing contributions to climate change.
	2		**Green Power and Carbon Offsets:** Encourage greenhouse gas reduction through grid-source, renewable energy and carbon mitigation projects.

4	3	6	MR - Materials and Resources (13 possible points)
•			**Storage and Collection of Recyclables:** Reduce waste generated by building occupants.
•			**Construction and Demolition Waste Management Planning:** Reduce construction and demolition waste by recovering, reusing, and recycling materials.
		5	**Building Life-Cycle Impact Reduction:** Encourage adaptive reuse and optimize the environmental performance of products and materials.
1	1		**Building Product Disclosure and Optimization - Environmental Product Declarations:** Encourage material and product use with life-cycle information available and environmentally, economically, and socially preferred impacts.
	1	1	**Building Product Disclosure and Optimization - Sourcing of Raw Materials:** Reward project teams for selecting products that have been extracted or sourced in a responsible manner.
1	1		**Building Product Disclosure and Optimization - Material Ingredients:** Reward project teams for selecting products with inventoried chemical ingredients, and are verified to minimize the use/generation of harmful substances.
2			**Construction and Demolition Waste Management:** Reduce construction and demolition waste by recovering, reusing, and recycling materials.

9	1	6	IEQ - Indoor Environmental Quality (16 possible points)
•			**Minimum Indoor Air Quality Performance:** Contribute to the comfort and well-being of building occupants by establishing minimum standards for indoor air quality (IAQ).
•			**Environmental Tobacco Smoke Control:** Prevent/minimize building occupant, indoor surface, and ventilation system exposure to environmental tobacco smoke.
2			**Enhanced Indoor Air Quality Strategies:** Promote comfort, productivity, and well-being of occupants by improving indoor air quality.
2	1		**Low-Emitting Materials:** Reduce chemical concentrations that can damage human health, air quality, productivity and the environment.
1			**Construction Indoor Air Quality Management Plan:** Promote well-being of construction workers and building occupants by minimizing indoor air quality problems related to construction and renovation.
2			**Indoor Air Quality Assessment:** Establish better indoor air quality after construction and during occupancy.
		1	**Thermal Comfort:** Promote productivity, comfort and well-being of occupants by providing quality thermal comfort.
1		1	**Interior Lighting:** Promote productivity, comfort and well-being of occupants by providing high-quality lighting.
		3	**Daylight:** Connect building occupants with the outdoors, reinforce circadian rhythms, reduce the use of electrical lighting.
1			**Quality Views:** Connect building occupants with the outdoors by providing quality views.
		1	**Acoustic Performance:** Provide workspaces and classrooms that promote productivity, comfort, and well-being of occupants through effective acoustic design.

LEED® Canada BD+C v4 Checklist for NEW SEATON PARAMEDIC STATION & TRAINING FACILITY (New Construction)

4	2	0	ID - Innovation in Design (6 possible points)
1			**Innovation Measure:** Exemplary Renewable Energy (PV)
1			**Innovation Measure:** Exemplary Low Emitting Materials
1			**Innovation Measure:** Occupant Survey
	1		**Innovation Measure:** TBD
	1		**Innovation Measure:** TBD
1			**Credit: LEED Accredited Professional (A.P.)**

2	0	2	RP - Regional Priority (4 possible points)
1			**Regional Priority:** Indoor Water Use (at least 4/6)
1			**Regional Priority:** Optimize Energy Performance (at least 10/18), Building Life Cycle Impact
		1	**Regional Priority:** Rainwater Management, Building Life Cycle Impact, High Priority Site, Heat Island Reduction
		1	**Regional Priority:** Rainwater Management, Building Life Cycle Impact, High Priority Site, Heat Island Reduction

Pursuing LEED v4.1 compliance path

Not met / not under consideration

1 General

1.1 Related documents

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

.2 Section 01 81 13 – Sustainable Design Requirements

.3 All technical Sections of the Specifications related to interior construction and finish materials, MEPFP systems, and items affecting indoor air quality.

.4 LEED Reference Guide for Building Design and Construction (BD+C), version 4, U.S. Green Building Council.

1.2 Description of work

.1 This Section includes requirements for the development of a Construction Indoor Air Quality Management Plan (herein referred to as the Plan). The Plan shall be developed by the Contractor and approved by the Owner and Architect. The Plan shall be implemented throughout the duration of the Project construction under the direction of the Contractor's IAQ Representative and shall be documented per the Submittal Requirements in Part 1 of this Section. The Plan is part of the Project LEED Requirements.

1.3 Construction IAQ management goals for the project

.1 The Owner has established that this Project shall minimize the detrimental impacts on Indoor Air Quality (IAQ) resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site, and poor housekeeping, shall be minimized.

1.4 Definitions

.1 Volatile Organic Compounds (VOC’s): Carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at

normal room temperatures. These compounds are common in and emitted by many building products, including solvents in paints, coatings, adhesives and sealants, wood preservatives; composite wood binder, and foam insulations. Not all VOC's are harmful, but many of those contained within building products contribute to the formation of smog and may irritate building occupants or construction workers by their smell and/or health impact.

.1 Materials that act as "sinks" for VOC contamination: absorptive materials, typically dry and soft (such as textiles, carpeting, acoustical ceiling tiles and gypsum board) that readily absorb VOC's emitted by "source" materials and release them over a prolonged period of time.

.2 Materials that act as "sources" for VOC contamination: products with high VOC contents that emit VOC's either rapidly during application and curing (typically "wet" products, such as paints, sealants, adhesives, caulks and sealers) or over a prolonged period (typically "dry" products such flooring coverings with plasticizers and engineered wood with formaldehyde).

.2 Minimum Efficiency Reporting Value (MERV): Filter rating established by ASHRAE and determined according to ASHRAE Standard 52.2-2007. MERV categories range from 1 (very low efficiency) to 16 (very high efficiency),

1.5 Reference standards

.1 ANSI/SMACNA 008-2008, "IAQ Guidelines for Occupied Buildings Under Construction", Second Edition 2007, Chapter 3, The Sheet Metal and Air Conditioner National Contractors Association (SMACNA), www.smacna.org.

.2 ANSI/ASHRAE 52.2-2007, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size", www.ashrae.org.

.3 EPA PB90200288 – Compendium of Methods for the Determination of Air Pollutants in Indoor Air, U.S. Environmental Protection Agency (EPA), 1990, available from National Technical Information Service, www.ntis.gov

1.6 Construction IAQ management plan (during construction) - overview

.1 The Contractor shall implement indoor air quality management during construction per the requirements of LEED EQ Credit - Construction Indoor Air Quality Management Plan.

.2 The Contractor shall prepare and submit a Construction IAQ Management Plan for the construction and pre-occupancy phases of the Project to the Owner and Architect. The Construction IAQ Management Plan shall meet the following criteria:

.1 Construction activities shall be planned to meet or exceed the minimum requirements included in the SMACNA “IAQ Guidelines for Occupied Buildings Under Construction”, as listed in Part 1 of this Section.

.2 Absorptive or porous materials shall be protected from moisture damage when stored on-site and after installation. Contractor shall not install water damaged materials in the building.

.3 Filtration media shall be installed to protect ductwork and/or HVAC equipment used during the construction process, per the requirements of Part 2 of this Section.

.4 The use of tobacco and cannabis products shall be prohibited inside the building and within 7.5m of the building entrance during construction.

.5 Only low-emitting and low- or no-VOC products shall be installed in the field on the interior of the Project, per the requirements of Division 01 Section 01 81 13 – Sustainable Design Requirements. Examples of such products include, but are not limited to, adhesives, sealants, paints, coatings, and carpet.

.6 A Sequence of Finish Installation Plan shall be developed, highlighting measures to reduce the absorption of VOCs by materials that act as “sinks”.

.7 Upon approval of the Plan by the Owner and Architect, it shall be implemented by the Contractor and Subcontractors throughout the duration of the construction process and documented in accordance with the LEED Submittal Requirements of this Section.

1.7 Construction IAQ management plan (during construction) – detailed requirements

.1 The SMACNA "IAQ Guidelines for Occupied Buildings Under Construction" (Chapter 3) outlines IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format and shall address measures to be implemented by the Contractor and/or Subcontractors in each of the five SMACNA categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this project should be listed as such.

.1 HVAC Protection:

.1 Return Side

.2 Central Filtration

.3 Supply Side

.4 Duct Cleaning

.2 Source Control

.1 Product Substitution

.2 Modifying Equipment Operation

.3 Changing Work Practices

.4 Local Exhaust

.5 Air Cleaning

.6 Cover or Seal

.3 Pathway Interruption

.1 Depressurize Work Area

.2 Pressurize Occupied Space

.3 Erect Barriers to Contain Construction Areas

.4 Relocate Pollutant Sources

.5 Temporarily Seal the Building

.4 Housekeeping

.1 Suppressing dust

.2 Cleaning and excess applications of products containing solvents

.3 Addressing spills, water conditions, and accumulated water

.4 Vacuuming

.5 Protecting porous materials and other building systems from exposure to moisture and contamination

.5 Scheduling

.1 Sequencing installation of materials

.2 Installation during unoccupied periods

.3 Avoid building occupancy while construction-related pollutants are still present

.2 Protection of Materials from Moisture Damage: Under the Housekeeping section of the Plan, describe measures to prevent installed materials or material stored on-site from moisture. This section should also describe measures to be taken if moisture damage does occur to absorptive materials during the course of construction.

.1 Store materials on elevated platforms or pallets under cover and in a dry location.

.2 If materials are not stored in an enclosed location, cover tops and sides of materials with waterproof sheeting, securely tied.

.3 Phase construction such that absorptive materials are installed only in areas that are weather-tight.

.3 Protection of Ductwork: Under the HVAC Protection section of the Plan, describe measures to protect air handling and distribution equipment and air supply and return ducting during construction.

.1 All ductwork arriving on site shall have the ends and openings sealed with plastic sheeting and stored on pallets or dunnage until installed. Plastic seals shall be remain in place during ductwork installation and shall be repaired or replaced as necessary to maintain continuous protection throughout the duration of construction.

.2 The Contractor shall cover and protect all exposed air inlets and outlets, openings, grilles, ducts, plenums, etc. to prevent water, moisture, dust and other contaminant intrusion.

.3 All ductwork shall be stored on site above the ground or floor slabs.

.4 Ducting runs shall be protected at the end of each day's work.

.5 The Contractor shall apply protection immediately after ducting.

.6 The Contractor's designated IAQ Representative shall inspect work and monitor subcontractor(s) to ensure compliance.

.4 Temporary Filtration: The Contractor shall inspect temporary filtration weekly and replace as required to maintain the proper ventilation rates in the building.

.1 Filtration Media shall meet the requirements as listed in Part 2 of this Section.

.5 Replacement of Filtration Media: Under the HVAC Protection section of the Plan, provide a description of the filtration media in all ventilation equipment used during construction. The description shall include replacement criteria for filtration media during construction and confirmation of filtration media replacement for all equipment immediately prior to occupancy.

.1 Filtration media shall meet the requirements of Part 2 of this Section. As part of required LEED Submittals outlined in Part 1 of this Section, at the end of construction the Contractor shall provide a confirmation that all filtration media were replaced prior to occupancy.

.6 Sequence of Finish Installation for Materials

.1 Absorptive materials should be installed after the installation of materials or finishes which have high short-term emissions of VOC's, formaldehyde, particulates, or other air-borne compounds.

.1 Absorptive materials ("sinks") include, but are not limited to: carpets; acoustical ceiling panels; fabric wall coverings; insulations (exposed to the air stream); upholstered furnishings; and other woven, fibrous or porous materials.

.2 Materials with high short-term emissions ("sources") include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paints, wood preservatives and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; finish processes and products

associated with gypsum board installation; and composite or engineered wood products with formaldehyde binders.

.2 The Contractor shall develop a Sequence of Finish Installation Plan and schedule that identifies how the sequencing of finish material installation will occur for the project. The schedule shall be submitted to the Owner and Architect in accordance with the Submittal Requirements of this Section.

.7 Ventilation during installation of materials and finishes: outside air shall be provided during the installation of materials and finishes, beginning after the building is substantially enclosed. If permanent building HVAC systems are used to supply the ventilation air, filtration media shall be installed per the requirements of Part 2 of this Section.

1.8 Construction IAQ management plan (before occupancy)

.1 As directed by the Owner, the Contractor shall implement the following prior to occupancy per the requirements of LEED EQ Credit - Indoor Air Quality Assessment. After construction ends, with all interior finishes and movable furnishings installed, major VOC-related punch list items finished, the building completely cleaned, and prior to occupancy, the Contractor shall assist in coordinating and implementing the following compliance option.

.1 Air Quality Testing: Conduct base line IAQ testing out in accordance with the requirements and standard methods outlined in the LEED Reference Guide for Building Design and Construction (BD+C), version 4. Concentrations of contaminants shall be tested and shall not exceed maximum levels specified in the Reference Guide. For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.

1.9 LEED submittal requirements

.1 The Contractor shall submit the following required records and documents:

.1 Prior to start of construction, submit the following:

.1 A construction schedule outlining the start-up date and expected duration of all Construction IAQ Management Plan control measures.

.2 A copy of the Construction IAQ Management Plan and the Sequence Installation Plan for approval by the Owner and Architect, as defined in Part 1 of this Section.

.2 Product cut-sheets for all filtration media installed immediately prior to occupancy, with MERV values highlighted and meeting the criteria for filtration media in Part 2 of this Section. Cut sheets shall be submitted with the Contractor's 'approved' stamp as confirmation that the products submitted are the same products installed on the project.

.2 The contractor shall submit the following during construction:

.1 Schedule Q1 – General Contractor Checklist & Log

.1 The General Contractor shall carry out an inspection of the building to verify compliance with the requirements of this specification section. To document this inspection, the General Contractor shall complete Schedule Q1 on a weekly basis. This schedule must be completed and supported by date-stamped digital photos from building close-in until the building is turned over to the Owner. Submit this schedule and supporting photos to the Consultant on a monthly basis as part of the Monthly LEED Construction.

.2 Schedule Q2 – Mechanical Contractor Checklist & Log:

.1 The Mechanical Contractor shall carry out an inspection of the mechanical aspects of building to verify compliance with the requirements of this specification section. To document this inspection, the Mechanical Contractor shall complete Schedule Q2 on a weekly basis. This schedule must be completed and supported by date-stamped digital photos from building close-in until the building is turned over to the Owner. Submit this schedule and supporting photos to the Consultant on a monthly basis as part of the Monthly LEED Construction Report.

.3 Monthly LEED Construction Report

.1 Within 10 working days after the end of each month, the Contractor shall submit the following items as part of the Monthly LEED Construction Report including the below schedule documents attached to this section:

.1 Schedule Q1 and supporting photos.

.2 Schedule Q2 and supporting photos.

.3 At end of construction, submit the following:

.1 Photographs that document the implementation of the Construction IAQ Management Plan throughout the course of the project construction. Submit photos labeled with the SMACNA control measure illustrated. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage to prevent moisture damage. Photographs shall include integral date stamping and shall be submitted with brief descriptions or be referenced to project meeting minutes or similar project documents.

.2 Construction IAQ Management Summary Report.

.3 Required documentation for LEED v4 EQ credit - Construction Indoor Air Quality Management Plan and EQ credit - Indoor Air Quality Assessment, including completed credit forms and supporting documentation.

2 Products

2.1 Filtration media

.1 Final filters: Replace all filtration media immediately prior to occupancy. For all ventilation systems that supply outside air, install filters having a Minimum Efficiency Reporting Value (MERV) of 13 or better as determined by ASHRAE Standard 52.2-2007.

2.2 Building materials

.1 Low-emitting products specified in technical Sections of the Project Manual. VOC content shall comply with requirements specified in Section 01 81 13 – Sustainable Design Requirements.

.2 Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches, commencing with installation of finishes inside the Project.

2.3 Cleaning supplies

.1 Use low toxicity cleaning supplies for surfaces, equipment and workers personal use, during periodic and final cleaning. Comply with requirements for closeout and final cleaning specified in Division 01.

3 Execution

3.1 Implementation and coordination

.1 The Contractor shall be responsible for implementation of the Construction IAQ Management Plan and for the coordination of the Plan with all affected trades per the requirements of Part 1 of this Section.

.1 The Contractor shall designate one individual as the Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner and Architect on a regular basis and for assembling the required LEED documentation.

.2 The Contractor shall include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order or to rectify non-compliant conditions.

.2 The Contractor shall include procedures related to IAQ Management on the agenda during pre-construction meetings and during regularly scheduled meetings on the jobsite. Minutes shall be recorded at all such meetings.

.3 Trade subcontractors shall be responsible for the implementation of specific control measures, as specified in the Construction IAQ Management Plan. Subcontractors shall coordinate their responsibilities through the Contractor and their designated Construction IAQ Representative.

3.2 Onsite quality control

.1 Site Inspections

.1 The Contractor and Mechanical Sub-contractors shall inspect IAQ measures on a weekly basis after building close-in. Inspections must continue until the building is turned over to the Owner.

.2 Record the IAQ measures that are in place, their locations and their conditions at the time of inspection using Schedule Q1 and Q2.

.3 Take date-stamped digital photos of all measures during each inspection.

.2 Conforming Work: Where one or more measures have been jeopardized, the contractor shall remediate as required and reinstate the measure immediately. Should any of the measures associated with protecting the HVAC ductwork be rendered ineffective, the ducts shall be cleaned at the Contractor's expense; the requirement to clean the ducts will be at the discretion of the Owner or their designated representative.

.3 Special Inspection Coordination: LEED Consultant inspections will take place intermittently throughout construction and provide feedback to the Contractor as to the status of the IAQ management.

3.3 IAQ measures and procedures

.1 Source Control

.1 Smoking is not permitted within 7.5 m of the building at any time. The Contractor shall post "No Smoking" signs throughout the building to enforce this requirement.

.2 All toxic chemicals and fuels are to be storage outside of the building.

.3 Keep idling trucks away from open portions of the building, outdoor air inlets, and open doorways.

.4 All equipment refueling is to be done outside of the building.

.5 After close-in, gas powered equipment is not permitted to be used in the building without prior approval from the LEED Consultant. Preference will be given to electric or propane powered equipment.

.6 All adhesives, sealants, paints and coatings applied onsite and used within the weatherproofing system must satisfy the requirements of specification Section 01 81 13 – Sustainable Design Criteria.

.7 Where practicable, assemble products and assemblies that require the use of adhesives, sealants, paints and coatings offsite (e.g. millwork).

.8 Where practicable, allow new materials, products and assemblies to off gas prior offsite or in a dedicated and isolated are within the building prior to installation (e.g. furniture).

.2 Scheduling

.1 Weatherproof the building from the exterior environment as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air barriers, flashing, exterior sealants and roofing, at the earliest possible time.

.2 Schedule construction operations involving wet and/or odourous materials prior to installation of dry and/or absorbent materials. Install interior absorptive materials only after the building envelope is sealed and weatherproofed.

.3 Once installed, protect absorbent materials including, but not limited to, porous insulations, paper-faced gypsum board, ceiling tile, and carpet from dust, dirt and moisture accumulation.

.4 After carpet is installed, place a protective barrier, such as cardboard or plastic sheet, over all floor areas that will be travelled on by workers prior to the end of construction.

.3 Material and Product Storage

.1 All porous, absorptive and finish materials are to be covered or contained prior to installation to prevent dust, dirt and moisture accumulation.

.2 While in storage, materials and products shall be elevated a minimum of 4 in. above the floor and covered using tarps or plastic sheets.

.3 Materials and products that will be installed inside the weatherproofing system must be kept dry at all times. The Contractor shall identify and remove all porous building materials that become wet or damaged by moisture within seven (7) calendar days of such exposure.

.4 Housekeeping Measures

.1 Clean up accumulated debris on a daily basis.

.2 Complete a comprehensive cleaning of the entire floor area on a weekly basis. Clean up shall include, at a minimum, the following activities:

.1 Remove of all unnecessary debris and waste from the building. Dispose of in accordance with Section 01 74 19 – Construction and Demolition Waste Management and Disposal.

.2 Vacuum (preferred) or sweep (using a non-toxic sweeping compound) all floor areas.

.3 Inspect storage of all materials and products for compliance.

.3 Once the building is closed-in, use walk off mats at all entryways to limit the amount of dirt that is tracked into the building.

.4 Keep dirt and other pollutants away from outdoor air intakes and building openings.

.5 Keep mechanical rooms clean and neat. Remove excess dust and debris.

.6 All standing water that accumulates on interior floors shall be removed on the day that it is observed.

.5 Pathway Interruption

.1 Project equipment and material staging areas shall be located away from critical airflow pathways.

.2 Mechanical rooms and air handling equipment areas shall not be used to store construction waste or materials.

.3 Use permanent or temporary barriers to isolate areas with heavy dust generating activities from the rest of the building. Used permanent walls, doors or temporary plastic sheet barriers to isolate these areas.

.4 Establish at least one centrally located work/cutting room that is isolated from other areas of the building using permanent or temporary barriers. Carryout out all heavy dust-generating activities (e.g. wood cutting) in this room. Provide temporary exhaust to the outdoors as required to maintain area at a negative pressure differential compared to surround areas.

.6 Ductwork Protection

.1 Stockpiled ductwork not yet installed shall be stored in an area that is clean, dry and has minimum exposure to dust. Ductwork shall be elevated a minimum of 4 in. above the floor and covered using tarps or plastic sheets.

.2 During ductwork installation, the working area shall be clean, dry and protected from the exterior elements.

.3 Wipe internal surfaces of ductwork immediately prior to installation to remove dust that has accumulated.

.4 All open ductwork must be covered at the end of each day or when not being worked on to prevent the entry of debris into the duct. This can be done using plastic sheets or duct end caps.

.7 HVAC Equipment Protection

.1 HVAC equipment not yet installed shall be stored in an area that is clean, dry and has minimum exposure to dust. Equipment shall be elevated a minimum of 4 in. above the floor and covered using tarps or plastic sheets.

.2 Seal supply diffusers and return grills with plastic during construction operations. Ensure that plastic covers remain in place until final building cleaning and prior to HVAC equipment start-up.

.3 Provide temporary exhaust to areas where heavy construction and dust generating activities are expected to take place. Exhaust systems shall be independent of the building HVAC system to minimize ductwork and equipment contamination.

.4 HVAC equipment should not be operated during construction. If temporary heating, cooling or ventilation is required, this should be done using temporary equipment. Equipment with firing sections located outside the building should be given preference over standard propane fired construction heaters.

End of section

4 Appendices

.1 Appendix A-018119 – Schedule Q1 – General Contractor Checklist & Log

.2 Appendix B-018119 – Schedule Q2 – Mechanical Contractor Checklist & Log

SCHEDULE Q1 – GENERAL CONTRACTOR IAQ CHECKLIST & LOG (APPENDIX A)

Complete this schedule on a weekly basis after the building reaches close-in. Submit completed schedule along with supporting digital photos to the Consultant at the end of each month.

Weekly Checklist – Seaton Paramedics Week of: _____

Complete this checklist to confirm that the IAQ requirements were carried out within the last week:

- ☐ Smoking has not been observed within the building. “No Smoking” signs are in place.
- ☐ Toxic chemicals and fuels are stored outside of the building.
- ☐ Clean-up of accumulated debris has taken place on a daily basis.
- ☐ Within the past week, a comprehensive cleaning of the entire floor area has taken place
- ☐ All materials and products are stored in accordance with 3.3.3.
- ☐ Stockpiled ductwork is stored in accordance with 3.3.6.
- ☐ Open ductwork not in use is sealed using plastic or end caps.
- ☐ Adhesives, sealants, paints and coatings that are, or will be, installed within the building have been reviewed and approved by the Consultant in accordance with specification section 01 81 13
- ☐ Ensure the building envelope is sealed and weatherproofed.
- ☐ Electric or propane powered equipment is being used.

Weekly Log - List the types, locations and conditions of IAQ measures implemented onsite:

IAQ Measure in Place	Location	Repairs Done / Required

Company Name	Contact Name	Date

☐ I have provided photo documentation supporting the information provided on this schedule.

SCHEDULE Q2 – MECHANICAL CONTRACTOR IAQ CHECKLIST & LOG (APPENDIX B)

Complete this schedule on a weekly basis after the building reaches close-in. Submit completed schedule along with supporting digital photos to the General Contractor at the end of each month.

Weekly Checklist – Seaton Paramedics Week of: _____

Complete this checklist to confirm that the IAQ requirements were carried out within the last week:

- ☐ Pipe and duct insulation are stored in accordance with 3.3.3.
- ☐ Stockpiled ductwork is stored in an area that is clean and dry.
- ☐ Stockpiled ductwork is elevated a minimum of 4” above the floor.
- ☐ Stockpiled ductwork is covered with tarps.
- ☐ HVAC equipment not yet installed is stored in an area that is clean and dry.
- ☐ HVAC equipment not yet installed is elevated a minimum of 4” above the floor.
- ☐ HVAC equipment not yet installed is covered with tarps.
- ☐ Open ductwork not in use is sealed using plastic or end caps.
- ☐ Diffusers and return grills are sealed with plastic.
- ☐ Mechanical rooms / air handling equipment areas are not being used to store construction waste
- ☐ All interior surfaces of ductwork installed in the past week were wiped prior to installation.
- ☐ Adhesives, sealants, paints and coatings that are, or will be, installed within the building have been reviewed and approved by the Consultant in accordance with specification section 01 81 13.

Weekly Log - List the types, locations and conditions of IAQ measures implemented onsite:

IAQ Measure in Place	Location	Repairs Done / Required

Company Name	Contact Name	Date

☐ I have provided photo documentation supporting the information provided on this schedule.

1 General

1.1 General instructions

.1 The Contractor shall plan, coordinate, and execute the commissioning of all installed equipment and systems provided as part of the Works.

.2 The Contractor shall provide all necessary labor, materials, Equipment, testing apparatus and incidentals necessary to completely start-up, verify, performance test and commission each item of Equipment and building system provided as part of the Works.

1.2 Reference standards and guidelines

.1 Commissioning activities will be completed in accordance with the following standards:

.1 CaGBC LEED EA p1 - Fundamental Commissioning of the Building Energy Systems

.2 CaGBC LEED EA Credit 1 - Enhanced Commissioning Credits

1.3 Related work

.1 The Team will provide commissioning for the following systems including but not limited to (as it applies to the project):

.1 Air Handling Systems

.2 Boilers

.3 Heaters

.4 Radiators

.5 Pumps

.6 Humidifiers

.7 Exhaust Fan Systems

.8 Terminal Units (Air)

.9 Heating Water Systems

.10 Air Conditioning Systems

.11 Lighting and Lighting Control Systems

.12 Ceiling Fans

.13 Transfer Switches

.14 Emergency Power Systems
.15 UPS Systems
.16 Domestic Hot Water Heaters
.17 Domestic Hot Water Circulation
.18 Booster Pumps
.19 Sump Pumps
.20 Building Automation Systems
  .1 Individual system control sequence
  .2 Graphics
  .3 Integrated Systems
.21 Fire Alarm System
.22 Security / Access Control System

1.4 Abbreviations

.1 The following are common abbreviations used in the Specifications:

.1 A/E – Architect and Engineer
.2 BoD – Basis of Design
.3 CC – Controls Subcontractor
.4 Cx – Commissioning
.5 CxM – Commissioning Manager
.6 Cx Plan – Commissioning Plan document
.7 EC – Electrical Subcontractor
.8 ECMS – Energy Monitoring and Control System
.9 FPT – Functional-Performance Test
.10 GC – General Contractor
.11 HVAC – Heating, Ventilation, and Air Conditioning
.12 IST – Integrated Systems Test
.13 MC – Mechanical Subcontractor
.14 SVC – Static Verification Checklists
.15 Subs – Subcontractors
.16 TAB – Test, Adjust, and Balance

1.5 Definitions

.1 The following definitions shall apply to the commissioning process:

.1 Architect / Engineer (A/E) – the prime consultant (Architect) and sub-consultants who comprise the Project Co. design team.

.2 Basis of Design (BoD) – a document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

.3 Commissioning (Cx): a systematic verification, documentation, and training process applied to all activities during the design, construction, static verification, start-up, and functional performance testing of equipment and systems in a facility to ensure that the facility operates in conformity with the owner's project requirements and the basis of design in accordance with the contract documents

.4 Commissioning Plan (Cx Plan) – a document that outlines the organization, roles, responsibilities, schedule, and documentation requirements of the commissioning process.

.5 Project Tracking Sheet – a document used to track progress during the commissioning process.

.6 Deferred testing — the postponement of functional performance testing of equipment or systems due to the absence of required conditions (e.g., during construction, as a result of environmental factors, or as a result of occupant load and/or operational requirements).

.7 Energy Monitoring and Control System (ECMS) -– the system for controlling and monitoring performance of building mechanical systems. The term is interchangeable with the terms Building Automation System (BAS) and Building Management System (BMS)

.8 Factory Testing – testing of equipment at the factory by factory personnel with MandT, A/E, and/or CxM representatives present.

.9 Functional Performance Test (FPT): a full range of test to verify the proper operation of a piece of equipment or system. Tests require operation under various modes, such as full and part loads

conditions, component failures, unoccupied modes, varying outside air temperatures, fire alarm, power failure, etc. The tests are designed to verify that the sequences of operation have been fully implemented and components are verified to be responding as per the sequenced states to meet the design intent.

.10 In-Warranty Walk-Through – an on-site meeting to review the building operation prior to expiration of equipment warranties (typically 8-10 months after substantial completion). Deficiencies identified in this post-occupancy review shall be documented and corrected under manufacturer or Contract warranties.

.11 Integrated Systems Test (IST) – a test intended to supplement the Functional- Performance Tests and to specifically address equipment interoperation, systems interoperation (mechanical, electrical, fire alarm, ICAT, Audio Visual, security etc.), design space loading, failure scenarios and/or overall system survivability. Completion of associated FPTs is required prior to execution of an IST.

.12 Over-written Value – manually entering a simulated sensor value over the true feedback in the control system to see the response of a system (e.g., changing the outside air temperature value to verify economizer operation is initialized).

.13 Owner's Project Requirements (OPR) – a document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. Refer to the PSOS and PA for this information.

.14 Sampling. – testing only a fraction of the total number of identical or near identical pieces of equipment.

.15 Seasonal Tests – tests that are deferred until the system(s) will experience outdoor weather conditions closer to their design conditions.

.16 Simulated Condition – a false reading condition that is created for the purpose of testing the response of a system (e.g., applying a hair dryer to a space sensor to observe the response of a reheat coil).

.17 Start-up Reports: documentation of inspections and procedures necessary to take a piece of equipment from a static state into an operating state (e.g. belt tension, oil levels, labels affixed, gauges in place, sensors calibrated, etc.). These forms are typically provided by the manufacturer of the piece of equipment and are completed by the subcontractor/vendor/ manufacturer responsible for performing startup.

.18 Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

.19 Systems Manual: Manual assembled that describes, in lay terms, the operation of all system and equipment in a facility. Manual will include control schematics, sequences of operation, control setpoints, alarm notifications, and other relevant documentation needed to understand the operation of the commissioned systems. This document is separate from the O&M Manuals provided by the Contractor.

.20 Trending – monitoring of long-term performance of equipment or systems using the data recording capabilities of the building Automation System.

.21 Validate – the process of witnessing and confirming successful performance demonstration of equipment and system performance including the recording of any deficiencies found.

1.6 Commissioning objectives

.1 Objectives of commissioning process are:

.1 to support quality management through monitoring and checking throughout the design and installation of building systems.

.2 to move completed facility from “static completion” state to optimal “dynamic” operating state.

.3 to verify system performance through testing of completed installation.

.4 to optimize operating and maintenance through delivery of comprehensive quality training and instruction to operating personnel.

.5 to assure provision of accurate and useful historical records, such as, as-builts drawings, test certificates. Such records provide important data for operating and maintaining systems as well as for future system testing, maintenance or renovations and to trouble shoot and repair the components of systems.

.6 to extend commissioning into operational phase in order to verify performance levels under a range of operating conditions, such as change of seasons. This process will help to avoid unforeseen or hidden operating and maintenance expenses that may develop later on.

.7 to monitor operation, performance and maintenance programs; optimize system's performance under normal operating conditions, partial occupancy, and full occupancy, under the direction and review of Commissioning Manager. This phase lasts throughout warranty period. It may involve activities to ensure completion of:

.1 system debugging and optimization.

.2 completion of training and instruction for operating and maintenance personnel.

.3 completion of all commissioning activities on defective, seasonally- sensitive systems, for varying modes and periodic simulated emergency conditions.

1.7 Commissioning process

.1 The commissioning process generally includes but is not limited to the following work:

.1 Commissioning Design Review

.2 Shop Drawings/Record Drawings

.3 Installation review and equipment verification

.4 Plumbing and drainage system testing

.5 Testing of piping systems

.6 Independent Contractor balancing of water systems

.7 Testing of air systems

.8 Independent Contractor balancing of air systems

.9 Testing of equipment and systems (and completed forms)

.10 Building Automation System Commissioning (and completed forms)

.11 Commissioning Manager performance testing (and completed forms)

.12 Commissioning meetings

.13 Operating and maintenance manuals

.14 Training

.15 Systems acceptance

1.8 Written work products

.1 Written work products described here and in in various parts of the Specifications are developed throughout the commissioning process.

.2 The Commissioning Plan shall list all the formal written work products, including brief descriptions of their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them.

.3 In General, the written products will be assembled into a Final Report. The final deliverables are to include (but are not limited to):

.1 Final commissioning plan

.2 Commissioning Meeting Minutes

.3 Commissioning Schedule

.4 Static Verification Checklists

.5 Startup and initial checkout plan

.6 Startup and initial checkout forms (Completed)

.7 Final TAB report

.8 Issues log (deficiencies)

.9 Commissioning Progress Reports

.10 Functional Performance Test forms (Blank and completed)

.11 O&M manual reviews

.12 System Manuals Assembly

.13 Final Commissioning Documentation

.14 Overall training results

.15 Specific training agendas and report of effectiveness of training.

1.9 Responsibilities

.1 Owner representative responsibilities

.1 Attend commissioning meetings as necessary.

.2 Provide the OPR requirements for information and use.

.3 Assign operation and maintenance personnel and schedule them to participate in commissioning team activities as needed.

.2 Commissioning manager responsibilities

.1 Organize and lead the commissioning activities in a logical, sequential manner using consistent protocols and forms.

.2 Develop and distribute the Cx Plan.

.3 Coordinate with the General Contractor to ensure commissioning activities are being included and updated in the master construction schedule.

.4 Complete commissioning related design reviews at approximate 50% and 90% milestones to ensure commissioning related items and O&M considerations are included in the contract documents.

.5 Review applicable equipment submittals concurrently with the A/E team for compliance with commissioning needs and provide comments to the A/E team for their inclusion in the official submittal reviews.

.6 Request and review additional information required to perform commissioning tasks, including O&M materials, start-up and checkout procedures.

.7 Develop project-specific Static Verification Checklists with input from subcontractors and the A/E team.

.8 Develop project-specific Functional Performance Test forms with input from subcontractors and the A/E team.

.9 Develop project-specific Integrated Systems Test forms with input from subcontractors and the A/E team.

.10 Perform site visits, as necessary, to observe confirm proper system installations and issue project reports documenting findings following each visit.

.11 Prepare and maintain the Issues Log and distribute an updated Issues Log on a regular basis.

.12 Prepare and maintain Project Tracking Sheet to indicate progress of Cx testing.

.13 Review construction meeting minutes for revisions/substitutions relating to the commissioning process.

.14 Verify the execution of commissioning process activities using random sampling:

.1 The sampling rate may vary from 10 to 100 percent depending on the type of system and the nature of the end use.

.2 Verification will include, but is not limited to, equipment submittals, Static Verification Checklists, Startup Reports, training, operating and maintenance data, Functional Performance Tests, and test reports to ensure compliance with the OPR.

.15 When a random sample does not meet the requirement, the CxM will report the failure in the Issues Log.

.16 Confirm Static Verification Checklist completion by reviewing completed checklist reports.

.17 Confirm proper start-up has been conducted by reviewing start-up reports and through select site observation and witnessing.

.18 Review TAB execution plan and provide comments to ensure proposed activities are performed in a sequential order consistent with the commissioning plan

.19 Witness systems, assemblies, equipment, and component start-up by reviewing start-up reports and through select site observation and witnessing.

.20 Confirm TAB report accuracy by completing a TAB Audit for a random selection of readings and through select site observation and witnessing.

.21 Analyze any functional performance trend logs and monitoring data to verify performance.

.22 Review to O&M Manuals prepared by the subcontractors.

.23 Review equipment warranties to ensure that O&M Staff responsibilities are clearly defined.

.24 Assembly the Systems Manual with documentation provided by the Cx Team.

.25 Assist with scheduling of Operation Staff training and review the effectiveness of training through operator surveys, select witnessing, and interviews and provide a written summary of the training activities in the final Commissioning Binders.

.26 Prepare a Final Cx Report at the end of the Project.

.27 Coordinate and supervise required seasonal or deferred testing and deficiency corrections after substantial completion.

.28 In accordance with LEED requirements, return to the site at 10 months into the 12 month period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning and make suggestions for improvements and for recording these changes in the O&M manuals.

.3 A/E responsibilities

.1 Attend selected commissioning team meetings when requested.

.2 Perform standard submittal review, construction observation, as-built drawing review, O&M manual review, etc. as contracted.

.3 Coordinate with CxM for submittal reviews and incorporate CxM comments prior to issuing disposition.

.4 Coordinate resolution of system deficiencies identified during commissioning according to the Contract Documents.

.4 General contractors responsibilities

.1 Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

.2 Cooperate with the CxM for resolution of issues recorded in the Issues Log.

.3 Attend commissioning team meetings

.4 Integrate and coordinate commissioning process activities with construction schedule.

.5 Complete Startup Reports as Work is completed and provide documentation to the CxM.

.6 Complete Static Verification Checklists as Work is completed and provide documentation to the CxM prior to scheduling start-up or Functional Performance Testing activities.

.7 Review and accept commissioning process Functional-Performance Test procedures provided by the CxM.

.8 Provide equipment and personnel required for all testing.

.9 Schedule Functional-Performance Test dates at least 5 business days prior to execution to ensure all required witnessing parties can be available to attend.

.10 Assist CxM with obtaining documentation such as installation and operation manuals, additional submittal information, RFIs, etc.

.11 Attend warranty review meeting 10 months after substantial completion and address deficient items.

.5 Subcontractor responsibilities

.1 Subcontractors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

.2 Include scope to complete commissioning requirements in the Contract price.

.3 Attend commissioning scheduling and coordination meetings as requested.

.4 Prepare schedule for respective system commissioning related activities.

.5 Include time in the project schedule for completion of installation and start-up forms and Functional-Performance Tests.

.6 Include time for resolution of deficiencies found during Functional-Performance Tests.

.7 Coordinate the use of Static Verification Checklists and start-up forms and turn over to CxM when completed.

.8 Ensure cooperation and participation of specialty subcontractors.

.9 Provide to CxM a completed Cx Test Request Form certifying that all systems, subsystems, equipment and associated controls are ready for testing, including any required TAB Work.

.10 Ensure participation of equipment manufacturers in appropriate training and testing activities.

.11 Prepare a Training Plan and submit to CxM for review.

.12 Execute the Functional-Performance tests while the CxM witnesses and documents.

.13 Provide documentation for the Systems Manual.

.6 Equipment suppliers

.1 Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the O&M Staff to keep warranties in force.

.2 Assist in equipment testing, per agreements with Subcontractors, which may include factory tests and the development of associated reports as indicated in the individual technical specification sections.

.3 Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to the Contract Documents in the base bid price.

.4 Provide information requested by CxM regarding equipment sequence of operation and testing procedures.

.5 Review test procedures for equipment installed by factory representatives.

2 Products

2.1 Test equipment

.1 All standard testing equipment required to perform start up, initial checkout and Functional Performance Testing shall be provided by the supplying subcontractor for the equipment being tested.

.2 Special equipment, tools and instruments only available from the vendor, and specific to a piece of equipment and required for testing equipment according to the Contract Documents shall be included in the base bid price.

.3 All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the specified tolerances and calibration tags shall be affixed or certificates shall be readily available.

3 Execution

3.1 Reporting

.1 CxM shall communicate with all members of the commissioning team, regularly, with increasing frequency as construction and commissioning progresses, keeping them apprised of commissioning progress and scheduling changes.

.2 A final summary report developed by CxM will be provided to the Cx Team on focusing the results of commissioning, evaluating commissioning process issues and identifying areas where the process could be improved.

3.2 Submittal review processes

.1 Equipment Submittals:

.1 The CxM shall review submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process.

.2 Cx submittal reviews shall be concurrent with the A/E review and the CxM will submit their review comments to the A/E team for official inclusion in their reviews.

.3 The A/E team shall prepare a response to each Cx submittal review comment and return these to the CxM.

.4 The CxM shall notify the team of areas that are not in conformance with Contract Documents and which require resubmission or clarification.

.2 BAS graphics submittal:

.1 The General Contractor shall submit all customized graphics intended to be used for the equipment specific to this project to the Owner within 10 weeks post controls shop drawings review/approval.

.2 Each graphic shall include all applicable data fields with correct units of measure, labeling of equipment consistent with project schedules, and correct depiction of unit components and control devices – including integrated packaged equipment and associated control devices.

.3 Control Integration Matrix submittal:

.1 Complete a matrix within 4 weeks of BAS and BAS-integrated equipment submittals.

.2 The General Contractor shall be responsible for the completion of the matrix and lead the coordination effort between equipment vendors, suppliers, startup technicians, BAS provider, etc.

.3 Correct use of the matrix ensures all integration and communication devices are provided and set up correctly.

3.3 General testing methodology

.1 Static Verification Procedures

.1 Subcontractors shall complete Static Verification Checklists and submit completed forms for review to the CxM prior to start-up or FPT witnessing.

.2 Each piece of equipment receives full pre-functional Static Verification checkout; no sampling strategies may be used.

.2 Start-Up Procedures

.1 The subcontractor responsible for the purchase of a piece of equipment develops the full start- up plan by combining (or adding to) the manufacturer’s detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets.

.2 The start-up plan for each piece of equipment should include test sheets and procedures with specific boxes or lines for recording and documenting the results of each procedure and a summary statement with a signature block at the end of the plan.

.3 Subcontractor proposed start-up plans are to be submitted for approval 4 weeks prior to start-up.

.4 Project Co shall complete Startup forms and submit completed forms for review prior to FPT.

.5 The primary role of the CxM in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed.

.3 Functional Performance Testing

.1 The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents.

.2 Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. During the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

.3 The CxM shall develop test sheets based upon approve controls shop drawings and with sufficient rigour to challenge the equipment/system and the sequence of operations to confirm compliance with the contract documents and the Owner's Project Requirements.

.4 Each system must be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response.

.5 Proper responses to abnormal modes and conditions such as, but not limited to, power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

.6 Before test procedures are written, CxM shall obtain all requested documentation and a current list of any changes affecting equipment or systems, including an updated points list, program code, control sequences and parameters.

.7 CxM shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system.

.8 Prior to execution, the CxM shall provide a copy of the test procedures to Project Co who, with the associated sub traders,

shall review the tests for feasibility, safety, equipment and warranty protection.

.9 The test procedure forms developed by the CxM shall include (but not be limited to) the following information:

.1 System and equipment or component name(s)

.2 Equipment location and ID number

.3 Date

.4 Project name

.5 Participating parties

.6 Required prerequisites such as (but not limited to) completed pre-functional test forms, completed start-up forms, completed static test forms.

.7 Instructions for setting up the test.

.8 Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format

.9 Acceptance criteria of proper performance with a Yes / No checkbox to allow for clearly marking whether or not the performance of each part of the test was achieved.

.10 A section for comments

.11 Signatures and date block for all participating parties.

.10 Functional Performance Testing is conducted after pre-functional testing, startup, and initial TAB activities have been satisfactorily completed.

.11 The CxM will schedule functional tests through the General Contractor.

.12 The CxM shall direct, witness and document the functional testing of all equipment and systems.

.13 Functional performance testing and verification may be achieved through manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the BAS trend log capabilities or by stand-alone data loggers. The CxM will determine which method is most appropriate for tests that do not have a method specified.

.14 Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible.

.15 Functional performance testing of meters will involve the verification of meter location, correct ID tags, calibration of meter output readings to BAS readings and the relevant site calibration certificates. Trending verification will be conducted by reviewing a two-week sample trend to ensure reasonable readings are being provided and that proper communication is occurring.

.16 Multiple pieces of identical non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy.

.17 The CxM shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose.

.18 If frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxM may stop the testing and require the Contractor to perform and document a checkout of the remaining units prior to the continuation of testing.

.4 Non-conformance

.1 The CxM may recommend solutions to problems found, however it is the responsibility of the contractor to solve, and correct problems.

.2 The CxM will arrange for re-testing after corrective action is completed.

.3 Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxM. In such cases the deficiency and resolution will be documented on the procedure form.

.4 Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.

.5 The Contractor shall respond in writing to the CxM, concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

.6 The CxM will maintain an Issues Log until the end of the project.

.7 Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension.

.5 Seasonal Testing

.1 Seasonal Performance Testing is to be completed within the warranty period, and completion is required as part of project completion.

.2 The CxM shall coordinate scheduling of this activity.

.3 Tests will be executed and any final adjustments to the O&M manuals and as-builds due to the testing will be made.

.6 Unforeseen Deferred Tests:

.1 If any system checks or testing cannot be completed due to lack of required occupancy condition, construction phasing, or other deficiency, the completion of Checklist sheets and Functional Performance Testing may be delayed upon approval of the Owner.

.2 These tests will be conducted in the same manner as the seasonal tests as soon as possible.

.7 O&M Manual Review

.1 Prior to substantial completion, the CxM shall review the O&M manuals, test report documentation, and as-built drawings prepared by the Contractor for systems that were commissioned to verify compliance with the Contract Documents.

.2 The CxM will communicate deficiencies in the manuals to Project Co.

.3 This work does not supersede the A/E’s review of the O&M manuals.

.8 Systems Manual

.1 This section describes the format and necessary information to operate, maintain, and recommission all energy-consuming systems within the building.

.2 The CxM is responsible for working with the owner to develop and outline the requirements of the system manual.

.3 Information for the systems manual is generally collected during construction and after completion of a project.

.4 The CxM will assembly the Systems Manual with documentation provided by Sub-contractor, Manufacturers and General Contractor.

.5 The Systems Manual will include the information for an ongoing commissioning plan.

.6 The scope and format of systems manual will include the following;

.1 Executive Summary

.2 Owner Project Requirements

.3 Basis of Design

.4 System single-line diagrams

.5 Construction record documents and specifications

.6 Approved submittals

.7 As-built drawings

.8 As-built sequence of operation

.9 Original setpoints for all systems commissioned.

.10 Recommended schedule for recommissioning

.11 Recommended schedule for sensor recalibration

.12 Equipment operations and maintenance manuals

.13 Equipment preventative maintenance manuals

.14 Equipment preventative maintenance schedules

.15 Confirmation of completed training for owner and occupants

.16 Ongoing system optimization procedures

.17 Final commissioning report

.9 Training of Operational Personnel

.1 The General Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

.2 The CxM shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

.3 Subcontractors required to perform training on commissioned equipment shall submit a Training Plan and/or schedule outlining

the trade or discipline, company/person leading the session, topic(s) of discussion, location, and time allotted for each session.

.4 The A/E team shall conduct the first training sessions to present the overall system design concept and the design concept for each equipment section, include a review of the simplified system schematics (single- line drawings) including:

.1 Building Envelope

.2 Fire protection systems

.3 heating systems,

.4 air distribution system,

.5 control system strategies,

.6 electrical distribution,

.7 fire alarm systems,

.8 Lighting control systems,

.9 Audio Visual systems

.10 Security systems

.11 all other installed systems.

.5 The General Contractor develops an overall training plan and coordinates and schedules, with input from the CxM, the overall training for the commissioned systems.

.6 The CxM develops criteria for determining that the training was satisfactorily completed, including attending some of the training, use of attendee surveys, etc. and recommends approval of the training to the team.

.10 Final Commissioning Documentation Assembly

.1 The CxM shall compile a Final Commissioning Report which will summarize the results of the commissioning process. The report shall include the following:

.1 Executive summary of the process and the results of the commissioning program, including observations, conclusions, and any outstanding items

.2 History of any system deficiencies identified and how they were resolved, including any outstanding issues or seasonal testing scheduled for a later date

.3 An evaluation of the systems performance test results

.4 Summary of the O&M documentation

.2 Summary of the training process

.3 The CxM will compile the following Commissioning Documentation into a final report:

.1 Final Commissioning Plan

.2 Completed Static Verification Checklists

.3 Completed Start-up Forms

.4 Completed Functional Test Forms

.5 Commissioning Meeting Minutes

.6 Field Inspection Reports

.7 Additional Commissioning Documentation as deemed appropriate by the CxM.

End of section

1 General

1.1 Section includes

.1 This section specifies requirements for concrete formwork and falsework.

1.2 Related requirements

.1 Section 03 20 00 – Concrete Reinforcing

.2 Section 03 30 00 – Cast-in-Place Concrete

.3 Section 07 92 00 – Sealants

1.3 References

.1 Canadian Standards Association (CSA)

.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA O86-09, Engineering Design in Wood

.3 CSA O121-08, Douglas Fir Plywood.

.4 CSA O151-09, Canadian Softwood Plywood.

.5 CSA O153-M1980, Poplar Plywood.

.6 CSA O325-07 (R2012), Construction Sheathing.

.7 CSA O437 Series-93, Standards for OSB and Waferboard.

.8 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.

.9 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork.

.10 CSA-S413-07, Parking Structures

.2 American Concrete Institute (ACI):

.1 ACI 347-04, Guide to Formwork of Concrete.

.3 National Lumber Grades Authority (NLGA):

.1 Standard Grading Rules for Canadian Lumber, 2010.

1.4 Definition

.1 Architectural Concrete — Concrete that is exposed as an interior or exterior surface in the completed structure that contributes to the visual character of the completed structure.

1.5 Design requirements

.1 Design formwork in according to CSA S269.1, CAN/CSA S269.3-M and CSA A23.1 Clause 6.5 – Formwork. For Architectural Concrete, provide formwork that conforms to the requirements of CSA A23.1 Clause 8.3.4 – Formwork for Special Architectural Finishes.

.2 Design and engineer falsework and formwork including shoring and bracing to resist loads due to wet concrete, forms, wind, dead loads, construction live loads and forces arising from use of equipment to place concrete without differential settlement between them and to ensure finished concrete within the tolerances required by CSA-A23.1/A23.2.

.3 Design forms for concrete exposed to view or to carry finish, with maximum deflection of 1/400th of span.

.4 If high range water reducer (superplasticizer) is used in concrete mix, design forms for full hydrostatic pressure.

.5 Make joints in forms watertight.

.6 Design formwork to meet variations from a reference system specified in CSA A23.1 Clause 6.4.6.

1.6 Submittals

.1 Submit in according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings:

.1 Indicate the method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1 for falsework drawings and comply with CAN/CSA S269.3-M for formwork drawings.

.2 Indicate in Shop drawings the following:

.1 Layout of panel joints, and tie hole pattern.

.2 Method of sealing form tie hole.

.3 Coordinate with details where shown on the Contract Drawings.

.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequences of erection and removal of formwork/falsework.

.5 Include full details and locations of splices.

.6 Each shop drawing submission shall be stamped and signed by a qualified professional engineer licensed to practice in the Province of Ontario.

.4 Product Data:

.1 Submit the manufacturer's Product data sheets including materials, allowable loading, installation, application and maintenance, and instructions for the applicable items listed:

.1 Proprietary scaffolding.

.2 Shoring beams.

.3 Lumber for formwork and falsework.

.4 Plywood for formwork and falsework.

.5 Tubular column forms.

.6 Form release agent.

.7 Form ties.

.8 Manufacturer's details and specifications for proprietary materials used in formwork liners and coatings.

.5 Submit one sample for each of the following items:

.1 Form ties.

1.7 Waste management and disposal

.1 Separate and recycle waste materials.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOCs.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 For concrete with special architectural features, use formwork materials in according to CSA A23.1/A23.2.

.2 Plywood: CSA O121, G1S; Douglas Fir plywood, sheets as large as practical, minimum 19 mm thick, seven ply, exterior grade, waterproof glue, edges sealed with oil based sealer.

.3 Prefabricated steel forms: CSA S136; Free of irregularities, dents, sags, rust, and materials that can discolour concrete finish.

.4 Steel forms: seamless, steel plates, internally treated with release material.

.5 Tubular column forms: Round, spirally wound laminated fibre forms free of dents and other irregularities, complete with seamless plastic liner, internally treated with form release agent.

.6 Form ties:

.1 For concrete not designated 'Architectural Concrete', use removable or snap-off metal ties, fixed or adjustable length, free of

devices leaving holes larger than 25 mm diameter in concrete surface.

.2 For Architectural Concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.3 Wire ties are not permitted.

.7 Form release agent: Quick drying, sprayable, non-staining, non-toxic coating, compatible with paint and mortar, VOC compliant, containing compounds that react with free lime present in concrete forming water insoluble soaps, preventing concrete from sticking to forms.

.1 Eucoslip VOX by The Euclid Chemical Company;

.2 Clean Strip Ultra (J-3 VOC) by Dayton Superior Corp.;

.3 Sealtight Duogard II by W.R. Meadows of Canada Ltd.;

.4 Debond Form Coating by L&M Construction Chemicals Inc. Buffalo., N.Y.; or

.5 Approved alternate.

.8 Chamfer strips: 20 x 20 mm triangular fillets milled from clear, straight grain pine, surfaced each side, or extruded vinyl type, with or without nailing flange.

.9 Falsework materials: in according to CSA S269.1.

.10 Sealant: in according to Section 07 92 00 – Sealants.

3 Execution

3.1 Fabrication and erection

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions are consistent with the Contract Drawings.

.2 Obtain approval from the Consultant for the use of earth forms framing openings not indicated on the Drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect formwork in according to CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within the tolerances required by CSA-A23.1/A23.2.

.5 Do not place shores and mud sills on frozen ground.

.6 Provide Site drainage to prevent the washout of soil supporting mud sills and shores.

.7 Align form joints and make watertight. Keep form joints to minimum.

.8 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise in the Contract Documents.

.9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated on the Contract Drawings.

.10 Construct forms for Architectural Concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.11 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.12 Clean formwork in according to CSA-A23.1/ A23.2, before placing concrete.

3.2 Removal and re-shoring

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 Four (4) Days for walls.

.2 Seven (7) Days for columns.

.3 Until concrete has reached 70 % of its compressive strength and not before seven (7) Days for beams, slabs, decks and other structural members. Re-shore concrete with adequate shoring to standards specified for fourteen (14) additional Days.

.2 Provide all necessary re-shoring of members if early removal of forms may be required or if members may be subjected to additional loads during construction as required.

.3 Space re-shoring in each principal direction at not more than 3,000 mm apart.

.4 Re-shoring shall remain until concrete has reached its twenty eight (28) Day designed compressive strength.

.5 Re-use formwork and falsework if required by CSA-A23.1/A23.2.

3.3 Construction joints

.1 Obtain approval from the Consultant for location and details of construction joints shown a minimum of two (2) weeks prior to start formwork.

3.4 Expansion and control joints

.1 Construct expansion and control joints at the locations indicated and in according to the details shown on the Contract Drawings.

.2 Construct clean expansion joints free of foreign material, likely to impair the proper operation of the joint.

.3 Provide a non-extruding joint filler in expansion joints for the full area between adjacent concrete members. Anchor the filler material to one of the adjacent members or between concrete members and adjacent members of other materials.

End of section

1 General

1.1 Section includes

.1 This section specifies requirements for concrete reinforcing installation.

1.2 Related requirements

.1 Section 03 10 00 – Concrete Formwork and Falsework

.2 Section 03 30 00 – Cast-in-Place Concrete

1.3 References

.1 Canadian Standards Association (CSA):

.1 CSA A23.1-09/A23.2-09, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.

.2 CAN/CSA A23.3-04, Design of Concrete Structures.

.3 CAN/CSA G30.18-M92, Billet Steel Bars for Concrete Reinforcement.

.4 CSA S413-07, Parking Structures.

.5 CSA W47.1-09 Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction

.2 Ontario Provincial Standard Specification (OPSS):

.1 OPSS 905, Construction Specification for Steel Reinforcement for Concrete.

.3 ASTM International:

.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.3 ASTM A497/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, For Concrete.

.4 Reinforcing Steel Institute of Canada (RSIC):

.1 RSIC, Reinforcing Steel Manual of Standard Practice (2004).

.5 International Conference of Building Officials (ICBO):

.1 ICBO Research Report.

1.4 Quality assurance

.1 Welder Qualifications: CSA W47.1 and CSA W186 certified.

1.5 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Shop Drawings:

.1 Submit reinforcement drawings prepared according to RSIC Manual of Standard Practice.

.2 Design and detail lap lengths to CAN/CSA A23.3. Supply Class B splices unless shown otherwise on the Contract Drawings. Splices are to be staggered unless otherwise shown on the Contract Drawings.

.3 Submit placing drawings, bar lists, quantities and bar bending details. Bar bending details shall include details of standard bends. Indicate the name of the bent bar fabricator, name of bulk steel supplier and steel grade.

.4 On placing drawings, indicate bar sizes, spacing, location and quantities of reinforcement, splices, splice lengths, location of expansion, control and construction joints, with identifying code marks to permit correct placement without reference to structural drawings. Indicate the sequence of placing concrete. Indicate type, sizes, spacings and locations of chairs, spacers and hangers.

.5 If bar list and bending schedule contain details of bars of more than one reinforcing bar placement drawing, then arrange bar marks in

separate groups for each placement drawing. Clearly indicate for each bar mark the corresponding reinforcing bar placement drawing number.

.6 For slabs, show a separate plan indicating concrete thicknesses, reinforcing bars, and dowels for walls and columns cast in slab.

.7 For walls, show separate elevations indicating concrete thicknesses, reinforcing bars, and dowels for slabs and adjacent walls cast in wall.

.8 Show position and size of openings in slabs and walls. Cooperate with trades requiring openings to ascertain necessary information.

.9 Do not add new information on previously reviewed shop drawings.

.10 Reinforcing bar placement shop drawings will be reviewed for bar sizes, locations, and spacing, and will be stamped and signed. Bar list and bending schedule will not be reviewed or stamped.

.11 Submit shop drawings of dowel bar splicers, detailing locations, sizes, and types.

.12 Substitution of different size bars may be permitted upon written acceptance of the Consultant.

.13 Reproduction of the Contract Drawings for use as shop drawings is not permitted. Do not use Contract CADD files.

.4 Product Data Sheets:

.1 Submit three (3) copies of the manufacturer's Product data sheets including installation and maintenance instructions for: chairs, bolsters, bar supports, and side form spacers, dowel bar splicers, and mechanical splices.

.5 Test Reports:

.1 Submit certified copies of mill test reports for reinforcing steel and welded wire fabric, showing physical and chemical analysis, a minimum of thirty (30) Days prior to commencing the Work. Determine physical and chemical properties of steel reinforcing according to requirements of CSA-G30.18.

.6 Certificates:

.1 Submit welding certificate according to CSA W47.1 and CSA W186-M.

.7 Information Submittals:

.1 Submit in writing the proposed source of reinforcement material to be supplied.

.2 Dowel Bar Splicers:

.1 Verification that device threads have been tested and meet the requirements for thread quality, according to the manufacturer's published methods.

1.6 Delivery, storage and handling

.1 Deliver, store and handle materials according to Section 01 65 00 – Product Delivery Requirements and with the manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: Deliver materials to Site in original factory packaging, labelled with the manufacturer's name and address.

.3 Ship bundles of bar reinforcement, clearly identified according to bar bending details and lists. Clearly indicate mill run for which bars were fabricated.

.4 Storage and Handling Requirements:

.1 Store reinforcing steel off the ground and kept free of mud, dirt, oil and any contaminants which may adversely affect performance of reinforcing steel. Comply with CSA A23.1/A23.2.

.2 Store welded wire fabric sheets flat and off the ground.

.3 Deteriorated or contaminated materials will be rejected and shall be removed from site.

.4 Replace defective or damaged materials with new materials at no additional cost to the Owner.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Substitution of different size bars may be permitted upon written acceptance of the Consultant.

.2 Reinforcing Bars:

.1 Reinforcing steel: CAN/CSA G30.18-M; Carbon-steel bars, deformed unless indicated otherwise in the Contract Documents, Grade 400R.

.2 Weldable reinforcing steel: CAN/CSA-G30.18-M; Weldable low alloy steel bars, if welding of reinforcing bars is indicated in the Contract Documents, deformed, Grade 400W.

.3 Plain round reinforcing steel: CAN/CSA G30.18-M; round, Grade 400R, for expansion joints.

.4 Do not substitute with epoxy-coated bars.

.3 Welded steel wire fabric: ASTM A82/A82M; Resistance welded in size and spacing shown for smooth wire fabric and ASTM A497/A497M for deformed wire fabric, in flat sheets only.

.4 Cold-drawn annealed steel wire ties: to ASTM A82/A82M, minimum 1.6 mm diameter, with coating for use with uncoated and coated reinforcing steel.

.5 Bar Supports and Spacers:

.1 Adequate for accurate placing and as required for construction loads.

.2 Provide non-conductive bar supports in contact with exposed surfaces that has geometry and bond characteristics that prevents moisture movement from the surface to the reinforcement.

.3 In beams, columns, walls, and slabs exposed to view after form removal: Small concrete blocks made up of same color and strength as concrete being placed around them.

.4 Do not use plastic or stainless steel bar supports or side form spacers.

.5 Design and fabricate special bar supports for top reinforcing bars in slabs if standard bar supports are not high or strong enough.

.6 Mechanical Splices:

.1 Mechanical Threaded Connections: Furnish metal coupling sleeve with internal threads engaging threaded ends of bars, capable of developing in tension or compression 125 % of yield strength of bar.

.1 Conform to CSA A23.3.

.2 Provide a thread-in plastic plug to protect the threads.

.3 Wrap exterior with tape.

.4 Clip the mounting washer, if provided, to maintain cover without displacing the bar.

2.3 Fabrication

.1 Fabricate and bend reinforcing steel according to CAN/CSA-A23.1/A23.2, RSIC Manual of Standard Practice and according to the accepted placing drawings.

.2 Reinforcing Bars:

.1 Use longest bar possible.

.2 Shear and bending Tolerances:

.1 Length: ±25 mm.

.2 Outside dimensions of stirrups, ties, and spirals: ±13 mm.

.3 Other bends: ±25 mm.

.4 If increases cause interference with waterstop- plus 0 mm.

.5 Ensure cutting and bending tolerances are sufficiently accurate to comply with placing tolerances shown.

.3 Keep number of splices to a minimum.

.4 Do not weld chairs, bolsters, bar supports, or spacers to reinforcing bars.

.3 Reinforcing Splices:

.1 Lap Splices: Splice by lapping reinforcing bars, unless specified otherwise in the Contract Documents.

.2 Welded Splices: Full penetration direct butt splice welds according to CSA W186 and as specified in the Contract Documents.

.3 Splices in Wire Fabric: Comply with CSA A23.3.

.4 Obtain prior written approval from the Consultant for locations of reinforcement splices other than those shown on the placing drawings.

.4 Bend bars cold, heating of bars will not be permitted.

.5 Verify elevations before cutting and bending reinforcing bars.

.6 Obtain written approval from the Consultant prior to welding reinforcement. Weld reinforcement according to CSA W186-M.

3 Execution

3.1 Preparation

.1 Notify Consultant a minimum one week in advance of when reinforcing is ready for inspection.

.2 Clean reinforcing bars of loose rust, mill scale, dried cement paste, mud, oil, or other coatings that will affect adhesion according to CSA A23.1/A23.2, Clause 6.1.5 – Surface Condition of Reinforcement, prior to placing concrete.

.3 Coat wire projecting from bar supports with dielectric material or plastic.

3.2 Field bending

.1 Do not field bend or field weld reinforcement without prior written approval by the Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure. Required radius of bend shall be provided according to CSA A23.4.

.3 Replace bars which develop cracks or splits.

3.3 Reinforcement bar installation

.1 Prior to installation of reinforcing steel, inspect installed Work of other trades and verify that Work is complete for installation of reinforcement.

.2 Place reinforcing steel as shown on reviewed placing drawings and according to CSA A23.1/A23.2.

.3 Use plain round bars as slip dowels in concrete.

.1 Paint the portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 When paint is dry, apply a thick even film of mineral lubricating grease.

.4 Tie bars at least at every fourth intersection minimum. Make maximum untied length 1,000 mm.

.5 Do not eliminate or displace reinforcement to accommodate hardware to be embedded in concrete.

.6 Do not field bend bars partially embedded in concrete except as shown on the Contract Drawings or as accepted by the Consultant.

.7 Prior to placing concrete or closing wall and column forms, obtain acceptance of reinforcing steel and position from Consultant.

.8 Ensure cover to reinforcement is maintained during concrete pour.

.9 Splicing:

.1 Use lap splices, unless otherwise shown on the Contract Drawings or permitted in writing by the Owner’s Representative.

.2 Welded Splices: Accomplish by full penetration groove welds and develop a minimum of 125 % of yield strength of bar in tension and compression.

.3 Stagger splices in adjacent bars.

.10 Dowel Bar Splicers:

.1 Use only in areas specifically approved in writing by the Owner’s Representative.

.2 Install threaded rods as recommended by manufacturer with threads totally engaged into coupling sleeve and according to ICBO Research Report.

.3 Install dowel bar splicers with plastic setting plugs.

.4 Lightly grease internal threads according to manufacturers printed instructions.

.5 Maintain minimum edge distance and concrete cover as noted in the Contract Drawings.

.11 Mechanical Splices:

.1 Install mechanical splices according to the manufacturer's written instructions. Request the presence of the manufacturer's representative to verify proper installation.

.12 Tying Reinforcing Bars:

.1 Bend tie wire away from concrete surface. Ensure that the cover for tie wires, form tie bolts, etc. are the same as the reinforcing bars. Do not let reinforcing tie wire touch formwork or be exposed in the finished concrete structure.

.13 Reinforcement Around Openings: On each side and above and below pipe or opening, place an equivalent area of steel bars to replace steel bars cut or disrupted for opening. Extend steel reinforcing a standard lap length beyond opening at each end.

.14 Welding Reinforcement:

.1 Only Type W bars may be welded.

.2 Do not perform welding until welder qualifications are approved.

.15 Do not field cut reinforcement except if indicated or authorized in writing by the Consultant.

3.4 Progress cleaning

.1 Leave the Work areas clean at end of each Working Day.

.2 Final Cleaning: Upon completion of reinforcing steel installation, remove surplus materials, rubbish, tools and equipment and verify that the area ready for placing concrete.

End of section

1 General

1.1 Section includes

.1 This section specifies requirements for cast in place concrete installation.

1.2 Related requirements

.1 Section 03 10 00 – Concrete Formwork and Falsework

.2 Section 03 20 00 – Concrete Reinforcing

.3 Section 03 30 00 – Cast-in-Place Concrete

.4 Section 07 21 00 – Thermal Insulation

1.3 References

.1 CSA International:

.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-13, Cementitious materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.4 CAN/CSA-G30.18-09: Carbon Steel Bars for Concrete Reinforcement.

.5 CSA S413-07, Parking Structures

.2 ASTM International:

.1 ASTM C260-06, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C494/C494M-11, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM C1017/C1017M-07, Standard specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.5 ASTM D1751-04 (2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.6 ASTM C1059/C1059M-99 (2008), Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

.7 ASTM D6690-07, Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

.8 ASTM D1752-04a (2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.9 ASTM D638-10, Standard Test Method for Tensile Properties of Plastics.

.10 ASTM D412-06, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension.

.11 ASTM C109/C109M-13, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars using 50-mm Cube Specimens

.12 ASTM C1315, Standard Specification for Liquid Membrane-Forming Compound having Special Properties for Curing and Sealing Concrete

.3 American Concrete Institute (ACI):

.1 304.2R Placing Concrete by Pumping Methods

.4 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

.2 CAN/CGSB 51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.4 Abbreviations and acronyms

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

.1 Type GU or GUb - General use cement.

.2 Type MS or MSb – Moderate sulphate-resistant cement.

.3 Type MH or MHb - Moderate heat of hydration cement.

.4 Type HE or Heb - High early-strength cement.

.5 Type LH or LHb - Low heat of hydration cement.

.6 Type HS or HSb – High sulphate-resistant cement.

.2 GGBFS - Ground, granulated blast-furnace slag.

1.5 Definitions

.1 Exposed Concrete: Concrete surfaces that can be seen inside or outside of structures including surfaces above water.

.2 Surface Defects: Surface areas that include honeycomb, rock pockets, indentations greater than 5 mm, cracks 0.25 mm wide and larger, spalls, chips, air bubbles greater than 20 mm in diameter, pinholes, bug holes, embedded debris, lift lines, sand lines, bleed lines, leakage from form joints, fins and other projections, form pop outs, texture irregularities, and stains and other colour variations that cannot be removed by cleaning.

.3 Defective concrete: As defined in subsection 1.5.6 – Defective concrete, below.

.4 New Concrete: Less than sixty (60) Days old.

1.6 Quality assurance

.1 Quality Assurance: according to Section 01 45 00 – Quality Control.

.2 Ready Mixed Concrete Producer: Certified member in good standing of the Ready Mixed Concrete Association of Ontario.

.3 Inspection and tests:

.1 Materials: CSA A23.1/A23.2.

.2 Tests will be performed according to CSA A23.1/A23.2.

.3 Cooperate with and assist the independent testing agency and the Consultant during inspections and tests.

.4 Remove defective materials and completed work which fails tests and replace as directed by the Consultant.

.5 Inspection or testing by the Consultant will not augment or replace the Contractor's quality control nor relieve the Contractor of its contractual responsibility.

.4 Test Panels

.1 Provide test panels 1.0 m x 1.0 m in size of illustrating sandblast specified for the Consultant’s approval before starting the sandblast finishing work.

.2 Provide one (1) test panel for each type of sandblast finish indicated.

.3 Erect panels individually or build-in on site in areas selected by the Consultant.

.4 Form as many panels as necessary until written approval has been issued by the Consultant.

.5 Upon approval, maintain sample panels in place throughout the duration of the Contract as the standard of workmanship to be adhered to.

.6 Upon completion of the concrete work, remove and dispose of the test panels off Site.

.5 Defective concrete:

.1 Concrete strength:

.1 Strength acceptance criteria from cylinder tests will be according to CSA A23.1/A23.2.

.2 Concrete shall be considered defective if a cylinder test fails to meet the performance requirements for the corresponding concrete type, as defined in subsection 2.2 – Concrete Mixes, below.

.3 In such cases, the Consultant may require further action or testing according to CSA A23.1, Clause 4.4.6.7 – Failure of Standard-Cured Cylinder Test Results to Meet Requirements.

.2 Concrete may be considered defective if it is structurally unsound, lacks moisture resistance, has surface defects, the measured air content fails to meet performance requirements or is improperly finished, as determined by the Consultant.

.3 The Consultant has the right to require replacement, strengthening or correction of impacted portions of defective concrete structure, according to Clause 4.4.6.7.2 of CSA A23.1.

.4 The Contractor shall bear all costs of rectifying defective concrete including inspections, design, coring, testing, strengthening, demolishing, and replacement. The Contractor shall also bear investigation and evaluation costs even if further evaluation of the design allows the unit to be classified as acceptable concrete.

.6 Concrete delivery:

.1 There shall be a maximum time limit of one hundred and twenty (120) minutes from the time of initial mixing to complete discharge, according to CSA A23.1 Clause 5.2.4.3.1 – Time of Delivery.

.7 Records:

.1 Before unloading at Site, have the concrete producer submit to the Consultant a delivery ticket (with each batch of concrete) on which is printed, stamped or written the following information:

.1 Name and location of batch plant.

.2 Date and serial number of ticket.

.3 Name of Contractor.

.4 Contract Name and Contract number.

.5 Concrete Mix Design Submission Form number, specified strength, target slump and air content at end of chute.

.6 Amount of concrete in cubic metres.

.7 Truck number, cumulative total, and/or load number.

.8 Time loaded or time of first mixing of cement and water/aggregate.

.2 Include the following information, which is to be registered by the producer's representative on at least two (2) copies of the delivery ticket, after discharge has been completed:

.1 Time that load arrived on Site.

.2 Time that discharge of load was started.

.3 Time that discharge of load was completed.

.4 Type and amount of admixtures. If added at Site, initialed by the Consultant.

.3 Maintain accurate records of cast-in-place concrete elements. Include in the records the following information:

.1 Date of placing concrete element.

.2 Location of concrete element.

.3 Specified strength of concrete.

.4 Air and form temperature when concrete was placed

.5 Temperature of concrete when placed in the form

.6 Test samples taken and results of test samples.

.8 The Owner, in consultation with the Consultant, will appoint an independent inspection and testing company to verify compliance with this Specification according to Section 01 45 00 – Quality Control. Cooperate and coordinate with the inspector to facilitate inspection.

1.7 Submittals

.1 Provide submittals according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Certificates:

.1 Submit a current, valid “Certificate of Ready Mixed Concrete Production Facilities” as issued by the RMCAO for plants supplying concrete to the Contract.

.2 Submit certification from the concrete producer that a Professional Engineer licensed in the Province of Ontario has designed the mixes based on the requirements of the Specifications and that the concrete mixes will produce concrete meeting the performance requirements of the Specification Sections.

.3 Submit certification demonstrating that aggregates will not, nor have the potential to, react with cement to result in deleterious expansion in the concrete. Ensure these tests are current and represent the aggregates being supplied

.4 Submit certifications with the concrete mix design, that all concrete constituents are compatible.

.4 Quality Control Plan:

.1 Submit for review by the Consultant the Quality Control Plan which describes the material, equipment and procedures to be used for the following activities:

.1 Uniform and consistent concrete finishing.

.2 Cold weather protection if the air temperature is at or below 5 °C.

.3 Hot weather protection if the ambient air temperature is at above 27 °C .

.4 Concrete curing.

.5 Concrete placing.

.6 Temperature Management Plan including temperature monitoring and corrective measures.

.2 Submit concrete delivery records.

.5 Records

.1 Concrete pours: Maintain and submit accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken, as described in subsection 3.8 - Field Quality Control, below.

.2 Concrete hauling times: Maintain and submit records of deviations from the maximum allowable time of one hundred and twenty (120) minutes for concrete delivery.

.6 Shop Drawings:

.1 Master Plan(s) of Concrete Placements:

.1 Before submitting shop drawings of formwork, falsework and reinforcing bars, submit master plan(s) showing separate concrete placements and the locations of all expansion,

isolation, control and construction joints, including any proposed construction joints that are in addition to those indicated on the Contract Drawings.

.2 Show layout and location for each type of joint, including expansion and construction joints.

.3 Show elevation or section taken through the plane of the joint showing the walls and slabs at the joint.

.4 Show details of joint fillers, sealant, adhesives, and other appurtenances.

.5 Show details of concrete inserts, including location, size, type and surface treatments.

.2 Concrete Placing Schedule:

.1 Submit concrete placing schedule.

.7 Concrete Mix Designs:

.1 Submit proposed performance mix design data, and the Supplier's applicable standard deviations.

.2 Tabulate concrete mixes. Indicate the types of cement, size of coarse aggregate, water/cementing material ratio, admixtures used, air content, slump, and the locations of use for each mix.

.3 For high slump flowing concrete submit a mix that will not result in segregation.

.8 Field Quality Control Test Results:

.1 Submit reports of results for each of the following field tests, and as described in subsection 3.8 – Field Quality Control, below:

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at seven (7) and twenty eight (28) Days.

.5 Air and concrete temperature.

.9 Product Data and Samples:

.1 Submit technical data and samples, if noted with quantities, of proposed materials including installation, application, and maintenance instructions for:

.1 Joint filler (100 mm length of each type).

.2 Curing compound.

.3 Evaporation retardant.

.4 Surface sealer.

.5 Floor hardener.

.6 Chemical hardener.

.7 Polyethylene sheet.

.10 Submit a Construction Waste Management plan as described in subsection 3.16 – Cleaning, below.

1.8 Pre-placement meeting

.1 Hold a meeting a minimum of twenty eight (28) Days prior to the initial placement of concrete to review the detailed requirements for preparing the concrete design mixes, finishes, and procedures for concrete placement for the structures.

.2 Ensure key personnel, Site supervisor, Consultant, concrete formwork and finishing Subcontractors, concrete pumping and conveying equipment supplier, concrete producer and testing laboratories attend.

.3 Notify the Consultant a minimum of ten (10) Working Days prior to the scheduled date of the meeting.

.4 Provide an agenda for the meeting a minimum of five (5) Working Days prior to the scheduled date of the meeting,

.5 Provide minutes of the meeting within five (5) Working Days after the meeting. Circulate to all parties.

1.9 Delivery, storage and handling

.1 Comply with the manufacturers' recommendations for delivery, storage, and handling.

.2 Store materials in a manner that will prevent deterioration or contamination. Deteriorated or contaminated materials will be rejected and must be removed from the Site.

.3 Concrete:

.1 Deliver and store materials on Site according to CSA A23.1/A23.2.

.2 Site-mixed concrete shall not be permitted.

.3 Concrete, mixed off-Site:

.1 If the truck mixer or agitator is accepted for mixing or delivery of concrete, do not add admixtures or water to batch after the initial introduction of mixing.

.2 If measured slump or entrained-air content falls outside specified limits, ensure another portion of the same sample is tested immediately. If second failure occurs, concrete will be considered to have failed the requirements of the Specification and will be rejected.

.4 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials.

1.10 Site conditions

.1 Do not place concrete during or prior to rain.

.2 Prevent rain from reaching newly placed concrete according to CSA A23.1/A23.2

.3 Cold weather protection:

.1 Maintain protection equipment, in a state of readiness, on Site. Use such equipment if the ambient temperature is at or below 5 °C, or if, in the opinion of the Consultant the temperature may fall below 5 °C before concrete has cured.

.2 Do not place concrete upon or against a surface that is at temperature lower than 5 °C.

.3 Provide temperature-controlled enclosures for areas if concrete is placed during ambient air temperature 5 °C or lower.

.4 Protect concrete from the adverse effects of space-heated enclosures including local overheating and combustion products.

.5 Heat mix water and, if necessary, aggregates if air temperature is at or below, or predicted to go below, 5 °C at any time during the next twenty (24) hours.

.6 Maintain temperature of reinforcing bars and forms above 10 °C prior to placing concrete.

.7 Maintain temperature of concrete if deposited in forms not less than 15 °C but not higher than 25 °C .

.8 Maintain temperature of concrete at surfaces at least 10 °C for a minimum period of seven (7) Days after placing and achieving minimum 75 % of specified strength. Concrete temperature may then be lowered to ambient air temperature at a rate of 0.5 °C per hour or 10 °C per day.

.9 Use additional protection if full twenty eight (28) Day compressive strength is required at an early age.

.10 Keep concrete continuously moist during the curing period.

.11 Obtain the Consultant’s acceptance of the method of maintaining minimum temperatures.

.4 Hot weather protection:

.1 Maintain protection equipment in a state of readiness on Site. Use such equipment if the ambient temperature is at or above 27 °C, or if, in the opinion of the Consultant the temperature may exceed 27 °C before concrete has cured.

.2 If ambient temperature is at or above 27 °C, protect concrete from direct sunlight and keep forms moist by sprinkling with cool water, applying wet burlap, or other accepted methods of cooling that will not adversely affect the concrete.

.3 Do not place concrete if the concrete temperature exceeds 27 °C in the mixer.

.4 Concrete, which has a temperature in the mixer between 20 °C and 27 °C shall:

.1 Contain a retarder which reduces mixing water requirements and increases strength.

.2 Not contain high early strength cement.

.5 Protect forms and equipment, including both mixing and placing equipment, from the rays of the sun and cool by wetting as necessary to maintain a temperature of not more than 5 °C in excess of the ambient temperature nor more than 30 °C.

.6 Prior to placing concrete, wet down forms and reinforcement and the area surrounding the work. Ensure that excess water is swept and drained away immediately before casting the concrete.

.7 Keep mixing time to the minimum, consistent with the production of the quality of concrete specified and place mixed concrete immediately.

.8 Use sufficient qualified personnel for rapid placing and finishing of concrete.

.9 Commence continuous wet curing as soon as the concrete has hardened sufficiently to prevent surface damage.

.5 Protection from drying:

.1 If the rate of surface moisture evaporation exceeds 0.50 kg/m^2/h, take additional measures to prevent rapid loss of moisture from surface of concrete as accepted by the Consultant and according to CSA A23.1 Clause 7.4.1.2 – Severe Drying Conditions.

.6 Frost Protection for Footings and Slabs on Grade:

.1 Protect subgrades below proposed concrete work. Ensure that subgrade temperatures are a minimum of 10 °C when the concrete is placed.

.2 Provide continuous protection for footings and slabs on grade to prevent the sub-grade below from freezing during cold weather. Provide heated enclosures and insulation as required.

.7 Influence of Ambient Concrete Temperature on Concrete Crack Control:

.1 To minimize the formation of thermal cracks during placement and curing, maintain previously cured concrete and concrete that will be placed against it at the same temperature.

.2 Failure to minimize temperature differential between adjacent pours may result in temperature induced cracking. Repair such cracks as specified in this Section.

.8 Backfilling and Service Loads Restrictions:

.1 Obtain approval from the Consultant prior to backfilling around structures.

.2 Verify that the backfill is not higher than the finished grades indicated in the Contract Documents.

.3 Verify that equipment for backfilling and compaction on top of slabs will not impose loads greater than those indicated in the Contract Documents.

.4 Verify that concrete in walls, and slabs, struts, and cross walls, which frame into the walls providing lateral stability, has been placed and has attained the specified compressive strength before backfilling against walls or subjecting walls to service loads.

.5 Verify that concrete in slabs, including slabs on grade supported by piles or caissons, and support components, have reached the specified compressive strengths before backfilling or subjecting slabs to service loads.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 General:

.1 Use admixtures for concrete according to CSA A23.1/A23.2, unless otherwise acceptable to the Consultant.

.2 Have the concrete producer certify that admixtures are compatible.

.3 Use Products according to the manufacturer's printed instructions unless otherwise acceptable to the Consultant.

.4 Fresh concrete to be normal density concrete (2,350 kg/m³ ± 100 kg/m³), unless otherwise noted in Part 2.2 – Concrete Mixes.

.2 Cement and supplementary cementing materials: according to CSA A3001:

.1 For use in general concrete construction, if the special properties of other cement types are not required, Portland cement Type GU or blended hydraulic cement type GUb shall be used.

.2 Should the Contractor choose to include silica fume cement in the concrete mix design, the substitution of silica fume shall not exceed 8 % by mass of Portland cement.

.3 Should the Contractor choose to include fly ash in the concrete mix design, the substitution of fly ash shall not exceed 25 % by mass of Portland cement.

.4 Should the Contractor choose to include a Ground Granulated Blast Furnace Slag (GGBFS) in the concrete mix design, the substitution of GGBFS shall not exceed 50 % by mass of Portland cement, unless specifically accepted by the Consultant.

.3 Aggregates:

.1 Course aggregates: According to CSA A23.1/A23.2. All aggregate sources as listed on the MTO's designated Source Materials (DSM) list.

.2 Fine aggregates: According to CSA A23.1/A23.2.

.4 Water: according to CSA A23.1/A23.2.

.5 Admixtures:

.1 Air entraining admixture: according to CSA A23.1/A23.2 and ASTM C260/C260M.

.2 Chemical admixture: according to CSA A23.1/A23.2, ASTM C260 and ASTM C494. The Consultant is to approve accelerating or set retarding admixtures during cold and hot weather placing.

.1 Water-reducing admixture: ASTM C494/C494M, Type A.

.2 Retarding admixture: ASTM C494/C494M, Type B.

.3 Accelerating admixture: ASTM C494/C494M, Type C.

.4 Water-reducing and retarding admixtures: Type D.

.5 Water-reducing and accelerating admixture: Type E.

.6 Water-reducing high range admixture (super plasticizers): Type F.

.7 Water-reducing, high range and retarding admixtures (super plasticizers): Type G.

.8 Specific performance admixtures: Type S.

.6 Curing compound: to CSA A23.1/A23.2 white.

.7 Non-shrink grout: Shrinkage compensating grout, pre-mixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.

.1 Compressive strength: 40 MPa at twenty eight (28) Days.

.8 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape if made into ball by hand and capable of developing compressive strength of 40 MPa at twenty eight (28) Days.

.9 Dry Pack Material: one (1) part cement and three (3) parts sand (fine aggregate) by volume. Add water to obtain a consistency that if a sample is squeezed, only enough water will come to the surface to moisten hand. Maximum water content shall be 4.5 L to 23 kg of cement.

.10 Dovetail anchors and slots: Minimum 0.64 mm thickness, Z275 zinc coated galvanized steel with fillers to prevent entry of concrete during pouring and minimum 2 mm overall thickness.

.11 Rigid insulation: Refer to Section 07 21 00 – Thermal Insulation.

.12 Drilled Anchors:

.1 HIT-HY 200 System by Hilti (Canada) Corporation;

.2 HSL-3 Heavy Duty Expansion Anchor by Hilti (Canada) Corporation; or

.3 Approved alternate.

.13 Bond breakers: 810-07 Non-Fibered Asphalt Roof and Foundation Coating by Henry Company Canada Inc. or approved alternate.

.14 Premoulded joint fillers:

.1 Bituminous impregnated fibre board: according to ASTM D1751.

.2 Sponge rubber: according to ASTM D1752, Type I, flexible firm grade.

.3 Self-expanding Standard cork: according to ASTM D1752, Type III.

.15 Surface hardener:

.1 Factory premixed natural emery aggregates with Type GU normal Portland cement, superplasticizers and wetting agents:

.1 EmeriCrete SH by Sika Canada Inc.;

.2 CPD Floor Hardener Pre-mix (Premium) by CPD Construction Products;

.3 MBT brand, Mastercron Ff by BASF – Building Systems; or

.4 Approved alternate.

2.3 Concrete mixes

.1 Performance Requirements:

.1 Proportion concrete for structures to create high performance concrete with improved durability, reduced shrinkage and reduced cracking.

.2 Density: Normal density.

.3 Linear Shrinkage:

.1 Limit linear shrinkage to 0.040 % after twenty eight (28) Days drying for 40 mm aggregate concrete and 0.045 % after twenty eight (28) Days drying for 20 mm aggregate concrete.

.4 Durability Design Life

.1 Provide concrete produced under this Section with an expected design life of at least seventy (70) years for the service conditions defined by the usage, and the exposures specified in the Contract Documents.

.2 General:

.1 Establish proportions of cementing materials, aggregates, water, and admixtures required to produce consistent workable concrete with strength and other properties specified, according to CSA A23.1/A23.2.

.2 Design concrete so that material will not segregate and excessive bleeding will not occur.

.3 Use same types and brand of cement throughout.

.4 Comply with and allow for the supplier's Standard Deviation as specified in CSA A23.1/A23.2, Clause 4.4.6.7 Compressive Strength Requirements.

.5 Admixtures plant added with the mix water.

.3 Unshrinkable fill: Ontario Provincial Standard Specification OPSS 1359.

.4 Mixes for Normal Density concrete:

.1 High performance concrete for foundations, footings and foundation walls:

.1 Class F-1 exposure.

.2 30 MPa at twenty eight (28) Days.

.3 Maximum aggregate size 40 mm for slab greater than 400 mm thickness and 20 mm unless the slab is less than or equal to 400 mm thickness.

.2 Concrete grout for starting structural walls below-grade at construction joint:

.1 Class F-1 exposure.

.2 30 MPa at twenty eight (28) Days.

.3 Utilize mix 1 above without the coarse aggregate.

.3 High performance concrete for interior slabs, including slabs-on-grade and slabs-on-deck:

.1 Class N exposure.

.2 32 MPa at twenty eight (28) Days.

.4 Exterior reinforced concrete slabs:

.1 Class C-1 exposure.

.2 35 MPa at twenty eight (28) Days.

.3 Air content category 1.

.4 Maximum aggregate size 40 mm for slab greater than 400 mm thickness and 20 mm for slabs less than or equal to 400 mm thickness.

.5 Exterior unreinforced concrete slabs, pavements, sidewalks and curbs:

.1 Class C-2 exposure.

.2 32 MPa at twenty eight (28) Days.

.3 Maximum aggregate size 40 mm for slab greater than 400 mm thickness and 20 mm for slabs less than or equal to 400 mm thickness.

.6 Lean fill, pipe bedding, duct banks, encasements, underpinning and skim slabs:

.1 Class N exposure.

.2 15 MPa at twenty eight (28) Days.

.3 Maximum aggregate size 20 mm.

.5 Mix for Pumped Concrete:

.1 Comply with the requirements of ACI 304.2R and this Section.

.2 Use coarse and fine aggregate with a uniform grading curve.

.3 Superplasticizing admixture may be used for pumped concrete.

.4 Do not use admixtures which promote bleeding.

3 Execution

3.1 Releases

.1 Obtain the Consultant's release:

.1 For reinforcement, formwork, falsework, and inserts as placed.

.2 To commence placing concrete.

.2 Provide the Consultant with written notice of the Contractor's intent to pour between twenty (24) hours and seven (7) Days prior to the pour.

.3 Provide a completed Concrete Pour Release Form (attached as a supplement to this Section) prior to each pour and allow the Consultant two (2) hours for their review.

.4 Do not order concrete until the Concrete Pour Release Form has been signed by the Consultant.

3.2 Preparation

.1 Obtain written approval from the Consultant before placing concrete. Provide twenty four (24) hours minimum notice prior to the placing of concrete.

.2 Place concrete reinforcing according to Section 03 20 00 – Concrete Reinforcing.

.3 Remove water, snow, ice, loose soil, laitance, curing compound, wood, and other debris from surfaces on or against which new concrete will be placed.

.4 Roughen and clean surfaces of previously placed concrete against which subsequent concrete will be placed.

.5 During concreting operations:

.1 The development of cold joints shall not be allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum re-handling, and without damage to the existing structure or Work.

.6 Pumping of concrete is permitted only after the approval of equipment and mix.

.7 Ensure reinforcement and inserts are not disturbed during concrete placement.

.8 Prior to placing of concrete, obtain the Consultant’s approval of the proposed method for protection of concrete during placing and curing.

.9 Protect the previous Work from staining.

.10 Clean and remove stains prior to application for concrete finishes.

.11 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.12 If new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with non-shrink grout to anchor and hold dowels in positions as indicated in the design drawings.

.13 Do not place load upon new concrete until authorized by the Consultant.

3.3 Maximum size of concrete placements

.1 Limit the size of each placement to allow for strength gain and volume change due to shrinkage.

.2 Add construction joints as necessary to suit pour sizes. Confirm the joint location with the Consultant and adjust as necessary.

.3 Consider beams, girders, brackets, column capitals, and haunches as part of the floor or roof system above and place monolithically with the floor or roof system.

.4 Construction Joints in Unrestrained Slabs on Ground:

.1 Base Slabs placed on the ground may be placed continuously from outside edge to outside edge, outside edge to expansion joint, or from expansion joint to expansion joint, unless shown otherwise on the Drawings.

.5 Construction Joints in Suspended Slabs Restrained by Connecting Walls:

.1 Place slab in alternate strips with the larger dimension of any single placement no greater than 15,000 mm for slabs.

.2 Locate construction joints in suspended slabs near the middle quarter of the spans of slabs and beams, unless indicated otherwise on the Contract Drawings. If a beam intersects a girder at this location, offset the construction joint in the slab and girder by a distance equal to two (2) times the depth of the beam.

.6 Construction Joints in Girders and Beams:

.1 Construct concrete beams and suspended slabs monolithically, unless indicated otherwise on the Contract Drawings.

.2 If vertical construction joints are required, provide shear key, and additional inclined shear reinforcing steel. The Consultant's review and acceptance is required for any joints added into girders and beams.

.7 Construction Joints in Walls:

.1 Limit pours to a maximum of 6.5 m vertically.

.2 Allow three (3) Days between adjacent pours.

.3 Locate construction joints a minimum of 2,000 mm away from any junction of two (2) or more walls, a column or beam supported on a wall, the nearest edge of an opening wider than 600 mm, and a construction joint in a slab on which the wall rests.

.4 Place wall in alternate portions with a distance between vertical construction joints not exceeding 15,000 mm for walls.

3.4 Installation/application

.1 Prevent damage to waterproofing if concrete is poured against waterproofing.

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, slab drop panels, column capitals or columns, except if indicated and approved by Consultant.

.2 If approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere in the Contract Documents.

.3 Sleeves and openings greater than 100 x 100 mm not indicated in design drawings must be reviewed by the Consultant.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from the Consultant before the placing of concrete.

.5 Confirm locations and sizes of sleeves and openings shown on the Drawings.

.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor rods:

.1 Prior to placing concrete, place anchor bolts in locations indicated on the reviewed shop drawings under the supervision of the trade supplying anchor bolts and templates according to the manufacturer's printed instructions and according to CSA A23.1/A23.2.

.4 Grout under base plates:

.1 Grout under base plates using procedures according to the manufacturer's recommendations that result in 100 % contact over grouted area. Thoroughly compact leaving no voids.

.5 Joint fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by the Consultant.

.2 If more than one (1) piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form isolation, construction and expansion joints as indicated on the Drawings and as described in this Section.

.6 Horizontal Construction Joints in Reinforced Concrete Walls and Columns:

.1 Thoroughly clean and saturate the surface of the joint with water.

.2 For walls and columns, place grout onto the existing concrete before starting regular concrete placement. Limit wall and column grout placement to a maximum thickness of 50 mm and a minimum thickness of 30 mm.

.7 Dovetail anchor slots:

.1 Install continuous vertical anchor slots to forms if masonry abuts concrete wall or columns.

.2 Install continuous vertical anchor slots at 800 mm o.c. if concrete walls are masonry faced. Anchors shall project to within 20 mm minimum of masonry face.

.3 Do not install anchor slots in underground concrete walls cast against excavation support systems

3.5 Protection and curing

.1 Protect and cure concrete according to CSA A23.1, Clause 7.4 and Table 20.

.2 Protect freshly placed and finished concrete from adverse conditions such as premature drying, moisture loss, defacement due to building operations, and from excessive hot and cold temperatures, for the period of time corresponding to the required curing type of concrete.

.3 Commence protection immediately after placing to achieve the temperature and moisture conditions for the period of time necessary for the concrete to develop its required properties.

.4 Concrete elements shall be protected to limit the temperature differential between the concrete core and the concrete surface within 20 °C.

.5 Protection shall not be removed until the concrete has cooled to the temperature differential given in the CSA A23.1, Table 21, in order to avoid cracking of the concrete due to the sudden temperature change near the end of the curing period.

.6 Removal of forms prior to the minimum curing period does not remove the Contractor's obligation to cure and protect the exposed concrete for the minimum time periods specified for curing and protection. Refer to CSA A23.1, Clause 7.4.1.5.3.4.

.7 Curing types based on CSA A23.1, Table 20, as modified in this Section:

.1 Type 1 – Basic curing: three (3) days at ≥ 10 °C or for the time necessary to attain 40 % of the specified strength.

.2 Type 2 - Additional curing: Seven (7) days total at ≥10 °C and for the time necessary to attain 70 % of the specified strength.

.3 Type 3 - Wet curing: Seven days at ≥ 10 °C and for the time necessary to attain 70 % of the specified strength.

.4 Note: Silica fume concrete must be wet cured.

.8 Wet Curing of Concrete:

.1 If wet curing is required, start fog misting immediately after placing operations are completed, in order to prevent plastic shrinkage and cracking from taking place.

.1 Fog misting must be applied continuously from the time of screeding until concrete is covered with burlap or other moisture-retaining covering, in such a way as to maintain high relative humidity above the concrete and prevent drying of the concrete surface.

.2 If concrete has set, cover horizontal surfaces with at least one (1) layer of wet burlap or other moisture-retaining covering.

.1 Strips must overlap 150 mm and must be held in place without marring the surface of the concrete.

.2 Provide suitable weights to prevent blow-off or displacement of protective cover.

.3 Burlap must be pre-soaked by immersing it in water for a minimum period of twenty four (24) hours prior to placing and must be maintained in a continuously wet condition throughout the curing period by means of a soaker hose.

.4 Do not permit intermittent drying.

.5 Remove burlap after a minimum of seven (7) consecutive Days and allow to air dry until the concrete has developed the specified design strengths.

.3 Water must not be allowed to drip, flow or puddle on the concrete surface during fog misting, if placing the burlap or at any time before the concrete has achieved final set.

.9 Use of Curing Compounds and Evaporation Reducers:

.1 Except if concrete wet curing is required, the use of pigmented curing compounds and evaporation reducers may be authorized by the Consultant.

.2 Apply curing compound/evaporation reducer after placing or finishing operations have been completed, according to the compound manufacturer’s printed instructions.

.3 Ensure the compound application is uniform and continuous over entire area being cured.

.4 If surfaces are to be exposed to sunlight, use compound with white pigment.

.5 Do not use curing compounds on surfaces if a bond is required for additional concrete or if a bonded surface coating such as paint, tile, resilient flooring, and similar materials are to be applied.

.10 Curing Plan:

.1 Detailed curing plan containing (at minimum) the duration of curing, the manner in which the surface will be kept moist, type of curing material, and provisions to address potential problems (for example, high winds or extreme weather conditions) shall be

prepared by the Contractor and submitted for review by the Consultant as part of the Work plan requested in subsection 1.6, above.

3.6 Finishing

.1 Treat and finish exposed formed surfaces according to CSA A23.1.

.2 Grout tie holes in concrete flush to the concrete surface. Grout with finishing cement mortar using the same sand and cement as used in the concrete.

.3 Pack grout into place to fill the tie hole and finish to match the adjacent concrete surface.

.4 After the removal of forms, strike off projections, and fill honeycombing and defects according to CSA A23.1/A23.2.

.5 Refer to honeycombed areas for inspection and designation as structural or non-structural and repair as directed by the Consultant.

.6 Floor finish classification: Class A according to Table 22 of CSA A23.1.

.7 Except if indicated otherwise in the Room Finish Schedule on the Contract Drawings or elsewhere in the Contract Documents, follow the follow finishing schedule:

.1 Wall Surfaces – Exterior:

.1 At above grade/exposed (above a point 150 mm below finish grade) provide number 6 finish.

.2 At above grade/concealed behind cladding provide number 5 finish.

.3 At Backfilled (below a point 150 mm below finish grade) provide number 4 Finish.

.2 Slabs – Upper Surface:

.1 At exterior roof slab/covered with roofing or waterproofing material provide number 1 finish.

.2 At other exterior slabs provide number 2 finish.

.3 At stairs and landings provide number 3 finish.

.4 At top of interior buildings slabs provide number 2 finish.

.5 At top of interior slabs to receive mortar setting bed for tile provide number 7 finish.

.6 At top of interior slabs to receive resilient flooring or carpet, special flooring, tiles on thin set mortar provide number 2 finish.

.7 At Equipment bases provide number 2 finish.

.8 If shake on hardener is applied provide number 2 finish.

.3 At exterior concrete pavement, walkways, curbs, and exposed site concrete refer to Section 03 30 00 – Cast-in-Place Concrete.

.8 Finish type other than those indicated in the Room Finish Schedule on the Contract Drawings or elsewhere in the Contract Documents shall be as follows:

.1 Number 1 Finish (Wood Float):

.1 After screeding by accepted method to obtain required floor tolerances, work the surface by means of a wood float in such a manner that after concrete has hardened, no portion of surface shows a variation of more than that specified.

.2 Number 2 Finish (Trowelled):

.1 After screeding and compaction with a wooden float, bring the surface to a smooth level and dense finish free from trowel marks, ridges and depressions by means of steel trowels operated either by hand or by mechanical means.

.2 Do not sprinkle dry cement or sand on the surface during the trowelling process.

.3 Maintain ambient temperature at a minimum of 10 °C, if steel trowelling is in progress.

.3 Number 3 Finish (Broomed):

.1 Before the floated surface has fully hardened, brush the surface with a stiff broom in one (1) direction to leave a rough surface.

.4 Number 4 Finish (Formed):

.1 As soon as forms have been removed and directions given by the Consultant, remove projections and fill honeycombing and defects.

.5 Number 5 Finish (Smooth Formed):

.1 As soon as forms have been removed and directions given by the Consultant, patch formwork tie holes, grind off projections, irregularities and rough spots, patch surface defective areas and repair rough spots. Provide a smooth uniform appearance

.6 Number 6 Finish (Rubbed):

.1 As soon as forms have been removed and holes pointed, rub surface with an abrasive rubbing brick until form marks and blemishes are removed and the surface is smooth and of uniform texture and colour.

.2 Do not remove from a larger surface than can be rubbed to fine finish within six (6) hours.

.7 Number 7 Finish (Floor to Receive Bonded Topping, Screed, Grout, or Porcelain Tile):

.1 Strike off and screed the concrete base slab to a level below the final floor surface equal to the specified thickness of the finish course as shown on the Drawings.

.2 Float the surface.

.3 Wire broom the surface to make 6 mm deep grooves at approximately 20 mm centres, running in one (1) direction.

.9 If the schedule of finishes requires painting, prepare surfaces for painting as specified in Section 09 90 00 – Painting.

.10 Sandblast finish:

.1 Provide abrasive-blast finish where indicated on the Drawings. Abrasive-blast finish is noted as "sandblast" or "sandblasted" on the Drawings.

.2 Perform abrasive blasting twenty four (24) to seventy two (72) hours after casting when concrete strength ranges between 1,000 and 1,500 psi (6.9 and 10.3 MPa).

.3 Coordinate with formwork construction, concrete placement schedule, and formwork removal to ensure that surfaces to be abrasive blasted are treated at the same age for uniform results.

.4 Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference mockup.

.1 Type 1 Sandblast Finish: Light sandblast finish: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color. Maximum reveal 1/16 in. (1.5 mm)

.2 Type 2 Sandblast Finish: Heavy sandblast finish: Expose and reveal coarse aggregate to a maximum projection of one-third of its diameter; reveal ¼ to ½ in. (6 to 12 mm).

.11 Surface Hardener:

.1 In area(s) indicated to receive surface hardener, power screed the floor slab and float.

.2 Over freshly floated concrete apply surface hardener according to the manufacturer's printed instructions.

.3 Distribute evenly, do not throw hardener.

.4 Float between applications of hardener and after second hardener application with power floats.

.5 Machine trowel to smooth, level, and dense surface of uniform colour, free from trowel marks, ridges, pinholes, and other defects.

.6 Have the manufacturer's representative on Site within twenty four (24) hours if requested by the Consultant.

.12 Ensure that the concrete finish is compatible with specified traffic topping or other applied finish.

.13 Production of smooth surfaces by means of cement plaster is not permitted.

3.7 Tolerance

.1 Concrete tolerances shall be according to CSA A23.1/A23.2 clause 6.4 - Construction Tolerances for Cast-in-Place Concrete and as follows.

3.8 Field quality control

.1 Site tests: Conduct tests as follows according to CSA A23.1/A23 and submit results as described in subsection 1.6 – Submittals, above.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at seven (7) and twenty eight (28) Days.

.5 Chloride ion content penetrability (for exposure class C-1 concrete).

.6 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Consultant for review according to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified according to CSA A283.

.3 Ensure test results are distributed for discussion at the pre-pouring concrete meeting between the testing laboratory and Consultant.

.4 The Consultant will take additional test cylinders during cold weather concreting. Cure cylinders on Site under the same conditions as concrete which they represent.

.5 Non-Destructive Methods for Testing Concrete: according to CSA A23.1/A23.2.

.6 Inspection or testing by the Consultant will not augment or replace the Contractor's quality control requirements nor relieve Contractor of any of its responsibilities under the Contract.

3.9 Loading of structure

.1 Do not load any portion of structure prior to achieving 70 % of specified strength and only with the acceptance of the Consultant.

.2 Removal of forms prior to the minimum required curing period does not remove the Contractor's obligation to cure and protect the exposed concrete for the minimum required time periods specified. Refer to subsection 3.5 of this Section above.

3.10 Repairing surface cracks in concrete

.1 After concrete has set for a minimum of twenty eight (28) Days, and before a maximum of one hundred and twenty five (125) Days, examine surfaces carefully for cracks.

.2 Rout cracks larger than 0.3 mm at the discretion of the Consultant.

.3 Fill cracks with non-shrink grout.

.4 Match the surface to existing surfaces in quality, texture, colour, and elevation.

3.11 Repair of temperature and shrinkage induced cracks

.1 Repair cracks in the completed structures employing a suitable polyurethane injection technique to make such cracks completely watertight after repair.

.2 Remove surface injection materials following the completion of the Work and finish the affected areas to match the surrounding concrete.

3.12 Injection of cracks – polyurethane grout

.1 Use materials according to the manufacturer's printed instructions.

.2 Clean and prepare cracked areas according to the manufacturer's recommendations.

.3 Inject polyurethane grout into cracks according to the manufacturer's written instructions.

.4 Commence injection at the lowest injector on a vertical face and at one (1) end on a horizontal surface. Continue injection until pure uncontaminated material flows out from adjacent injectors. Cap the injectors and proceed to adjacent injectors until all injectors have been filled.

.5 Upon completion, remove injectors and surface sealer. Thoroughly clean the concrete surfaces of excess grout material. Finish the surface to match the surrounding concrete.

.6 Patch injection holes.

3.13 Patching

.1 Carry out patching as specified in CSA A23.1/A23.2.

.2 Make good temporary openings left in concrete for pipes, conduits, ducts, shoring, and other Work during construction.

.3 Reinforce with welded wire fabric, as required, and finish to match the surrounding work.

3.14 Sealant application

.1 Do not fill joints sooner than thirty (30) Days after concrete pours.

.2 Comply with the manufacturer’s printed instructions and curing and sawcutting requirements.

.3 Execute joint sealing during cool, dry ambient conditions if the slab is in a contracted state to minimize future joint separation at sealant filled joints.

.4 Fill sawn joints in concrete slabs full depth with sawcut joint sealant.

.5 Seal over pre-moulded joint filler with joint sealant.

.6 Comply with the sealant manufacturer's primer, application, and temperature requirements. Mask floor to edge of joints and fill joint with sealant.

.7 After initial set, prime sealant surface and refill joints with sealant as required to produce a slightly convex joint surface.

3.15 Cleaning

.1 Cleaning:

.1 Promptly as the Work proceeds and upon completion, clean-up and remove from the site, the rubbish and surplus material resulting from the Work of this Section.

.2 Leave the Work area clean at the end of each Day.

.3 Final Cleaning: upon completion, remove surplus materials, rubbish, tools and equipment.

.2 Waste Management:

.1 Prepare a Construction Waste Management plan according to Section 01 74 19 – Construction and Demolition Waste Management.

.2 Separate waste materials for reuse and –Divert unused concrete materials from landfill to local quarry or facility after receipt of written approval from Consultant.

.3 Provide an appropriate area on Site where concrete trucks can be safely washed.

.4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to an official hazardous material collections site as approved by Consultant.

.5 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.6 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.7 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.

.8 Dispose of waste according to applicable local, provincial and national regulations.

End of section

1 General

1.1 Section includes

.1 Work of this Section includes the following:

.1 Requirements for concrete floor additives such as:

.1 Penetrating sealer

.2 Hardener additive

.2 Testing and measurement for floor flatness and levelness,

.3 Trowelling, levelling, and floating of floor surfaces for ready for applied finishes.

1.2 Related requirements

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 05 50 00 – Metal Fabrications

1.3 Definitions

.1 Floor Classifications: Classification of concrete floor slabs based on their intended use, methods of finishing and finish materials applied to flooring as denoted by the F-rating below, and as follows:

.1 Single Course Floor: Floors placed in a single course with final finishing applied to properly levelled concrete.

.2 Finish or Finishes: Materials applied to finished concrete surface, i.e.: stained or coloured concrete, carpet, resilient flooring or ceramic tile.

.3 Finishing: Methods, tools and equipment employed to achieve levelness or surface flatness for shored slabs and slabs-on-grade, and durability indicated and as follows:

.1 F3-Finishing: Floors having a straightedge value of ±1.6 mm over 3,048 mm (1/6 in. over 10 ft.); similar to CSA A23.1 Class C Slab Finishing.

1.4 Reference standards

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compound for Curing Concrete.

.2 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Colored Concrete.

.2 American Concrete Institute (ACI):

.1 ACI 117-2010, Specifications for Tolerances for Concrete Construction and Materials and Commentary

.2 ACI 302.1R-15, Guide for Floor and Slab Construction

.3 Canadian Standards Association (CSA):

.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.4 International Concrete Repair Institute (ICRI):

.1 ICRI 310.2R-2013, Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair

1.5 Administration requirements

.1 Coordination: Coordinate a meeting between the Contractor, Subcontractor responsible for concrete placement, and the Consultant to determine Site Quality Control testing section borders and sample measurement line locations, method of measurement, and accuracy requirements of the measuring devices.

.2 Pre-Construction Meetings: Arrange meeting with Contractor, Subcontractor for work of this Section and other Subcontractors affected by work of this Section to discuss effects and issues governing installation of concrete finishing materials; prepare an outline agenda for meeting in accordance with Section 01 31 19 – Project Meetings.

1.6 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit manufacturer's product data for each materials specified including recommended application rates and methods of installation.

.4 Informational Submittals: Provide the following submittals during the course of the work:

.1 Site Quality Control Submittals: Submit results for straightedge measurements to demonstrate compliance with specified tolerances. Record the following information on a drawing indicating floor slab layout, column locations and slab penetrations:

.1 Indicate variance from specified straightedge measurements as a + or - value.

.2 Failed tests in excess of 50 % of the straightedge will require the Subcontractor to flash patch floor to achieve specified tolerance; example of tolerance failure.

.3 Slabs-On-Grade: Measurement of 1.6 mm (1/16 in.) or greater than ±6 mm (¼ in.) measurement will be considered as a failed test and will require flash patching.

.4 Suspended Slabs: Measurement of 3 mm (⅛ in.) or greater than ±6 mm (¼ in.) measurement (80 % tolerance allowance) will be considered as a failed test and will require flash patching.

1.7 Project closeout submissions

.1 Operation and Maintenance Data: Submit detailed cleaning and maintenance instructions for concrete densifier products, and instruct Owner in proper care and maintenance of specified floor finishes, including a complete list of floor care products that will be required for

ongoing maintenance, in accordance with Section 01 78 00 – Closeout Submittals; Operation and Maintenance Data.

1.8 Quality assurance

.1 Qualifications:

.1 Work of this Section shall be executed by a company that has adequate equipment and skilled tradesmen to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified, during a period of at least the immediate past five (5) years.

.2 Co-operation:

.1 Ensure that concrete supplied for slabs contains no admixtures which would be incompatible with floor finishing materials.

1.9 Site conditions

.1 Environmental Requirements:

.1 Ensure that adequate temporary heating is provided as required for cold weather work.

.2 Provide adequate moisture, sun shades and wind barriers to prevent too rapid drying of concrete during hot weather.

.2 Protection:

.1 Ensure that finished concrete floor areas are protected from abrasion from foot or wheeled traffic, and from damage caused by spillage of oil or other harmful materials.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Unless specified otherwise, materials shall meet specified requirements of Section 03 30 00 – Cast-in-Place Concrete.

.2 Curing Sheet: 2 mil polyethylene sheet conforming to CGSB 51-GP-51M or laminated waterproof kraft paper.

.3 Liquid Applied Penetrating Sealer: Clear water based silane micro emulsion penetrating concrete sealer formulated to prevent water and chloride intrusion into concrete surfaces.

.1 Basis of Design Materials:

.1 Cipadm S-40 by CPD Construction Products;

.2 Sikagard SN40 by Sika Canada Inc.;

.3 Hydrozo Silane 40 VOC by BASF; or

.4 Approved alternate.

.4 Hardener Aggregate: Pre-mixed, non-metallic aggregate, dry shake hardener.

.1 Basis of Design Materials:

.1 Floor Hardener Pre-Mix by CPD Construction Products;

.2 Diamag 7 by Sika Canada Inc.;

.3 MasterTop 100 by BASF; or

.4 Approved alternate.

.5 Patching and Flash Patching Materials: Cementitious based, polymer modified, fine aggregate, single component, rapid curing, early strength floor patching compounds having high adhesion, for application in thicknesses to a minimum of ⅛ in. to 1 in.

.1 Basis of Design Materials:

.1 MAPEI Canada Inc., Mapicem 101;

.2 Sika Canada Ltd., SikaQuick 1000;

.3 W.R. Meadows of Canada, Sealtight Meadow-Crete H; or

.4 Approved alternate.

.6 Joint Sealant: Refer to Section 07 92 00 – Sealants.

3 Execution

3.1 Examination

.1 Before commencing work, ensure that surfaces are acceptable to receive and maintain concrete finishing, and that specified installation will be achieved.

3.2 Finishing floors and slabs

.1 Finish floors and slabs in accordance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.

3.3 Installation

.1 Concrete Finishing:

- .1 Roll or tamp concrete to force coarse aggregate into concrete mix and then screed.
- .2 Bring surface to true grade by floating.
- .3 Steel trowel to a true and even surface.
- .4 Follow with second steel trowelling to produce a smooth burnished surface.

.2 Sealed Floors:

- .1 Seal all exposed concrete floors. Apply sealer as recommended by manufacturer. Install bond breaker of silica sand, polyethylene film strip or foam filler in bottom of joints.

.3 Hardened Floors:

- .1 Apply hardener aggregate to floor surfaces indicated on drawings and/or schedules in two shakes, half of the aggregate for each shake.
- .2 Apply first shake when the concrete is firm enough to support workmen and equipment and when no standing water is present. Mechanically float aggregate into surface.
- .3 Apply the second shake and mechanically float as specified above for finishing.

.4 Apply total amount of aggregate at rate of 60-100 lbs. per 100 $ft.^2$ of floor area.

.5 Cure concrete as specified in CAN/CSA-A23.1/A23.2-94, and as indicated in Paragraph 3.4 - Concrete Finishing Schedule. Ensure that no curing compound is used which is detrimental to bond of bedding for finish flooring or finish flooring materials.

.4 Floor Underlayment:

.1 Leak Prevention: Fill cracks and voids in subfloor where leakage of slurry could occur using suitable quick setting patch material or caulk, as recommended by underlayment manufacturer.

.2 Prime substrate according to manufacturer's recommendations.

.3 Installation shall not begin until building is enclosed.

.4 Install sound attenuation mat where required on drawings, complete with isolation strips, prior to pouring floor underlayment.

.5 Mix underlayment in accordance with manufacturer's written instructions and test mix for slump using 100 mm (4 in.) cylinder.

.6 Pour underlayment to recommended thickness and immediately spread and screen to smooth surface.

.5 Control Joints:

.1 As soon as concrete surface is firm enough not to be torn or damaged by cutting, cut 5 mm (3/16 in.) wide control joints into surface of concrete with abrasive blade power saw.

.2 Locate control joints on centre lines of columns, and at maximum spacing of 6,096 mm (20 ft.) in both directions unless noted.

.3 Cut joints in slabs on grade 38 mm (1½ in.) deep.

.4 Within four (4) weeks of cutting joints, fill them with joint sealant. Completely clean side joint surfaces of dirt, oil, grease, and similar contaminants. Mask floor surfaces at joints while pouring. Prime side joint surfaces with compatible primer if surfaces are not completely dry.

.6 Cast-in all items as supplied by other Sections.

3.4 Patching and refinishing

.1 Before completion of project, patch and refinish defective surfaces to match surrounding areas with no discernible variation in appearance.

End of section

1 General

1.1 Section includes

.1 Brick Veneer Masonry

.2 Masonry mortar, grout and the provision of coloured mortar.

.3 Through-wall flashing.

.4 Masonry accessories.

.5 Site quality control.

1.2 Administrative requirements

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this Section.

.2 Coordinate the masonry work with anchor requirements at framed openings.

.3 Coordinate the masonry work with air barrier installation to achieve continuous monolithic air barrier.

1.3 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Provide data for fabricated wire reinforcement and each type of anchor and masonry accessory.

.3 Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement, anchors and accessories. Include locations and spacing of joint reinforcement.

.4 Coloured Mortar Samples:

.1 Samples for Selection: Submit colour manufacturer's sample chip set for colour selection.

.2 Samples for Verification: Submit sample chips of specified colours indicating colour numbers and required dosage rates.

.5 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

1.4 Submittals for information

.1 Qualifications Data: For manufacturer and installer.

1.5 Quality assurance

.1 Perform Work to CSA-A371 and CSA-S304.1.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

.4 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 Mock-up

.1 Provide 2.4 m long by one storey high masonry wall panel incorporating a corner and door opening, including coloured mortar and accessories.

.2 Randomly select blocks to ensure colour conformity in accordance with manufacturer’s instructions.

.3 Construct masonry mock-up with door frame mock-up.

.4 Locate where directed by Consultant.

.5 Ensure mock-up clean and dry at time of Consultant review.

.6 Allow for multiple iterations of mortar colour.

.7 Approved mock-up may remain as part of the Work.

1.7 Delivery, storage, and protection

.1 Deliver, store, protect and handle products to site.

.2 Package and protect masonry units to arrive undamaged at the job site.

.3 Store masonry under waterproof cover on pallets or plank platforms held off ground.

1.8 Environmental requirements

.1 Maintain materials and surrounding air temperature to minimum 10 °C and maximum 32 °C, prior to, during, and forty-eight hours after completion of masonry work.

2 Products

2.1 Materials – general

.1 Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

.2 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Brick veneer masonry units

.1 Clay Masonry Unit: shall conform to CSA A82-14.

.1 Grade: EG.

.2 Size: Metric Modular – 57x190x90 mm.

.3 Acceptable material: “Cobalt Smooth” by Meridian Brick, or approved alternate.

2.3 Reinforcement and anchorage

.1 Provide masonry connectors, including anchors, fasteners and ties, meeting the requirements specified in CSA A370-14, Connectors for Masonry.

.2 Cavity Wall Ties:

.1 Concrete Masonry Unit Back-Up:

.1 Bent anchor plate, minimum 1.6 mm thick stainless steel, Type 304 per ASTM 167, sized to suit block back-up, insulation and cavity widths.

.2 Minimum 4.76 mm stainless steel wire tie,

.3 Anchor plate and tie to meet the requirements for non-conventional connectors specified in CSA A370-14, Connectors for Masonry.

.4 Acceptable products:

.1 ‘BL-507' by Blok-Lok Limited;

.2 ‘Slotted Block Tie (Type II)’ by Fero Corporation; or

.3 Approved alternate.

.2 Cast-In-Place Concrete Back-Up

.1 Bent anchor plate, minimum 1.6 mm thick stainless steel, Type 304 per ASTM 167, sized to suit insulation and cavity widths.

.2 Minimum 4.76 mm stainless steel wire tie,

.3 Provide manufacturer’s recommended fastener to suit conditions.

.4 Anchor plate, tie and fastener to meet the requirements for non-conventional connectors specified in CSA A370-14, Connectors for Masonry.

.5 Acceptable products:

.1 ‘BL-407' by Blok-Lok Limited;

.2 ‘Slotted Rap-Tie’ by Fero Corporation; or

.3 Approved alternate.

.3 Steel Stud Back-Up (side mounted ties)

.1 Designed to CSA A370-14 for non-conventional Connectors, consisting of flat plate bracket, minimum 1.6 mm thick stainless steel, Type 304 per ASTM 167, with two (2) 6.75 mm diameter holes for screw fasteners. Size to suit wall thicknesses including width of metal studs, thickness of sheathing, insulation and cavity.

.2 Provide manufacturer’s recommended fastener to suit conditions.

.3 Anchor plate, tie and fastener to meet the requirements for non-conventional connectors specified in CSA A370-14, Connectors for Masonry.

.4 Acceptable products:

.1 ‘BL-607' by Blok-Lok Limited;

.2 ‘Side Mounting Rap-Tie’ by Fero Corporation; or

.3 Approved alternate.

.3 Dovetail Anchors:

.1 Minimum 2.75 mm hot-dip galvanized dovetail anchors with 4.76 mm diameter hot-dip galvanized wire tie which projects to within 19 mm of the exterior face of the facing wythe:

.1 ’D/T Flex-O-Lok’ by Block-Lok Limited; or

.2 Approved alternate by:

.1 Dur-O-Wal Limited; or

.2 Masonry Reinforcing Corporation of America and distributed by JV Building Supply, division of Consolidated Materials Corporation; or

.3 Other approved alternate.

.4 Lateral Support Anchors:

.1 Top of Wall:

.1 Anchor for backing wythe of exterior cavity walls: Refer to structural drawings.

.2 Exposed Anchor: 2.75 mm thick galvanized steel head anchors by Acrow-Richmond or approved alternate, throat opening to suit block thickness.

.3 Concealed Anchor: Pin Type, 2.75 mm thick galvanized steel with 10 mm diameter pin; plate anchored to structure overhead, pin sliding in plastic tube embedded in mortar at top of wall or equivalent.

.4 Provide concealed type anchors where top of wall is visible in the finished work to the general public or tenants.

.2 Side of Wall:

.1 End of wall to cast-in-place concrete column or wall:

.1 dovetail anchors: minimum 2.75 mm thick hot-dip galvanized metal.

2.4 Mortar

.1 Portland Cement:

.1 Types GU, MS, HE or HS, as specified in CSA A3001.

.2 Provide natural colour or white cement as required to produce mortar colour specified.

.2 Masonry Cement: as specified in CSA A3002.

.3 Mortar Cement: as specified in CSA A3002 or ASTM C 1489.

.4 Hydrated Lime: Types S, SA, N NA, as specified in ASTM C 207.

.5 Mortar Aggregate: CSA A82.56M, standard masonry type; clean, dry, protected against dampness, freezing, and foreign matter, from an approved source.

.6 Water: Clean and potable.

.7 Admixes: not permitted.

.8 Mixing - Mortar:

.1 Mortar for Exterior Walls: CSA A179, Type N cement-lime 1:1:6 mortar.

.2 Grouting and pointing mortar shall be Type M.

.3 Thoroughly mix mortar ingredients in accordance with CSA-A179 in quantities needed for immediate use.

.4 Premix Mortar: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to site.

.5 If water is lost by evaporation, re-temper only within two hours of mixing.

.6 Use mortar within two (2) hours after mixing at temperatures of 30 °C, or two and one half (2 ½) hours at temperatures under 10 °C.

.9 Mixing - Grout: Site-mix in quantities needed for immediate use in accordance with ASTM C476, Fine grout.

.10 Masonry Mortar Pigment: ASTM C979, factory prepared, milled, blended and prepackaged mortar colour; minimum 90 % pure mineral oxide without fillers or extenders with the following properties:

.1 Produce uniform and consistent colour.

.2 Inert, stable to atmospheric conditions, sunfast, weather resistant, alkali resistant, water insoluble, lime proof, and nonbleeding.

.3 Free of deleterious fillers and extenders.

.4 Particle Size: 95 to 99 % minus 325 mesh.

.5 pH: 6.5 to 9.0.

.6 Acceptable Product:

.1 'SGS Concentrated A, H, and X Series Mortar Colors' manufactured by Solomon Colors;

.2 Products meeting the requirements of this Section manufactured by Davis Colors; or

.3 Approved alternate.

.7 Make allowance for full loading of 2 kgs per bag of 1-1-6. Colour as selected by Consultant to match brick.

2.5 Accessories

.1 Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity; strips, full-depth of cavity and 250 mm high, with a shaped configuration that prevents clogging with mortar droppings.

.1 Products: Subject to compliance with the requirements of this Section, provide one of the following:

.1 'Mortar Maze' by Advanced Building Products Inc.;

.2 'Polytite MortarStop' by Dayton Superior Corporation, Dur-O-Wal Division;

.3 'Mortar Net' by Mortar Net USA, Ltd.; or

.4 Approved alternate.

.2 Weep Holes:

.1 Offset "T" shape injection moulded vent made from flexible polyvinyl chloride, designed to permit air passage into and out of

cavity while allowing water to weep out and preventing water from penetrating in.

.2 Acceptable products:

.1 Hohmann & Barnard Inc. #343 Louvered Weep Hole;

.2 Williams-Goodco brick vent; or

.3 Approved alternate.

.3 Provide weep holes in facing wythe of cavity walls in the following locations:

.1 Bottom course of facing wythe throughout;

.2 Top courses of facing wythe throughout;

.3 Facing wythe course resting on lintels and intermediate angles.

.3 Compressible Joint Filler: ASTM C1330, closed cell polyethylene, urethane or neoprene foam board; oversized 50 % larger than joint width; self-expanding.

.4 Joint Sealer: Specified in Section 07 92 00 – Sealants.

.5 Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.6 Through wall flashing

.1 Refer to Section 07 27 00 – Membrane Air Barrier for through wall flashing materials to be installed by this section.

.2 Refer to Section 07 62 00 – Prefinished Metal Flashing and Trim materials referenced.

2.7 Fabrication

.1 Manufacture masonry units to CSA-A371.

3 Execution

3.1 Examination

.1 Verify that field conditions are acceptable and are ready to receive work.

.2 Verify items provided by other sections of work are properly sized and located.

.3 Verify that built-in items are in proper location, and ready for roughing into masonry work.

.4 Verify walls including steel connections in walls to be grouted have been inspected by structural engineer, before grouting.

3.2 Schedule sequence

.1 Schedule sequence for erection of masonry cavity walls to ensure the following conditions:

.1 Membrane air barrier has been installed and reviewed, to provide a complete and continuous air barrier.

.2 Membrane through-wall flashing has been installed and reviewed.

.3 Metal through-wall flashing has been installed and reviewed.

.4 Insulation has a minimum of voids and is secured firmly against membrane moisture barrier with insulation retainers.

.5 Air space between insulation and outer wythe is clear of mortar and properly drained and ventilated.

3.3 Preparation

.1 Direct and coordinate placement of metal anchors supplied to other Sections.

.2 Provide temporary bracing and shoring during installation of masonry work. Maintain in place until building structure provides permanent bracing.

.3 Protect materials and adjacent construction mortar droppings and damage during construction.

.4 Plug grouting clean-out holes with block masonry units. Brace masonry for wet grout pressure.

3.4 Installation – general

.1 Construct masonry assemblies in accordance with the requirements specified in CSA A370, Masonry Construction for Buildings.

3.5 Installation - reinforcement and anchorage

.1 Install reinforcement and anchorage to CSA-A370, CSA-A371 and CSA-S304.1.

3.6 Installation - lintels

.1 Install loose steel lintels, centred over openings.

.2 Maintain minimum 200 mm bearing on each side of opening.

3.7 Installation - lateral support and anchorage

.1 Unless otherwise indicated, attach strap anchors to building structural members abutting ends of walls. Embed in every second block joint.

.2 Provide other lateral support and anchorage as indicated.

3.8 Installation – through wall flashing

.1 Install through-wall flashing in accordance with manufacturer's written instructions, where indicated on drawings and in absence of indication in locations as follows:

.1 first course above new grade line,

.2 over exterior lintels and shelf angles,

.3 under window sills,

.4 beneath jointed masonry window sills,

.5 over the back and top of parapet walls,

.6 beneath weepholes,

.7 over the heads of openings in exterior wails, such as windows, doors, and mechanical louvres,

.8 wherever roofs or other exterior, horizontal surfaces intersect masonry walls, immediately above roof flashing or horizontal surface flashing and connect to roof, air barrier flashing strips or flashings.

.2 Install continuous metal drip flashing at all locations where through-wall flashing occurs at wall face. Accurately mitre metal drip flashings at all inside and outside corners and deburr all sharp edges/corners. Insert metal drip flashing 50 mm into masonry joint with drip edge turned down

approximately 10 mm to present a neat, straight line appearance. Adhere through-wall flashing to top surface of metal drip flashings.

.3 Extend damp coursing and flashing through full thickness of walls, carrying material from outside to inside. Then install flashing, using same material as damp course, from outside through thickness of first wythe at same joint as damp course, up face of exterior wallboard 200 mm and under air barrier membrane for cavity wall construction.

.4 Lap all joints 150 mm and seal with adhesive.

.5 Wrap through-wall flashing into inside corners and around outside corners, sealing seams and corners with adhesive/sealant.

.6 At ends of exterior lintels and shelf angles provide "end dams" in through-wall flashing by extending through-wall flashing up minimum of 150 mm and wrapping into inside corners and sealing with adhesive sealant. Adhere "end dam" to adjacent masonry facing units with adhesive.

.7 Inspect through-wall flashing for punctures, tears, misaligned seams and the like, apply additional layer of through-wall flashing, extending minimum of 150 mm around damaged area in all directions.

.8 Trim exposed edges of through-wall flashing in a neat, even appearance, removing excess materials projecting beyond edge of support.

3.9 Installation - air barrier membrane

.1 Tie in through-wall flashing with air barrier membrane to ensure continuity of air barrier in accordance with OBC requirements, and outlined in Section 07 27 00 – Membrane Air Barrier.

3.10 Installation - cavity wall insulation

.1 Refer to Section 07 21 00 – Thermal Insulation requirements for Semi-Rigid mineral wool insulation for exterior rain screen cavities.

3.11 Installation - accessories

.1 Mortar Dropping Control:

.1 Avoid dropping mortar into cavity. Remove excess mortar pressed from joints on inner face of outer wythe. Bevel concealed edge of mortar bed to minimize mortar squeeze out.

.2 Install mortar dropping control device into the wall air space on through-wall flashing in accordance with manufacturer's installation instructions.

.2 Vents

.1 Install vents in vertical joints in bottom courses of outer masonry wythe at 400 mm c.c. immediately above through-wall flashing and at the bottom of cavities created by horizontal construction and compartments including lintel and shelf angles in exterior brick wythes.

.2 Set vents back from face of masonry unit with back of vent flush with back face of unit.

.1 set on 400 O.C. for brick facing in the following locations:

.1 Bottom course of brick facing throughout;

.2 Top courses of brick facing throughout;

.3 Brick facing resting on lintels and intermediate angles.

3.12 Installation – masonry units

.1 Coursing:

.1 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.2 Establish lines, levels, and coursing indicated. Protect from displacement.

.3 Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

.4 Mortar Joints: Concave where exposed.

.2 Placing and bonding:

.1 Where indicated, provide special shape units.

.2 Exposed Faces: Lay face work from face side with exposed face flush.

.3 Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

.4 Remove excess mortar as work progresses.

.5 Interlock intersections and external corners of walls with running bond.

.6 Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

.7 Perform job site cutting of masonry units with power-driven abrasive discs to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges. Allow 3 mm clearance around items penetrating or built into walls.

.8 Isolate masonry from vertical structural framing members with a control joint as indicated.

.9 Isolate top joint of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.

.3 Provision for movement:

.1 Leave space of dimension indicated between top of non-loadbearing wall and structural elements. Do not use wedges.

.2 Fill deflection spaces to provide complete seal between each side of wall or partition.

.4 Control joints:

.1 Provide continuous control joints as indicated.

.2 Do not continue horizontal joint reinforcement through control joints, unless otherwise indicated.

.3 Break vertical mortar bond with control joint filler, full depth of unit. Fill adjacent core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

.4 Size control joint as specified in Division 07 Section Joint Sealants, for sealant performance.

.5 Where joint locations are not indicated, space joints 6 m on centre, and one adjacent to corner at each change of direction.

.5 Built-in work:

.1 As work progresses, install built-in items to be built into the work and furnished by other sections.

.2 Install built-in items plumb and level.

.3 Build chases; cutting not permitted. When openings require cutting after walls are in place, saw cut only; breaking of block not permitted.

.4 Where masonry encloses conduit or piping, place to required level to permit inspection and testing. Cover items when directed.

.5 Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill hollow metal door frame voids solid with grout or insulation as indicated.

.6 Do not build in organic materials subject to deterioration.

3.13 Erection tolerances

.1 Maximum Variation from Plane of Wall: 6 mm/3 m and 13 mm/6 m or more; 3 mm/3 m for walls to receive.

.2 Maximum Variation from Plumb: 6 mm per story non-cumulative; 13 mm in two stories or more.

.3 Maximum Variation from Level Coursing: 3 mm/m and 6 mm/3 m.

3.14 Cutting and fitting

.1 Cut and fit neatly for conduit, sleeves, recessed or built-in objects. Coordinate with other sections of work to provide correct size, shape, and location.

.2 Make cuts straight, clean and free of uneven edges.

.3 Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 Site quality control

.1 Inspections:

.1 Engage a professional structural engineer experienced in design and installation of this work and licensed in the Province where the Project is located, to perform inspections.

.2 Perform timely and regular inspections.

.3 Verify installation conforms to applicable building Code.

.4 Prepare and submit inspection forms required by applicable building code.

.2 Testing:

.1 Owner will engage qualified independent testing agency to inspect and test engineered masonry work and prepare reports.

.2 Allow testing agency access to scaffolding and work areas, as needed to perform tests and inspections. Retest materials that fail to meet specified requirements.

.3 Tests prior to construction: One (1) set of tests.

.4 Tests during construction: One (1) set of tests for each 300 m^2 of wall area or portion thereof.

.5 Mortar and Grout Compressive Strength and Air Content Tests: For each mix provided, according to ASTM C780 for mortar; ASTM C1019 for grout.

3.16 Repairing, pointing, and cleaning

.1 Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

.2 Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

.1 Replace defective mortar. Match adjacent work

.3 In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

.4 Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry.

.1 Clean soiled surfaces with cleaning solution.

.2 Use non-metallic tools in cleaning operations.

3.17 Protection of finished work

.1 Protect installed work.

.2 Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

.3 Cover unfinished walls to prevent moisture infiltration.

End of section

1 General

1.1 Section includes

.1 This Section includes supply and installation of unit masonry assemblies consisting of the following:

.1 Concrete Masonry Units (CMU).

.2 Masonry accessories.

.3 Site quality control.

1.2 Related requirements

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 05 12 23 – Structural Steel for Buildings

.3 Section 05 40 00 – Cold Formed Metal Framing

.4 Section 05 50 00 – Metal Fabrications

.5 Section 07 84 00 – Firestopping and Smokeseals

.6 Section 07 92 00 – Sealants

.7 Section 08 11 13 – Steel Doors and Frames

.8 Section 08 41 13 – Aluminum Framed Entrances and Storefronts

.9 Section 09 21 16 – Gypsum Wallboard

.10 Section 09 90 00 – Painting

1.3 Reference standards

.1 American Concrete Institute: (ACI):

.1 ACI 530.1-99/ASCE 6-99/TMS 602-99, Commentary on Specification for Masonry Structures

.2 Brick Institute Association (BIA)

.1 BIA Technical Notes 20, Cleaning Brickwork

.2 BIA Technical Notes 23A - Efflorescence, Causes and Prevention

.3 Canadian Standards Association (CSA):

.1 CSA A165 Series-04 (R2009), CSA Standards on Concrete Masonry Units

.2 CSA A179-04 (R2009), Mortar and Grout for Unit Masonry

.3 CSA A370-04 (R2009), Connectors for Masonry

.4 CAN/CSA A371-04 (R2009), Masonry Construction for Buildings

.5 CSA S304.1-04 (R2010), Design of Masonry Structures

.6 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction

.4 American Society for Testing of Materials (ASTM):

.1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

.2 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

.3 ASTM A496/A496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

.4 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts

.5 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.6 ASTM A1011/A1011M-12, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

.7 ASTM C67-11, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

.8 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes

.9 ASTM C270-12, Standard Specification for Mortar for Unit Masonry.

.10 ASTM C494-11, Standard Specification for Chemical Admixtures for Concrete.

.11 ASTM C568/C568-10, Standard Specification for Limestone Dimension Stone

.12 ASTM E488/E488M-10, Standard Test Methods for Strength of Anchors in Concrete Elements

.13 ASTM E514/E514M-11, Standard Test Method for Water Penetration and Leakage Through Masonry

.14 ASTM E2556/E2556M-10, Standard Specification for Vapour Permeable Flexible Sheet Water Resistive Barriers Intended for Mechanical Attachment.

.15 ASTM F593-02(2008)e1, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

.16 ASTM F594-09e1, Standard Specification for Stainless Steel Nuts

.5 Ontario Concrete Masonry Block Association (OCBA):

.1 OCBA Metric Technical Manual

.6 Underwriters Laboratories of Canada (ULC):

.1 ULC List of Equipment and Materials for Fire Rated Construction

1.4 Administrative requirements

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this Section.

.2 Coordinate the masonry work with anchor requirements at framed openings.

.3 Coordinate the masonry work with air barrier installation to achieve continuous monolithic air barrier.

1.5 Submittals

.1 Provide submittals according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Samples: Submit samples of the following; stone tile panel, concrete block, mortar, masonry reinforcement, ties and anchors, damp course/thru-wall flashing and adhesive, metal drip flashing, mortar

dropping control device and weepholes for Consultant's approval before commencing work of this section.

.4 Shop Drawings: Submit shop drawings indicating the following:

.1 Indicate sizes, profiles, coursing, and locations of special shapes for concrete masonry units and stone masonry cladding.

.2 Indicate sizes, profiles, and locations of each stone trim unit required.

.3 Detail corner units, end dam units, and other special applications for fabricated flashings.

.5 Samples for Verification: Submit samples for verification for each type and colour of the following:

.1 Decorative stone masonry cladding units, in the form of small scale units.

.6 Informational Submittals: Provide the following submittals if requested by the Consultant:

.1 Submit ULC Assembly Listings and Materials cut sheets for fire rated assemblies as follows:

.1 Submit copies of ULC Assembly and Materials Listing for indicating ULC Number and how assembly meets the rating criteria for assemblies listed on drawings or meets requirements of Supplementary Standard SB-3 of Ontario Building Code

.2 Use the same system and material as would be required for a tested assembly for the project; ULC Listings are tested with the specific materials indicated; substitutions will not be permitted unless evidence of equivalency is confirmed.

.3 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.

.7 Certificates: Submit statements of material properties indicating compliance with specified requirements for each type and size of the following:

.1 Masonry Units:

.1 Include material test reports substantiating compliance with requirements.

.2 Include ULC Listings for fire resistance rated materials and construction equivalent to assemblies with indicated on drawings indicating fire resistance ratings.

.2 Cementitious Materials:

.1 Include brand, type, and name of manufacturer for site mixed mortar materials.

.2 Include description of type and proportions of ingredients for pre-blended, dry mortar mixes.

.3 Include description of type and proportions of ingredients for grout mixes.

.3 Accessories:

.1 Reinforcing bars

.2 Joint reinforcement

.3 Anchors, ties, and metal accessories

.4 Site Quality Control Submissions: Submit detailed description of methods, materials, and equipment used according to cold or hot weather requirements; and proposed unit masonry cleaning techniques.

1.6 Site conditions

.1 Protection of Masonry: Protect masonry and other work from marking and other damage and as follows:

.1 Cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work during construction until permanent flashings and membranes are completed.

.2 Cover partially completed masonry if construction is not in progress to prevent wetting of inside wythes of construction and contribution to efflorescence.

.3 Extend cover a minimum of 24 in. down both sides and hold cover securely in place.

.4 Secure cover a minimum of 24 in. down face next to un-constructed wythe and hold cover in place if one (1) wythe of multi-wythe masonry walls is completed in advance of other wythes.

.5 Provide adequate bracing for masonry during construction and until permanent lateral supports are in place.

.6 Do not apply uniform floor or roof loads for a minimum of twelve (12) hours and concentrated loads for a minimum of three (3) days after building masonry walls or columns.

.2 Cold Weather Protection:

.1 Keep masonry materials completely free from ice and frost. Use approved smokeless heaters. Do not use scorched sand. Do not use salts, admixtures or antifreezes.

.2 Maintain materials and surrounding air temperature to minimum 10 °C and maximum 32 °C, prior to, during, and forty eight (48) hours after completion of masonry work.

.3 Hot Weather Requirements

.1 Comply with hot weather construction requirements contained in reviewed submittals.

.2 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

.3 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

1.7 Delivery, storage, handling and protection

.1 Delivery and Acceptance Requirements: Deliver pre-blended, dry mortar mix in moisture resistant containers designed for lifting and emptying into dispensing silo; store dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

.2 Storage and Handling Requirements: Store masonry units on elevated platforms in a dry location and as follows:

.1 Stack materials on floors of building so that structural design loads are not exceeded; coordinate with Consultant.

.2 Cover tops and sides of stacks with waterproof sheeting securely tied to pallets if units are not stored in an enclosed location; do not install masonry units that become wet until they are dry.

.3 Store cementitious materials on elevated platforms, under cover, and in a dry location; do not use cementitious materials that have become wet or damp.

.4 Store aggregates where grading and other required characteristics can be maintained; store to prevent contamination by substances deleterious to performance and appearance.

.5 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Concrete masonry units

.1 Architectural Concrete Masonry Units: Manufactured according to CAN/CSA CSA A165 Series-04 (R2009), and as follows:

.1 Classification: H/15/A/M and S/15/A/M

.2 Size: Modular metric to sizes indicated on Drawings.

.3 Special shapes:

.1 Provide square, bull nosed, and half high units for exposed corners.

.2 Provide purpose made shapes for lintels and bond beams.

.3 Provide additional special shapes required for project.

.4 Manufacture special shapes at same time and with the same batch as architectural concrete block to be used.

.2 Standard concrete blocks shall be autoclave or bubble cure process, high pressure steam cured, modular, conforming to CSA A165 Series-04

(R2009), with lineal shrinkage and moisture movement not to exceed 0.035 % and shall be as follows;

.1 Classification: S/15/A/M, 75 % solid for all locations where structural members bear on concrete block.

.2 H/15/A/M, for all other block work.

.3 Size: Modular imperial to sizes indicated on Drawings.

.4 Special shapes:

.1 Provide square units for exposed corners.

.2 Provide purpose made shapes for lintels and bond beams.

.3 Provide additional special shapes required for project.

.4 Manufacture special shapes at same time and with the same batch as standard concrete block to be used.

.3 Fire Resistant Concrete Masonry Units:

.1 CAN/CSA-A165 Series, same classification as non-rated block units except aggregate used in units and equivalent thickness of units to comply with applicable Code for fire-resistance ratings indicated. For fire rated walls requiring a fire-resistance rating of three (3) hours or greater, use ULC certified units.

.4 Size: Modular to sizes indicated on Drawings.

.1 Where concrete block walls are required as fire separations or barriers, they shall conform to the National Building Code. With respect to equivalent thickness and type of concrete. Consult with Consultant for locations and special conditions.

.5 Exposed block shall all be made by one (1) manufacturer and shall be uniform in colour, shade and texture.

2.3 Mortar materials

.1 Mortar materials shall conform to CSA A179-04 (R2009).

.2 Water: Potable (clean, exempt of ice, oils, acid, alkalis, organic matter, sediments or any other harmful matter). CSA A179-04 (R2009).

.3 Aggregate:

.1 CSA A179-04 (R2009).

.2 Use same brands of materials and source of aggregate for entire project.

.3 Use washed aggregate consisting of natural sand or crushed stone for mortar that is exposed to view.

.4 Cement: Normal portland, in according to CSA A3000-08, Type GU.

.5 Grout: In according to CSA A179-04 (R2009), Table 3.

.6 Hydrated Lime: ASTM C207-06 (2011), Type S.

.7 Cold Weather Admixture:

.1 Non-chloride, non-corrosive, accelerating admixture according to CSA A179 and ASTM C494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

.2 Acceptable Materials:

.1 Grace Construction Products, Morset;

.2 BASF, Trimix-NCA; or

.3 Approved alternate.

2.4 Mortar mixes

.1 Mixing:

.1 Prepare and mix mortar materials under strict supervision and in small batches for immediate use only. Mix proprietary mortars in strict according to CSA A179. Do not use re-tempered mortars for coloured mortars.

.2 For Masonry Below Grade and In Contact With Earth:

.1 Use premixed silo or bagged Type 'S' masonry cement mortar having minimum compressive strength of 8.5 Mpa at 28 days, jobsite tested.

.3 For Exterior Wythe of Cavity/Composite Walls (non load-bearing, above grade):

.1 Use Type 'N', 1:1:6 pre-mixed, pre-coloured, Portland cement/lime/sand mortar, 'Betomix Plus' by Daubois Inc., or Maxi-Mix silo, or approved alternate. Use non-staining "white" cement

where required to achieve colour as selected later by the Consultant.

.4 Interior Reinforced or Non-Reinforced Block Walls:

.1 Use Type 'S', premixed 'Bloc Mix' by Daubios Inc., or approved alternate by Maxi-Mix, or other approved alternate.

.5 For All Other Masonry:

.1 Use Type 'N', premixed silo or bagged masonry mortar having a minimum compressive strength of 3.5 MPa at twenty eight (28) days, jobsite tested as per property specification, Table 6, CSA A179-04 (R2009).

2.5 Masonry reinforcement, ties and anchors

.1 Masonry Joint Reinforcement: In according to CSA A371-04(R2009) and ASTM A496/A496M-07, with corrosion protection in according to CSA S304.1-04(R2010) and CSA A370-04 (R2009), and as follows:

.1 Interior Walls: Hot dip galvanized, carbon steel.

.2 Exterior Walls: Stainless steel.

.3 Lengths: A minimum of 10 ft. with prefabricated corner and tee units.

.2 Connectors: In according to CSA A370-04 (R2009) and CSA S304.1-04(R2010) with hot dip galvanized finish.

.3 Single Wythe Masonry Joint Reinforcement: Either ladder or truss type with single pair of side rods.

.4 Ties and anchors specified in this section shall be designed in according to CSA A370-04 (R2009) for non-conventional masonry connectors as follows:

.1 Deflection: Maximum 1/16 in. including free play, If acted upon by a lateral load of 0.45 kN, in all possible positions of adjustment.

.2 Positive restraint at position of maximum adjustment.

.3 Free play of multi-component ties maximum 1/32 in. if assembled in all possible configurations.

.4 Anchors shall allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall.

.5 Lateral Partition Supports (Top of Wall Anchors):

.1 Angle Support: Fabricated from ⅛ in. core metal thickness angled steel plate having 3 in. long legs fastened to deck structure to allow vertical movement of masonry assembly; hot dip galvanized; coordinate with Section 07 84 00 – Firestopping and Smokeseals for firestopping insulation and smoke seals.

.2 Plate Support: Fabricated from ⅛ in. core metal thickness stainless steel plate with ⅜ in. diameter metal 6 in. long welded to plate having closed end plastic tube fitted over rod that allows rod to move in and out of tube.

.3 Anchor Bolts: Where required provide Headed or L-shaped steel bolts in according to ASTM A307-10, Grade A; with ASTM A563-07a hex nuts and, where indicated, flat washers; hot-dip galvanized in according to ASTM A153/A153M-09, Class C.

.4 Post Installed Anchors: Provide chemical anchors, with capability to sustain, without failure, a load equal to six times the load imposed if installed in solid or grouted unit masonry and equal to four times the load imposed if installed in concrete when tested according to ASTM E488/E488M-10 conducted by a qualified independent testing agency, and as follows:

.1 Indoor Locations: Carbon-steel components zinc-plated according to ASTM B633-11, Class Fe/Zn 5.

.2 Outdoor and High Humidity Locations: Alloy Group 1 or 2 stainless steel bolts complying with ASTM F593-02(2008)e1 and nuts complying with ASTM F594-09e1.

.3 Fastening into Solid Concrete or Solidly Grouted Installation: Two component, injectable adhesive specifically manufactured for use in installing dowels or threaded anchor rods and inserts into new or existing concrete or grout. Basis-of-Design Materials: Hilti Inc., HIT HY150 System,or approved alternate.

.4 Fastening Trough Hollow Wall Installation: Two component, injectable adhesive specifically manufactured for use in installing dowels or threaded anchor rods and inserts, with cylindrical mesh screen tube into new or existing masonry

cavity wall. Basis-of-Design Materials: Hilti Inc., HIT HY20 System, or approved alternate.

.6 Galvanizing for Masonry Reinforcement, Ties and Anchors:

.1 Hot Dip Hardware and Bolts: According to ASTM A153/A153M-09, Class B-2 regardless of location.

.2 Hot Dip Sheet Steel: According to ASTM A653/A653M-11, Coating Designation Z600, regardless of location.

.3 Structural Shapes and Pipes: According to ASTM A123/A123-09, Grade 85, regardless of location.

2.6 Miscellaneous masonry accessories

.1 Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

.1 Products: Subject to compliance with the requirements of this Section, provide:

.1 'RS Series – Rubber Control Joints' Hohmann & Barnard, Inc.; or

.2 Approved alternate.

.2 Packing Insulation: Loose, mineral wool insulation, 1.0 lbs./ft^3. density, and conforming to CAN/CGSB-51.11, as indicated in Section 07 21 00 – Thermal Insulation.

.3 Firestopping: As specified under Section 07 84 00 – Firestopping and Smokeseals.

.4 Sealants: As specified under Section 07 92 00 – Sealants.

.5 Support Angle:

.1 Hot dip galvanized 458 g/m^2/side according to CSA A370-04 (2009) and ASTM A153/A153M-09.

.6 Fasteners: Galvanized fasteners meeting the requirements of ASTM A325-10, and as recommended by manufacturer.

.7 Joint Filler:

.1 Compressible Filler: Pre-moulded filler strips according to ASTM D1056-07, Grade 2A1; compressible up to 35 %; of width and thickness indicated; formulated from neoprene, urethane or PVC.

.8 Bond Breaker Strips: #15 asphalt saturated, organic roofing felt according to CSA A123.3-05 (R2010).

3 Execution

3.1 Examination

.1 Verify that field conditions are acceptable and are ready to receive work.

.2 Verify items provided by other sections of work are properly sized and located.

.3 Verify that built-in items are in proper location, and ready for roughing into masonry work.

.4 Verify walls including steel connections n walls to be grouted have been inspected by structural engineer, before grouting.

3.2 Preparation

.1 Direct and coordinate placement of metal anchors supplied to other Sections.

.2 Provide temporary bracing and shoring during installation of masonry work. Maintain in place until building structure provides permanent bracing.

.3 Protect materials and adjacent construction mortar droppings and damage during construction.

.4 Plug grouting clean-out holes with block masonry units. Brace masonry for wet grout pressure.

3.3 Coursing

.1 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.2 Establish lines, levels, and coursing indicated. Protect from displacement.

.3 Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

.4 Concrete Masonry Units:

.1 Bond: Running; stack bond for walls indicated with vertical bar reinforcing.

.2 Coursing: One (1) unit and one (1) mortar joint to equal 200 mm.

.3 Mortar Joints: Concave where exposed or where paint or other finish coating is indicated; flush for concealed joints. Cut mortar joints flush where resilient base, wall tile, parging, air barrier or insulation is scheduled.

3.4 Placing and bonding

.1 Lay hollow masonry units with face shell bedding on head and bed joints.

.2 Reinforced Masonry: Lay masonry units with core cells vertically aligned clear of mortar and unobstructed. Place mortar in masonry unit bed joints back 6 mm from edge of unit grout spaces, bevel back and upward.

.3 Where indicated, provide special shape units.

.4 Exposed Faces: Lay face work from face side with exposed face flush.

.5 Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

.6 Remove excess mortar as work progresses.

.7 Interlock intersections and external corners of walls with running bond.

.8 Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

.9 Perform job site cutting of masonry units with power-driven abrasive discs to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges. Allow 3 mm clearance around items penetrating or built into walls.

.10 Isolate masonry from vertical structural framing members with a control joint.

.11 Isolate top joint of masonry from horizontal structural framing members and slabs or decks with compressible joint filler. Finish resulting joint with Sealant.

.12 Fill masonry cores with grout at:

.1 Ends of walls, both free and abutting other work.

.2 Jambs of openings, minimum 300 mm from jamb face.

.3 Courses under plates and lintel requiring bearing.

.4 Attachment devices for fixtures and built-in items.

.5 Courses at tops of fire rated walls.

.6 Blocks of parapet walls, and according to CSA-A371, Appendix G1.

.7 Anchors set in block cells.

.8 Install building paper below voids to be filled with grout; keep paper 25 mm back from face of units.

3.5 Control and expansion joints

.1 General: Install control and expansion joint materials in unit masonry where indicated and not to exceed 6 m on center and 3 m from corners. Build-in related items as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

.2 Form control joints in concrete masonry as follows:

.1 Install preformed control-joint gaskets designed to fit standard sash block.

.2 Keep head joints free and clear of mortar for application of sealant.

3.6 Provision for movement

.1 Leave space of dimension indicated between top of non-loadbearing wall and structural elements. Do not use wedges.

3.7 Reinforcement and anchorage

.1 Install reinforcement and anchorage to CSA-A370, CSA-A371 and CSA-S304.1 and as indicated.

.2 Install masonry joint reinforcement as indicated. Where not indicated provide as follows:

.1 Install horizontal joint reinforcement 400 mm on centre. For stack bond, place joint reinforcement at every course.

.2 Place reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.

.3 Place reinforcement continuous in first and second joint below top of walls.

.4 Lap joint reinforcement ends minimum 150 mm.

.3 Bar Reinforcing Steel:

.1 Secure reinforcing steel in place. Provide bar sizes, laps and spacings as indicated. Maintain position within 13 mm of dimensioned position.

.2 Unless otherwise indicated locate vertical reinforcing on centreline of units.

.3 Unless otherwise indicated, reinforce stack-bonded unit joint corners and intersections with strap anchors 400 mm on centre.

.4 Secure reinforcing steel in place. Inspect steel connections before grouting.

.5 Provide cleanout openings at bottom of cores containing reinforcement.

.6 Fill cells containing reinforcement and anchor bolts solidly with grout.

.4 Anchorage:

.1 Provide lateral supports for masonry walls and partitions as required by applicable codes, perpendicular to wall faces and either horizontally or vertically to wall panel edges.

.2 Where lateral support at tops of walls is required, provide anchors or clip angles installed at spacings not exceeding ten (10) times the wall thickness, unless otherwise indicated.

.3 Where lateral support at sides of walls is required, provide anchors or clip angles installed at spacings not exceeding four (4) times the wall thickness, unless otherwise indicated.

3.8 Lintels

.1 Install steel lintels where indicated.

.2 Provide masonry lintels where shown and where openings of more than 610 mm are shown without structural steel or other supporting lintels.

.3 Provide minimum bearing of 200 mm at each jamb unless otherwise indicated.

3.9 Lateral support and anchorage

.1 Unless otherwise indicated, attach strap anchors to building structural members abutting ends of walls. Embed in every second block joint.

.2 Provide other lateral support and anchorage as indicated.

3.10 Grouting reinforced masonry

.1 Permit mortar to cure seven (7) days before placing grout.

.2 Unless otherwise indicated, reinforce masonry unit cores with reinforcing bars and grout as follows:

.1 Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement as indicated.

.2 Wet masonry unit surfaces, in contact with grout just prior to grout placement to reduce moisture suction from grout.

.3 Grout spaces less than 50 mm in width with Fine grout using low lift grouting techniques. Grout spaces 50 mm or greater in width with Coarse grout using high or low lift grouting techniques. Completely fill spaces of stack bonded masonry; attain minimum 50 % grout filling of spaces in running bond masonry.

.4 If grouting is stopped for more than one (1) hour, terminate grout 38 mm below top of upper masonry unit to form a positive key for subsequent grout placement.

.3 Low Lift Grouting: Place first lift of grout to a height of 400 mm to three masonry unit courses and rod for grout consolidation. Place subsequent lifts in 200 mm increments and rod for grout consolidation.

.4 High Lift Grouting:

.1 Provide cleanout opening no less than 100 mm high at the bottom of each cell to be grouted by cutting one (1) face shell of masonry unit.

.2 Clean out masonry cells with high pressure water spray. Permit complete water drainage.

.3 Request inspection of cells. Allow three (3) days advance notice of inspection.

.4 After cleaning and cell inspection, seal openings with masonry units.

.5 Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.

.6 Limit grout lift to 1,500 mm and mechanically vibrate. Wait forty five (45) minutes before placing next lift.

3.11 Control joints

.1 Provide continuous control joints as indicated.

.2 Do not continue horizontal joint reinforcement through control joints, unless otherwise indicated.

.3 Break vertical mortar bond with control joint filler, full depth of unit. Fill adjacent core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

.4 Size control joint as specified in Division 07 Section Sealants, for sealant performance.

.5 Where joint locations are not indicated, space joints 6 m on centre, and one (1) adjacent to corner at each change of direction.

3.12 Built-in work

.1 As work progresses, install built-in items to be built into the work and furnished by other sections.

.2 Install built-in items plumb and level.

.3 Build chases; cutting not permitted. If openings require cutting after walls are in place, saw cut only; breaking of block not permitted.

.4 Where masonry encloses conduit or piping, place to required level to permit inspection and testing. Cover items if directed.

.5 Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill hollow metal door frame voids solid with grout or insulation as indicated.

.6 Do not build in organic materials subject to deterioration.

3.13 Erection tolerances

.1 Maximum Variation from Plane of Wall: 6 mm/3 m and 13 mm/6 m or more; 3 mm/3 m for walls to receive thin-set tile.

.2 Maximum Variation from Plumb: 6 mm per story non-cumulative; 13 mm in two (2) stories or more.

.3 Maximum Variation from Level Coursing: 3 mm/1 m and 6 mm/3 m.

3.14 Cutting and fitting

.1 Cut and fit neatly for conduit, sleeves, recessed or built-in objects. Coordinate with other sections of work to provide correct size, shape, and location.

.2 Make cuts straight, clean and free of uneven edges.

.3 Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 Site quality control

.1 Inspections:

.1 Engage a professional structural engineer experienced in design and installation of this work and licensed in the Province where the Project is located, to perform inspections.

.2 Perform timely and regular inspections.

.3 Verify installation conforms to applicable building Code.

.4 Prepare and submit inspection forms required by applicable building code.

.2 Testing:

.1 Owner will engage qualified independent testing agency to inspect and test engineered masonry work and prepare reports.

.2 Allow testing agency access to scaffolding and work areas as needed to perform tests and inspections. Retest materials that fail to meet specified requirements.

.3 Tests Prior to Construction: One (1) set of tests.

.4 Tests During Construction: One (1) set of tests for each 300 m^2 of wall area or portion thereof.

.5 Mortar and Grout Compressive Strength and Air Content Tests: For each mix provided, according to ASTM C780 for mortar; ASTM C1019 for grout.

3.16 Cleaning

.1 Clean installed work.

.2 Remove excess mortar and mortar smears as work progresses.

.3 Replace defective mortar. Match adjacent work.

.4 Clean soiled surfaces with cleaning solution.

.5 Use non-metallic tools in cleaning operations.

3.17 Protection of finished work

.1 Protect installed work.

.2 Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

.3 Cover unfinished walls to prevent moisture infiltration.

End of section

1 General

1.1 Section includes

.1 Gabion basket stone cladding veneer system,

1.2 References

.1 ASTM A975-97 – Standard Specification for Double – Twisted Hexagonal Mesh Gabions and Revet Mattresses.

.2 OPSS.MUNI 512 – Construction Specification for Installation of Gabions.

.3 OPSS.PROV 1004 – Material Specification for Aggregates – Miscellaneous.

1.3 Performance criteria

.1 Details and information indicated on drawings are schematic, showing general intent only and shall not be considered or construed to be the engineering design for the system or to be complete or adequate to meet the design criteria.

.2 Design, fabricate and install gabion stone cladding to withstand normal loads from wind, gravity, movement of building structure, and thermally induced movement, as well as to resist deterioration under conditions of normal use including exposure to weather, without failure.

.3 Retain the services of a professional engineer, as described below, to design the gabion cladding support and retention system. The Professional engineer will prepare engineering calculations for the justification of all gabion basket gauges. plates, units, fasteners, and anchorage components for compliance with the performance criteria established herein.

.4 Engineering calculations shall be based on design loads, material properties, and applicable safety factors. Include the following information as part of the calculations:

.1 Gabion cladding loads and allowable loads,

.2 basket size and thicknesses,

.3 support and anchorage loads, stresses, safety factors, design loads, and allowable loads,

.4 support and anchorage sizes.

.5 Design, detail and fabricate connections to provide allowance for fabrication tolerances, erection tolerances and structural deflections.

.6 Control of Corrosion: Prevent galvanic and other forms of corrosion by insulating metals and other materials from direct contact with non-compatible materials, or by suitable coating.

1.4 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Provide Shop Drawings with engineers stamp clearly indicating:

.1 Sizes and sections of stone for fill, and dimension of Gabion stone baskets,

.2 Arrangements of joints between baskets,

.3 Anchoring details and relationship to supporting structure,

.4 Interface with adjacent materials.

.4 Submit product data sheets for all products required to perform the work of this section.

.5 Samples: Submit samples of stone for baskets, and 300mm x 300mm sample of Gabion basket.

1.5 Quality assurance

.1 Installer: Contractor executing work of this section shall have a minimum of ten (10) years continuous Canadian experience in successful fabrication and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Employ skilled stone fitters at the site to do necessary field cutting as stones are set.

.3 Fabricator: Company having sufficient capacity to quarry, cut, and deliver on schedule.

.4 Obtain stone from a single quarry source with resources to provide materials of specified consistent quality.

.5 Obtain gabion baskets and accessory from a single manufacturer for each product.

1.6 Mock-up

.1 Mock-ups shall be complete with gabion stone system, anchors, membrane air barrier and flashing, vents and sealants. Coordinate with other trades involved with the mock-up.

.2 Locate mock-up where directed by the Consultant at the Place of the Work. Brace assembly.

.3 Modify mock-up subject to review by the Consultant.

.4 Mock-up may remain as part of the Work if accepted by the Consultant.

1.7 Delivery, storage and handling

.1 Deliver and store materials in a manner designed to prevent damage.

.2 Lift skids with proper and sufficiently long slings or forks with protection to prevent damage to units. Protect edges and corners.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Approved products and manufacturers

.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.

.2 Acceptance of products from other manufacturers will be subject to review by the Consultant, for conformity with the specifications and meeting the

physical characteristics of the specified products. Include compliance with referenced standards. Submittals which do not include adequate product evaluation will not be considered.

2.3 Stone materials

.1 Provide stone fill material meeting OPSS.PROV 1004 standard, Table 8, G-3.

2.4 Baskets, reinforcement and anchorage

.1 Provide gabion basket according to ASTM A975-97 guidelines for Double Twisted Hexagonal Mesh Gabions and as follows:

.1 Minimum diameter of mesh wire: 0.120 in.

.2 Minimum diameter of selvedge wire: 0.153 in.

.3 Minimum diameter of lacing wire: 0.091 in.

.4 Coating of wire: finish 5 class 3 zinc coating- ASTM A-641 tested in accordance with ASTM A370-92.

.5 Tensile of wire: soft temper in accordance with ASTM A641-92

.6 Weight of zinc coating of wire: shall be determined by ASTM A-90

.7 Wire diameter of 0.120 in. shall have a weight of zinc coating of: 0.85 oz/sf

.8 Wire diameter of 0.153 in. shall have a weight of zinc coating of: 0.90 oz/sf

.9 Wire diameter of 0.091 in. shall have a weight of zinc coating of: 0.80 oz/sf

.10 Grade of zinc coating of wire: high grade or special high grade in accordance with ASTM B-6, Table 1

.11 Uniformity of coating: shall be determined by ASTM A-239

.12 Elongation: not less than 12 % in accordance with ASTM A370-92.

.13 All of the above wire diameters are subject to a tolerance limit of 0.004 in accordance with ASTM A-641.

2.5 Building envelope materials

.1 Through Wall Flashing:

.1 Flashing Membrane: Refer to Section 07 27 00 – Membrane Air Barrier.

.2 Metal Drip Flashings: Coordinate with Section 07 62 00 – Prefinished Metal Flashing and Trim.

.3 Air/Vapour Barrier Membrane: Refer to Section 07 27 00 – Membrane Air Barrier.

.2 Cavity Insulation: Refer to Section 07 21 00 – Thermal Insulation.

2.6 Fabrication

.1 Fabricated in such a manner that the sides, ends, lid and diaphragms can be assembled at site into rectangular baskets of the sizes specified in reviewed shop drawings.

.2 Gabions shall be of single unit construction: the base, lid, ends and sides shall be either woven into a single unit or edge of these members connected to the base section of the gabion ensuring strength and flexibility at the connecting point does not compromise the engineered structural design of the gabion.

.3 If the length of the gabion exceeds one and one half its horizontal width, the gabion shall be divided by diaphragms of the same mesh and gauge as the body of the gabion, into cells whose length does not exceed the horizontal width.

.4 Provide necessary diaphragms secured in proper position on the base so that no additional tying is required at this juncture.

2.7 Fabrication tolerances

.1 Fabricate limestone dimension stone to the following tolerances:

.1 Unit Length: plus or minus 3 mm.

.2 Unit Height: plus or minus 3 mm.

.3 Deviation From Square: plus or minus 3 mm, with measurement taken using the longest edge as the base.

3 Execution

3.1 Examination

.1 Examine substrates to receive the work of this section and ensure that work of other sections is complete and that there are no conditions which will adversely affect the work of this section.

.2 Do not proceed with the work of this section until unsatisfactory conditions have been corrected.

3.2 Sequence of erection

.1 Commencement of the work of this section implies acceptance of surfaces and conditions.

.1 Schedule sequence for erection of exterior thin stone veneer to ensure the following conditions:

.1 Membrane moisture barrier has been installed and reviewed, to provide a complete and continuous moisture barrier.

.2 Membrane through-wall flashing has been installed and reviewed.

.3 Metal through-wall flashing has been installed and reviewed.

.4 Insulation has a minimum of voids and is secured firmly against membrane moisture barrier with insulation retainers.

.5 Air space between insulation and back of gabion stone cladding is clear and properly drained and ventilated.

3.3 Installation – damp course/through-wall flashing

.1 Install damp course/through-wall flashing with adhesive in accordance with manufacturer's written instructions, where indicated on drawings and in absence of indication in locations as follows:

.1 first course above new grade line,

.2 under window sills and jambs,

.3 over the back and top of parapet walls,

.4 over the heads of openings in exterior wails, such as windows, doors, and mechanical louvres,

.2 Install continuous metal flashing at all locations where through-wall flashing occurs at wall face. Accurately mitre metal drip flashings at all inside and outside corners and deburr all sharp edges/corners. Insert metal drip flashing to present a neat, straight line appearance. Adhere through-wall flashing to top surface of metal drip flashings.

.3 Extend damp coursing and flashing through full thickness of walls, carrying material from outside to inside. Then install flashing, using same material as damp course, from outside thickness of thin stone veneer at same joint as damp course, up face of exterior wallboard 200 mm and under air barrier membrane for cavity wall construction.

.4 Lap all joints 150 mm and seal with adhesive.

.5 Wrap damp course/through-wall flashing into inside corners and around outside corners, sealing seams and corners with adhesive/sealant.

.6 Inspect damp course/through-wall flashing for punctures, tears, misaligned seams and the like, apply additional layer of damp course/through-wall flashing, extending minimum of 150 mm around damaged area in all directions.

.7 Trim exposed edges of damp course/through-wall flashing in a neat, even appearance, removing excess materials projecting beyond edge of support.

.8 Tie in damp course/through-wall flashing with air barrier membrane to ensure continuity of air barrier in accordance with OBC requirements.

3.4 Installation - air/vapour barrier membranes

.1 Tie in through-wall flashing with air barrier membrane to ensure continuity of air barrier in accordance with OBC requirements, and outlined in Section 07 27 00 – Membrane Air Barrier.

3.5 Installation – cavity wall Insulation

.1 Refer to Section 07 21 00 – Thermal Insulation requirements for Semi-Rigid mineral wool insulation for exterior rain screen cavities. installation – stone panels and anchorage system

.2 Anchors:

.1 Set all anchors, anchorage systems, and fastenings shown on reviewed shop drawings.

.3 Gabion Stone Cladding:

.1 Prior to setting stone on anchors, ensure anchors, dowel slots are sealed.

.2 Accurately set gabion baskets in strict accordance with reviewed shop drawings.

.3 Set gabion stone cladding system plumb and accurately in position with anchors securely fastened.

.4 Make joints uniform and of indicated width.

.5 Lay out work to pattern detailed.

.6 Assemble gabion baskets by tying or fastening in accordance with reviewed shop drawings.

.7 A line of empty gabions, shall be placed into position according to the contract drawings. Secure each unit to the adjoining one along the vertical reinforced edges and the top selvedges. Ensure a tight, neat seam and minimize gabion wired or fastened to the latter at front and back. The lid shall be secured with an approved closure tool to insure proper closure without mesh deformation.

.8 Stretch gabion baskets to achieve uniform alignment. Install connecting wire during the filling operation in accordance with engineered shop drawings and manufacturers instructions, and not exceeding every 300 mm of vertical lift of the gabion unit.

3.6 Cleaning

.1 Upon completion of the work of this Section, examine the work of this Section, replace uneven or damaged. Remove defective work and replace with new material, carefully fill and rearrange stone fill where required by Consultant. Repairing or replacement of defective materials or workmanship shall be made at no additional cost to the Owner and at the Owner's convenience.

.2 Remove all debris resulting from the work of this Section from the Site.

End of section

1 General

1.1 Section includes

.1 Provide labour, materials, equipment, services and perform all operations required to complete structural steel installation.

1.2 Related requirements

.1 Section 05 21 00 – Steel Joist Framing

.2 Section 05 31 00 – Steel Decking

.3 Section 05 50 00 – Metal Fabrications

1.3 References

.1 Canadian Standards Association (CSA International)

.1 CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel/ Structural Quality Steel.

.2 CSA S16-09, Design of Steel Structures.

.3 CAN/CSA S136-07 North American Specification for the Design of Cold Formed Steel Structural Members.

.4 CSA S136.1, Commentary on North American Specification for the Design of Cold Formed Steel Structural Members.

.5 CSA W47.1-03 (R2008), Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W48-06(R2011), Filler Metals and Allied Materials for Metal Arc Welding.

.7 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.8 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

.2 Canadian Institute of Steel Construction (CISC)

.1 CISC, Handbook of Steel Construction.

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

.1 CISC/CPMA 1-73a, Quick-Drying One-Coat Paint for Use on Structural Steel.

.2 CISC/CPMA 2-, Quick-Drying Primer for use on Structural Steel.

.4 American Society for Testing and Materials International, (ASTM)

.1 ASTM A307-12, Standard Specification for Carbon Steel Bots, Studs and Rods 60,000 PSI Tensile Strength.

.2 ASTM A325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).

.3 ASTM A490M-12, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).

.4 ASTM A123/A123M-08, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.5 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless.

.6 ASTM F606-13, Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets.

.7 ASTM A1011/A1011M-09a, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

.8 ASTM F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

.5 Master Painters Institute

.1 MPI-INT 5.1-98, Structural Steel and Metal Fabrications.

.2 MPI-EXT 5.1-98, Structural Steel and Metal Fabrications.

.6 Research Council on Structural Connections (RCSC)

.1 Specification for Structural Joints Using ASTM A325 or A490 Bolts (2009)

.7 The Society for Protective Coatings (SSPC)

.1 SSPC SP 6/NACE No. 3-00, Commercial Blast Cleaning.

1.4 Design requirements

.1 Design details and connections according to the requirements of CSA S16 and CSA S136 to resist forces, moments, shears indicated or implied and handling, transportation and erection loads.

.2 Connections – General:

.1 Design according to CSA S16 Clause 21 - Connections. Have designs completed by a Professional Engineer licensed to practice in the Province of Ontario.

.2 For normal framing, connections may be bolted or welded.

.3 Design connections for end reactions from torsion, bending moment, shear, and axial load where indicated on the Contract Drawings.

.4 If no moments, shears or axial loads are indicated, design according to CSA S16 requirements for Simple Construction. Design connections to 70 % of the ultimate shear capacity of the member.

.5 For beams with intersecting bracing members, design connections for beam reaction plus reaction from the bracing members.

.6 Detail connections of steel members so as not to interfere with architectural clearance lines or finishes.

.7 As a minimum provide 2-16M A-325 bolts per connection.

.3 Bolted Connections

.1 Unless noted otherwise in the Contract Documents, use bearing type connections with snug-tightened bolts.

.2 Where indicated on the Contract Drawings, use slip-critical connections.

.3 Use high-strength bolts according to CSA S16 Clause 22 - Design and Detailing of Bolted Connection.

.4 Use pretensioned bolts according to CSA S16, Clause 22.2.2 - Use of Pretensioned High-Strength Bolts, for:

.1 Slip-critical connections.

.2 Connections proportioned for seismic design.

.3 Connections of members resisting crane loads.

.4 Connections supporting running machines or other live loads that produce impact or cyclic loads.

.5 Connections where bolts are subject to tensile axial loads.

.6 Connections using oversize or slotted holes, unless designed to accommodate movement.

.5 If accessible, use clipped double connections where beams of similar size are bolted to both sides of a column at a common location.

.4 For bracing and other tension and compression members, design connections, if not finished to bear, to develop the force due to full factored loads where indicated. Otherwise, design for 100 percent of strength of the member, in tension or compression capacity, whichever governs.

.5 Design splices for the full strength of the member in torsion, bending, shear, and axial load unless noted otherwise in the Contract Documents.

.6 Provide a pair of bearing stiffeners on beams and girders at point of concentrated loads, such as at columns, monorail and crane runway beams, and equipment supports.

.7 Temporary bracing shall be according to CSA S16 Clause 29.1 – Temporary Conditions. Bracing members shown on structural design drawings are not to be assumed as adequate for erection purposes.

.8 If structural steel members specified on the Drawings are not available, contact the Consultant for written acceptance of any and all substitutions.

1.5 Quality assurance

.1 The Owner, in consultation with the Consultant, will appoint an independent inspection and testing company to verify compliance with this Specification according to Section 01 45 00 – Quality Control. Cooperate and coordinate with the inspector to facilitate inspection.

.2 Provide an affidavit from the structural steel fabricator stating that materials and products used in fabrication according to the applicable material and Products standard specified and indicated in the Contract Documents.

.3 Retain a Professional Engineer, licensed to practice in the Province of Ontario, with experience in design, fabrication and erection of structural steel work of comparable complexity and scope, to perform the following services as part of the work of this Section:

.1 Design connections.

.2 Stamp and sign shop drawings and erection drawings, design calculations and amendments.

.4 Hot Dip Galvanizing:

.1 Retain an independent testing agency to inspect and test hot dip galvanized fabricated items according to ASTM A123/A123M.

.2 Visually inspect and test for thickness and adhesion of zinc coating for minimum of three test samples from each lot according to ASTM A123/A123M.

.3 Reject and retest nonconforming articles according to ASTM A123/A123M.

.5 High Strength Bolted Connections:

.1 Retain an independent testing agency to perform the following inspection and testing according to CSA S16:

.1 Marking identification and according to CSA standards.

.2 Alignment of bolt holes.

.3 Placement, type and thickness of hardened washers.

.4 Tightening of bolts.

.2 Bearing Type Connections Not Fully Tensioned (N, X): Snug tight condition with plies of joint in firm contact.

.3 Fully Tensioned (FT) Bearing and Slip Critical (SC) Connections:

.1 Conduct pre-installation test.

.2 Monitor installation and tightening of TC bolts.

.3 Monitor condition of faying surfaces for slip critical connections.

.4 Pre-installation Test:

.1 Conduct a test on Site prior to the start of work using a bolt tension measuring device.

.2 Select a representative sample according to ASTM F606-13 and not less than three bolts of each diameter, length, and grade for each manufacturer if varies.

.3 Conduct the test according to RCSC “Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts”.

.4 Nondestructive Testing (NDT) Report: Prepare and submit a written NDT report identifying location of inspected bolted connections and summary of corrections as required to meet CSA S16 acceptance criteria.

.5 Defective Connections: Correct and re-inspect defective and improperly tightened high strength bolted connections. Retest fully tensioned bolts as necessary to demonstrate compliance of the completed work.

.6 Welded Connections:

.1 Retain an independent testing agency to perform visual inspection and testing according to CSA W59.

.2 Weld acceptance criteria for visual, radiographic, liquid penetrate, ultrasonic and magnetic particle testing shall be based on the acceptance criteria set out in CSA W59.

.3 Nondestructive Testing (NDT) Report: Prepare and submit a written NDT report identifying location of inspected welded connections and summary of corrections as required to meet CSA S16 and CSA W59 acceptance criteria.

.4 Defective Connections: Correct and re-inspect defective and improperly welded connections. Retest as necessary to demonstrate compliance of the completed work.

1.6 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Submit shop drawings, sketches and design calculations stamped and signed by a qualified professional engineer licensed to practice in the Province of Ontario.

.4 Shop Drawings:

.1 Submit fabrication and erection documents. Include connection design details, shop details, erection drawings and erection procedures.

.2 Fabrication details shall include shop and field splices, connection details, cuts, copes, camber, bolt tension, holes, bearing plates, threaded fasteners, anchors, reinforcements, surface preparation and finishes, identification marks and welds on shop details. Indicate welds according to the CSA W59 welding symbols standard.

.3 Erection drawings:

.1 Indicate details and information necessary for assembly and erection purposes such as description of methods, member identification, sequence of erection, type of equipment used in erection and temporary bracings.

.2 On erection drawings, mark each member with a number corresponding to the drawing containing the shop details of the member.

.3 Reproduction of the Contract Drawings for use as erection drawings is not permitted. Do not use Contract CADD files.

.4 Shop details and erection drawings together for each structure or part of structure.

.5 Connection design calculations.

.6 Dimension shop drawings in S.I. metric units. Shop drawings not prepared in metric units will be rejected.

.5 Certifications:

.1 Submit certifications for welding companies under Division 1 or 2.1 according to CSA W47.1 for fusion welding of steel structures, and CSA W55.3 for resistance welding of structural components.

.2 Submit confirmation by the Professional Engineer that fabrication and erection complies with the Contract Documents.

.3 Hot Dip Galvanizing: Submit a certificate of compliance signed by the galvanizer that describes the material process and applicable standard used for coating.

.6 Test Reports:

.1 Four weeks minimum, prior to structural steel fabrication, submit two (2) copies of mill test reports by the steel manufacturer indicating chemical and physical properties of steel to be used in the Work and confirming that tests completed are according to CSA G40.20/G40.21.

.2 Provide mill test reports certified by metallurgists qualified to practice in the Province of Ontario, Canada.

.7 Inspection Reports:

.1 Submit field reports of shop and field inspections by the independent testing agency.

.8 Methods proposed to resolve misalignment between anchor bolts and bolt holes in steel members.

.9 Submit a Construction Waste Management plan as described in subsection 1.6 – Waste Management and Disposal, below.

1.7 Waste management and disposal

.1 Prepare a Construction Waste Management plan according to Section 01 74 19 – Construction and Demolition Waste Management.

.2 Separate and recycle waste materials.

.3 Remove from Site and dispose of packaging materials at the appropriate recycling facilities.

.4 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material for recycling according to the Waste Management Plan.

.5 Divert unused metal materials from the landfill to the metal recycling facility approved by Consultant.

.6 Divert unused paint material from the landfill to the official hazardous material collections site approved by the Consultant.

.7 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location if it will pose health or environmental hazard.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Rolled structural steel shapes and flat hot-rolled steel: CSA G40.20/G40.21, Grade 350W.

.2 Hollow structural sections: CSA G40.20/G40.21, Grade 350W, Class C.

.3 Channels, angles and plates: CSA G40.20/G40.21, Grade 300W.

.4 Cold formed shapes: CSA S136.

.5 Anchor rods: CSA-G40.20/G40.21, Grade 300W.

.6 Bolts, nuts and washers: ASTM A325 or ASTM A490, Type 1.

.7 Welding materials: CSA W59 and certified by Canadian Welding Bureau.

.8 Grout: non-shrink, premixed grout as specified in Section 03 30 00 – Cast-in-Place Concrete.

.9 Primer: as specified in Section 09 90 00 – Painting.

.10 Zinc rich primer for galvanized surfaces: zinc rich, as specified in Section 09 90 00 – Painting.

.11 Hot dip galvanizing: to ASTM A123/A123M-13, minimum zinc coating of 600 g/m2, Coating Grade 85.

2.3 Fabrication

.1 Fabricate structural steel according to CSA S16, CISC Code of Standard Practice for Structural Steel Buildings, CSA W59 and according to the reviewed shop drawings.

.2 Splicing of members is not permitted except as indicated on the Contract Drawings or with prior written approval of the Consultant.

.3 Mark and match mark materials for field assembly.

.4 Complete assembly, including bolting and welding of units, before the start of finishing operations.

.5 Field measure before fabrication.

.6 Provide camber as indicated on the Drawings.

.7 Continuously seal members by continuous welds where indicated on the Contract Drawings. Galvanize vent/weep holes for structural steel members.

.8 Grind shop fabrication welds smooth.

.9 The minimum size of welds shall be as required in CSA W59.

.10 Provide drain and vent holes in HSS members to be galvanized. Install plug holes after galvanizing.

.11 Do not fabricate steel members until erection diagrams have been returned. Any work done prior to return of erection diagrams will be at the fabricator's risk or at the Contractor's written request and risk.

.12 Flame cutting of structural steel shall be not permitted without the prior written approval of the Consultant.

2.4 Shop painting

.1 Surface Preparation and painting as specified in Section 09 90 00 – Painting.

.2 Prime interior structural steel in shop except if galvanized finish is indicated in the Contract Documents.

.3 Do not shop prime the following surfaces, unless indicated otherwise in the Contract Documents:

.1 Steel members which are to be completely encased in reinforced concrete or coated with cementitious fireproofing.

.2 Surfaces to receive field installed stud shear connections.

.3 Surfaces and edges to be field welded.

.4 Faying surfaces of friction-type connections.

.5 Below grade surfaces in contact with soil.

.4 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

.5 Grind paint or any coating from the surfaces of what shall be welded. Welding on painted surfaces not permitted.

.6 Shop primer for steel members to be coated with intumescent fireproofing shall be compatible with the fireproofing specified in the Contract Documents.

2.5 Galvanizing

.1 Galvanize exterior structural steel unless indicated otherwise in the Contract Documents. Provide galvanized bolts, nuts and washers for exterior steel bolted connections.

.2 Fabricate steel to be galvanized according to ASTM A123/A123M-13. Avoid fabrication techniques that could cause the distortion or embrittlement of steel.

.3 Remove welding slag, splatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to delivery for galvanizing.

.4 Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.

.5 Hot dip galvanize steel members, fabrications, and assemblies after fabrication according to ASTM A123/A123M-13.

.6 Hot dip galvanize A325 and A490 bolts, nuts, washers, and hardware components according to ASTM A123/A123M-13. Oversize holes to allow for zinc alloy growth. Shop assemble bolts, nuts and washers with special lubricant and test according to ASTM A123/A123M-13.

.7 Galvanize components of bolted assemblies separately before assembly.

.8 Locally remove galvanizing from the surfaces to be welded. Welding galvanized surfaces shall not be permitted. Grind welds smooth and touch-up with zinc-rich prime after welding.

3 Execution

3.1 General

.1 Structural steel work: according to CSA S16.

.2 Welding: according to CSA W59.

.3 Companies performing welding to be certified under Division 01 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

.4 Flame cutting of structural steel will be not permitted without the prior written approval of the Consultant.

3.2 Connection to existing work

.1 Verify the condition and dimensions of previously installed work upon which this Section depends. Report any defects to the Consultant. The commencement of the work shall constitute the Contractor's acceptance of the existing conditions.

.2 Obtain the written approval from the Consultant prior to field cutting or altering of structural members.

3.3 Marking

.1 Mark materials according to CAN/CSA- G40.20/G40.21-04. Do not use die stamping. If steel is to be left in an unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: Shop mark bearing assemblies and splices for fit and match.

3.4 Erection

.1 Supply and coordinate the location and placement of anchor bolts and base plates.

.2 Provide templates and other devices for presetting bolts and other anchors to accurate locations.

.3 If column vase plates are recessed in the concrete floor slab, any projection of anchor bolts beyond the face of the concrete floor surface shall not be permitted. Verify recess dimensions shown on the Contract Drawings for adequacy and notify the Consultant of any required modification to recess dimensions.

.4 Erect structural steel according to reviewed shop drawings, erection drawings and tolerances of CSA S16 and CISC Handbook of Steel Construction tolerances except restrict the maximum variation in elevation to 6 mm.

.5 Splicing of members shall not be permitted except as indicated on the Contract Drawings or as accepted in writing by the Consultant.

.6 Field cutting or altering structural members shall not be permitted without prior written approval from the Consultant.

.7 Set steel accurately to lines and elevations indicated. Set column bases and shim to proper elevations. Install structural grouting according to details and the manufacturer's recommendations.

.8 Assemble structural steel members true, plumb and level, free of twists and open joints.

.9 Make high strength bolted connections according to CSA S16.

.10 Weld according to CSA W59

.11 Install the Contractor designed temporary construction bracing to provide necessary support until components are in place and construction is complete.

3.5 Shop and field inspection

.1 Inspections and testing of materials and workmanship will be carried out by the independent testing agency. The independent testing agency shall be qualified according to the requirements of CSA W178.1-08(R2013) and certified by the Canadian Welding Bureau.

.2 The inspection shall cover shop work and field erection work to review for compliance with the requirements of CSA S16, the Contract Documents

and reviewed shop drawings. The independent testing agency will randomly review materials to ensure according to the requirements of CSA S16, the Contract Documents and reviewed shop drawings.

.3 Provide safe access and working areas for testing on Site, as required by the independent testing agency and as authorized by Consultant.

.4 The independent testing agency will submit reports to the Consultant, Contractor and steel fabricator covering the work inspected and provide details of errors or deficiencies observed within one week of completion of inspection.

.5 Structural steel items to be cast into concrete or masonry shall be randomly inspected by the Consultant or the independent testing agency prior to concrete/grout placement.

.6 Notify the independent testing agency two weeks in advance of the date when the first work will be ready for inspection.

.7 The independent testing agency shall carry out visual inspection of all connections including butt joints. The independent testing agency shall, as a minimum, visually examine all welded joints for inclusions, porosity, lack of fusion, penetration, contour, under-cuts and cracks.

.8 The independent testing agency shall start field inspection as soon as each section of the Work has commenced in the field.

.9 Inspection shall include:

.1 Shop inspection of fabrication in the plant.

.2 Company certification is according to CSA W47.1 Division 01.

.3 Welders' CWB Qualifications.

.4 Welding procedures are approved by the CWB in accordance to CSA W47.1 and CSA W59.

.5 Splicing details and procedures.

.6 Overall dimensions.

.7 Fabricated members against specified member sections.

.8 Workmanship regarding layout, punching and drilling of holes.

.9 Shop and field inspection of bolt installation.

3.6 Finishing systems

.1 Clean steel according to SSPC SP 6, Commercial Blast Cleaning.

.2 Paint according to Section 09 90 00 – Painting.

.3 Touch-up Painting:

.1 Upon completion of erection, mechanically brush clean bolts, rivets, welds and burned or scratched surfaces.

.2 Touch-up damaged surfaces and surfaces without shop coat with field touch-up primer or touch-up primer for galvanized steel as applicable.

End of section

1 General

1.1 Section includes

.1 Provide all labour, materials, equipment, services and perform all operations required to complete steel joist framing installation.

1.2 Related requirements

.1 Section 05 12 23 – Structural Steel for Buildings

.2 Section 05 31 00 – Steel Decking

.3 Section 05 50 00 – Metal Fabrications

1.3 References

.1 Canadian Standards Association (CSA International):

.1 CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA-S16-09, Design of Steel Structures.

.3 CAN/CSA-S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.

.4 CSA-S136.1-07, Commentary on North American Specification for the Design of Cold Formed Steel Structural Members.

.5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W55.3-08 (R2013), Certification of Companies for Resistance Welding of Steel and Aluminum.

.7 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.2 Canadian Institute of Steel Construction (CISC):

.1 Handbook of Steel Construction.

.3 CISC and Canadian Paint Manufacturer's Association (CPMA):

.1 CISC/CPMA 1-73b, Quick-Drying One-Coat Paint for Use on Structural Steel.

.2 CISC/CPMA 2-75, Quick-Drying Primer for use on Structural Steel.

.4 Master Painters Institute (MPI):

.1 MPI-INT 5.1-02, Structural Steel and Metal Fabrications.

1.4 Design of steel joists and bridging

.1 Comply with the latest edition of the 2012 Ontario Building Code and all amendments thereto.

.2 Design steel joists and bridging to carry loads as per the uniform load shown on the Drawings according to CSA S16.

.3 Design joists and anchorages for uplift forces as indicated on the design drawings.

.4 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.

.5 Unless indicated otherwise on the Drawings limit roof joist deflection due to specified live load to L/360 of span and deflection due to specified total load to L/240 of span.

.6 Provide steel angle bridging at top and bottom chord with L/r not exceeding 300.

.7 Provide diagonal bridging at ends of bridging lines with L/r not exceeding 200.

.8 Extend bottom chord of joists to connect to columns to form tie joists at column lines.

1.5 Quality assurance

.1 Submit an affidavit prepared by the fabricator of structural steel joists stating that materials and products used in fabrication conform to this Specification Section.

.2 Companies to be certified under Division 01 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

.3 A minimum of two weeks prior to the start of fabrication, submit to the Consultant a letter from the fabricator’s welding engineer stating that the welding engineer is responsible for welding procedures and practices for this Work as outlined in CSA W47.1.

.4 Provide Certificate of Quality Compliance from open web steel joists fabricator upon the completion of fabrication stating that the work has been designed and fabricated according to the requirements of the Contract Documents.

.5 The Owner, in consultation with the Consultant, will appoint an independent inspection and testing company to verify compliance with this Specification according to Section 01 45 00 – Quality Control. Cooperate and coordinate with the inspector to facilitate inspection.

1.6 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Submit calculations and joist design drawings for all joists for Consultant review a minimum of two weeks prior to fabrication, calculations and joist design drawings to be stamped and signed by a Professional Engineer licensed to practice in the Province of Ontario.

.4 Product Data:

.1 Submit the manufacturer's instructions, printed product literature and data sheets for steel joist framing and include product characteristics, performance criteria, physical size, finish and limitations.

.5 Shop Drawings:

.1 Indicate on erection drawings, relevant details such as joist mark, depth, spacing, bridging lines, bearing, anchorage and details.

.2 Indicate particulars, on shop drawings, relative to joist geometry, framed openings, splicing details, bearing and anchorage. Include member size, properties, specified and factored member loads, and stresses under various loadings, deflection and camber.

.3 Elevation view of each type of joist showing configuration, chord and web member sizes, panel point dimensions, and chord extensions.

.4 Connection and bearing details between joists and supporting steel, concrete, etc.

.5 Bridging member sizes and connection details.

.6 Calculations:

.1 Complete design, including stress and deflection calculations, for joists, joist members, and connections for design load and equipment weight as indicated, plus any construction loads applied by the Contractor's operations.

.7 Certifications:

.1 Submit certifications for welding companies under Division 1 or 2.1 according to CSA W47.1 for fusion welding of steel structures, and CSA W55.3 for resistance welding of structural components.

.8 Inspection Reports:

.1 Submit the inspection report by the independent testing agency.

.9 Information Submittals:

.1 If requested, submit to the Consultant one copy of all approved welding procedures for the Contract Work.

1.7 Delivery, storage and handling

.1 Deliver, store and handle materials according to Section 01 65 00 – Product Delivery Requirements and with the manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to Site in the original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in a dry location and according to the manufacturer's recommendations in a clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new materials.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Open web steel joists: according to CSA S16.

.2 Structural steel: according to CSA G40.20/G40.21 Grade 300W (Minimum).

.3 Welding materials: according to CSA W59.

.4 Shop paint primer: according to MPI #79.

2.3 Fabrication

.1 Fabricate steel joists and accessories according to CSA S16 and according to the reviewed shop drawings.

.2 Weld according to CSA W59.

.3 Provide diagonal bridging, horizontal bridging and anchorages according to CSA S16, unless indicated otherwise on the Contract Drawings.

2.4 Shop painting

.1 Clean, prepare and shop prime surfaces of steel joists to CSA S16.

.2 Clean members of loose mill scale, rust, oil, dirt and other foreign matter. Prepare surfaces according to SSPC SP-6.

.3 Apply one coat of CISC/CPMA 2 primer to steel surfaces to achieve dry film thickness of .065mm to .080 mm maximum, except for:

.1 Surfaces to be encased in concrete.

.2 Surfaces and edges to be field welded.

.3 Faying surfaces of friction-type connections.

.4 Members that are to be galvanized.

.4 Apply paint under cover, on dry surfaces if surface and air temperatures are above 5 °C.

.5 Maintain a dry condition at a minimum temperature of 5 °C until the paint is thoroughly dry.

.6 Strip paint bolts, nuts, sharp edges and corners before the prime coat is dry.

3 Execution

3.1 Examination

.1 Verification of Conditions: verify that the conditions of the substrates previously installed under other Sections or Contracts are acceptable for steel joist framing installation according to the manufacturer's written instructions.

.1 Visually inspect substrate in the presence of the Consultant.

.2 Inform the Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation work only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 Fabrication

.1 Fabricate according to CSA S16.

.2 Weld according to CSA W59.

.3 Provide required bridging.

.4 Provide bottom chord extensions.

.5 Provide wall anchors and header supports.

.6 Apply primer to steel surfaces.

3.3 Field quality control, inspection and testing

.1 The independent testing agency will inspect representative joists for integrity, accuracy of fabrication and soundness of welds. The independent testing agency will also check representative field

connections. The Consultant will determine the extent of and identify all inspections.

.2 Submit inspection report to the Consultant within seven (7) days after completion of inspection.

.3 The Contractor shall pay for the cost of testing. Costs for any re-inspections and or retesting as a result of deficient work shall be paid for by the Contractor at no additional cost to the Owner.

.4 Prior to inspection and testing by the testing agency, the structural steel erection Subcontractor will carry out an inspection of the work and make the inspection results available to the Consultant and the independent testing agency. The inspection report will identify the areas of work inspected, identified deficiencies and measures taken to correct the deficiencies.

3.4 Erection

.1 Erect steel joists and bridging according to CSA S16 and reviewed erection drawings.

.2 Complete installation of bridging and anchorages before placing construction loads on joists.

.3 Obtain written approval from the Consultant prior to field cutting or altering joists or bridging.

.4 Complete installation of all bridging and anchorages before placing construction loads on joists.

.5 Anchor bridging to end walls.

3.5 Touch-up painting

.1 Immediately following erection, remove debris from completed installation.

.2 Clean field welds, bolted connections, rust spots, and abraded areas.

.3 Repair damaged painted and galvanized surfaces as specified in Section 09 90 00 – Painting.

3.6 Field painting

.1 Paint according to Section 09 90 00 – Painting.

3.7 Cleaning

.1 Progress Cleaning:

.1 Promptly as the Work proceeds and upon completion, clean-up and remove from the site, the rubbish and surplus material resulting from the Work of this Section.

.2 Leave the Work area clean at the end of each Day.

.2 Final Cleaning: upon completion, remove surplus materials, rubbish, tools and equipment.

3.8 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to materials caused by steel joist framing installation at no additional cost to the Owner.

End of section

1 General

1.1 Section includes

.1 Provide labour, materials, equipment, services and perform all operations required to complete steel decking installation.

1.2 Related requirements

.1 Section 05 12 23 – Structural Steel for Buildings

.2 Section 05 21 00 – Steel Joist Framing

.3 Section 05 50 00 – Metal Fabrications

1.3 References

.1 Canadian Standards Association (CSA International)

.1 CSA-S16-09, Design of Steel Structures.

.2 CAN/CSA-S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.

.3 CSA-S136.1-07, Commentary on North American Specification for the Design of Cold Formed Steel Structural Members.

.4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.

.5 CSA W55.3-08 (R2013), Certification of Companies for Resistance Welding of Steel and Aluminum.

.6 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM A653/A653M-08, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron-Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A780-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.3 A924/A924M-13 Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.3 American Welding Society (AWS):

.1 D1.3, Structural Welding Code – Sheet Steel.

.4 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 10M-13, Standard for Steel Roof Deck.

.2 CSSBI 12M-13, Standard for Composite Steel Deck.

1.4 Design requirements

.1 Design steel deck using limit states design according to CSA S136 and CSSBI 10M for roof deck or CSSBI 12M for composite floor deck.

.2 Design steel deck to carry loads indicated or implied on Contract Drawings, including dead, live, snow loads and uplift loads, according to CSA-S16. Design steel deck to the approximate depth and base steel nominal thickness shown on the Contract Drawings. Design steel deck for diaphragm action to forces indicated on the Contract Drawings.

.3 Unless indicated otherwise on the drawings limit deflection due to specified live load to L/360 of span and deflection due to specified total load to L/240 of span.

.4 Design framing for openings or holes through deck up to and including 600 mm in width.

1.5 Quality assurance

.1 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.

.2 The Owner, in consultation with the Consultant, will appoint an independent inspection and testing company to verify compliance with this Specification according to Section 01 45 00 – Quality Control. Cooperate and coordinate with the inspector to facilitate inspection.

1.6 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Submit drawings and calculations stamped and signed by a qualified professional engineer licensed to practice in the Province of Ontario.

.4 Shop Drawings:

.1 Plan view layout of decking showing reinforcing channels and details, pans, special jointing, connections to supports, connections between sheets, projections and accessories.

.2 Indicate the location of openings, deck laps, and deck attachment details.

.3 Indicate the type and section properties of deck panels, including the deck profile, dimensions, base steel thickness and metallic coating designation.

.5 Certifications:

.1 Submit certifications for welding companies under Division 1 or 2.1 according to CSA W47.1 for fusion welding of steel structures, and CSA W55.3 for resistance welding of structural components.

.6 Inspection Reports:

.1 Submit the inspection report by the independent testing agency.

.7 Information submittals:

.1 Submit the following upon request of the Consultant:

.1 Design calculations.

.2 One copy of all approved welding procedures for this project.

1.7 Delivery, storage, and handling

.1 Deliver, store and handle materials according to Section 01 65 00 – Product Delivery Requirements and with the manufacturer's written instructions.

.2 Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

.3 Store deck bundles on platforms or pallets, with one end elevated to provide drainage.

.4 Protect bundles against condensation with a ventilated waterproof covering.

.5 Stack bundles so there is no danger of tipping, sliding, rolling, shifting or material damage.

.6 Appropriately package and protect architecturally exposed deck to prevent

1.8 Site conditions

.1 Examine Site conditions and verify dimensions on Site to ensure accurate and proper fitting of the steel deck to be installed.

.2 Promptly notify the Consultant if any apparent discrepancies are found.

1.9 Waste management and disposal

.1 Separate and recycle waste materials.

.2 Divert unused metal from landfill to metal recycling facility approved by the Consultant.

.3 Dispose of unused paint material at official hazardous material collections site approved by the Consultant.

.4 Do not dispose of unused paint material into the sewer system, into streams, lakes, onto ground or in other location if it will pose health or environmental hazard.

.5 Dispose of unused caulking material at official hazardous material collections site approved by the Consultant.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Metal decking

.1 Provide metal deck as shown in the following schedule:

Type	Depth	Panel Width	Minimum Nominal Thickness	Min. Yield Strength Fy	Min. Section Modulus S(+)	Min. Moment of Inertia I	Finish
	(mm)	(mm)	(mm)	(MPa)	(mm^3/m)	(mm^4/m)	
Composite Floor Deck	38	914	0.91	230	11,558	254,750	Galv; Z275
Roof Deck	38	914	0.91	230	11,558	254,750	Galv; Z275
Roof Deck	76	914	0.91	230	29,407	1,262,487	Galv; Z275
Roof Deck, Acoustic	90	609	1.37	230	60,750	3,796,330	Galv; Z275

.2 Increase deck gauge to suit snow accumulation, rain, or wind loads.

.3 Sheet steel for galvanized deck and accessories according to ASTM A653M Structural Quality Grade 33 or higher, as shown in the Steel Deck Schedule above.

.4 Galvanizing according to ASTM A924M with a coating class of Z275 as defined in ASTM A653M and as shown in the Steel Deck Schedule above.

.5 Closures: according to the manufacturer's recommendations unless otherwise indicated on the design drawings.

.6 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.91 mm. Metallic coating shall be the same as deck material.

.7 Manufacturers:

.1 Canam Group Inc.;

.2 Vicwest Inc.;

.3 Epic Metals Corporation; or

.4 Approved alternate.

2.3 Materials

.1 Structural steel: according to CSA-G40.20/G40.21, Grade 300W.

.2 Acoustic insulation: fibrous glass 17.5 kg/m^3 density profiled to suit deck flutes, as indicated on the Contract Drawings.

.3 Caulking: to Section 07 92 00 – Sealants.

.4 Shear studs: CSA W59 Appendix H.

.5 Steel deck primer: CAN/CGSB 1.181; ready mixed Organic Zinc rich organic.

3 Execution

3.1 General

.1 Structural steel work: according to CAN/CSA-S136 and CSSBI 10M.

.2 Welding: according to CSA W59, except if specified otherwise in the Contract Documents.

3.2 Examination

.1 Examine supporting framing and field conditions for compliance with the requirements for installation tolerances and other conditions affecting performance of the steel deck

3.3 Installation

.1 Locate deck bundles to prevent overloading of support framing members.

.2 Install at right angles to supporting members, unless shown otherwise on the contract drawings and according to the Specifications and the manufacturer's installation recommendations.

.3 Bearing: 38 mm, minimum.

.4 Endlaps: Minimum of 100 mm and located over supports.

.5 Do not stretch sidelaps.

3.4 Field quality control, inspection and testing

.1 Welded Connections:

.1 The independent testing agency will perform 100 % visual testing of connections according to AWS D1.3.

.2 Weld acceptance criteria for visual testing shall be based on the acceptance criteria set out in AWS D1.3.

.3 Prepare and submit a written Nondestructive Testing inspection report identifying the location of inspected welded connections and a summary of corrections as required to meet the acceptance criteria set out in AWS D1.3.

.4 Submit inspection report to Consultant within seven (7) Days after the completion of the inspection.

.5 Defective Connections: Correct and re-inspect defective and improperly welded connections. Retest as necessary to demonstrate compliance of the completed Work.

.6 The Contractor shall pay for the cost of testing. The cost of any re-inspections and/or retesting as a result of deficient work shall also be paid for by the Contractor at no additional cost to the Owner.

.2 Mechanical Fasteners:

.1 Visually inspect, according to the manufacturer's instructions, for each type of fastener.

3.5 Closures

.1 Install closures according to the approved details and shop drawings.

3.6 Openings and areas of concentrated loads

.1 For deck openings with any one dimension equal to or smaller than 600 mm, reinforce as recommended by the manufacturer, except as otherwise indicated in the Contract Documents.

.2 For deck openings with any one dimension greater than 600 mm and for areas of concentrated load, reinforce according to structural framing details, except as otherwise indicated in the Contract Documents.

3.7 Deck attachment

.1 Welded connections: Support connections: 19 mm (0.75 in.) diameter arc spot welds at minimum 300 mm on centres, three welds per panel support minimum, unless indicated otherwise on the Contract Drawings. Weld at additional locations for diaphragm action.

.2 Mechanical Power Driven Fasteners:

.1 Install fasteners according to the manufacturer's written instructions and with special installation tools.

.2 Minimum Sidelap Edge Distance: 10 mm.

.3 Minimum End/End Lap Distance: 25 mm.

.4 Head Projection: As specified by the manufacturer for correct penetration into the flange of the steel support member.

.3 Mechanically clinch longitudinal or side joints of panels at 600 mm maximum on centres, or as indicated on the Contract Drawings. Unless otherwise noted on the Contract Drawings, check for minimum diaphragm shear of 5.0 kN/m (unfactored).

.4 Lap steel deck edges, including ends and bearing, 50 mm minimum.

.5 Design the anchorage of the steel roof deck to resist wind uplift.

.6 Weld stud shear connectors through steel deck to steel beams below.

3.8 Touch-up painting

.1 Immediately following erection, remove unused deck edge trimmings, screws, fasteners, welding washers, butt ends of welding rods, and debris from the completed installation.

.2 Clean field welds, bolted connections, rust spots, and abraded areas.

.3 Repair damaged painted surfaces.

.4 Repair damaged galvanized surfaces with zinc rich spray paint according to ASTM A780; colour shall match the galvanized deck.

.5 Use a magnetic gauge to determine that the thickness of the repair is equal to, or greater than the base painted or galvanized coating.

End of section

1 General

1.1 Section includes

.1 Unless otherwise specified conform to CSA-S16, Steel Structures for Building - Limit States Design and CAN/CSA-S136, Cold Formed Steel Structural Members.

1.2 Related requirements

.1 Section 04 21 13 – Brick Veneer Masonry

.2 Section 06 10 00 – Rough Carpentry

.3 Section 07 21 00 – Thermal Insulation

.4 Section 07 46 19 – Metal Wall Panels

.5 Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane

.6 Section 08 44 13 – Glazed Aluminum Curtain Wall

.7 Section 09 21 16 – Gypsum Wallboard

1.3 Reference standards

.1 Canadian Institute of Steel Construction (CISC):

.1 CISI - Specification for the Design of Cold-Formed Steel Structural Members, in accordance with CAN/CSA-S136.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A153/A123M-09, Zinc Coating (Hot-Dipped) on Iron and Steel Hardware.

.2 ASTM A568/A568M-11b, General Requirements for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

.3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.4 ASTM C955-11c, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.

.3 American National Standards Institute/American Welding Society:

.1 ANSI/AWS D1.3, Structural Welding Code - Sheet Steel.

.4 Canadian Standards Association:

.1 CSA-W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.2 CSA-W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

.3 CSA-S16-09, Design of Steel Structures

.4 CAN/CSA-S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members

.5 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type

.6 Canadian Sheet Steel Building Institute:

.1 CSSBI 51M-1991, Lightweight Steel Framing Design Manual.

1.4 System description

.1 Design Requirements:

.1 Have work of this section designed by a professional engineer licensed to design structures and registered in the place of Work.

.2 Design cold formed metal framing system to resist pressure and suction of wind loads, snow loads, snow load build-up and temperature range, expected in the geographical area for this project, under the local Building Code, climatic information for 30 year probability without any detrimental effects on appearance and performance.

.3 Design shall be based on Limit States Design principles using factored loads and resistances.

.4 Deflection (inward or outward) shall not be greater than L/720 of the span between points of support.

.5 Resistance strength and resistance factors shall be determined in accordance with applicable building code requirements and CAN/CSA-S136.

.6 Construct work of this section to provide for expansion and contraction of components as will be caused by ambient temperature range without causing buckling, failure of joint seals, undue stress on fasteners or other effects detrimental to appearance or performance.

.7 Section properties shall be computed on the basis of the nominal core thickness.

.8 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress affects due to torsion between lines bridging. Sheathing shall not be used to help restrain member rotation and translation perpendicular to the minor axis for wind bearing studs.

.9 Design cold formed metal framing system to support loads and superimposed loads transferred from cladding and include for design of support and attachment components between other assemblies and stud system. Responsibility for design of exterior wall loads transferred from other envelope components is part of work of this section.

1.5 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings:

.1 Prepare and submit shop and erection drawings which conform to the requirements of the CAN/CSA-S16, and as specified herein.

.2 Cold formed metal framing system must have shop drawings prepared by qualified draftsmen, checked by and bearing the seal of a professional engineer registered to design structures and practice in the place of Work.

.3 Show the size, spacing and location of connections, attachments, reinforcing and anchorage. Include necessary plans, elevations and details. Indicate size and type of fastening. For weld connections use welding symbols in compliance with AWS and indicate clearly net weld lengths.

.4 Submit typical details of connections, and any special connections for approval before preparation of shop drawings.

.5 Review of shop drawings by the Consultant and Structural Engineer will not absolve the Contractor from his responsibility of providing materials and equipment to complete and finish work of this section in accordance with the architectural and structural drawings. Departures or differences from the referenced drawings shall be approved in writing by the Consultant.

1.6 Quality assurance

.1 Conform to requirements of CAN/CSA-S16, Steel Structures for Buildings, and CAN/CSA-S136, Cold Formed Steel Structural Members.

.2 Work to be executed by firm thoroughly conversant with laws, by-laws and regulations which govern, and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturer's specializing in this work.

.3 Work shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the site to direct the work.

.4 Install system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

.5 Install system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.7 Inspection and testing

.1 An independent inspection and testing company appointed and paid for by the Owner may carry out inspection and testing of the structural steel stud systems in accordance with Section 01 45 00 – Quality Control.

.2 Provide free access for inspectors to all places where work is being done.

.3 Inspectors are to ensure that materials conform to the requirements of this section.

.4 Any inspection and/or testing required because of an error by the Contractor, or due to departure from the Contract Documents shall be paid for by the Contractor.

.5 Inspection and testing of structural metal stud systems shall include, but shall not be limited to the following:

.1 Checking that mill test reports are properly correlated to materials.

.2 Sampling fabrication and erection procedures for general conformity to the requirements of the specification.

.3 Checking that the welding conforms to the requirements of CSA W47.1, CSA W59 (R2008) and/or ANSI/AWS D1.3, whichever is applicable.

.4 Checking fabricated members against specified member shapes.

.5 Visual inspection of all welded connections including sample checking of joint preparation and fit-up.

.6 Sample checking of screwed and bolted joints.

.7 Sample checking that tolerances are not exceeded during fit-up and/or erection.

.8 Additional inspection and testing of welded connections at required by CSA W59.

.9 General inspection of field cutting and alterations required by other trades.

.10 Submission of reports to the Consultant covering the work inspected with details of deficiencies discovered.

.6 The inspection and testing provided in this Section does not relieve the Contractor of his responsibility for the performance of the Contract. The

Contractor shall implement his own supervisory and quality control procedures.

.7 Materials and/or workmanship not conforming to the requirements of the Contract Documents may be rejected at any time during the progress of the work, and shall be replaced and/or repaired without cost to the Owner.

1.8 Delivery, storage, handling and protection

.1 Coordinate deliveries to comply with Construction Progress Schedule and arrange ahead for off-the-ground storage location. Do not load any area beyond the design limits.

.2 Adequately protect steel against rust and damage during manufacturing, delivery and storage.

.3 Store material on planks on a dry area and protect from damage. Make good immediately any damage done, clean scratches and the like, touch-up with specified primer.

2 Products

2.1 Manufacturers

.1 Cold formed metal framing as indicated on drawings and as specified herein shall be by one of the following:

.1 Bailey Metal Products Limited; or

.2 Canadian Steel Manufacturing, Division of British Steel Canada Inc.; or

.3 Lightsteel Inc., Boucherville, Quebec; or

.4 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Framing materials shall conform to the requirements of CAN/CSA-S136.

.2 Galvanized Sheet Steel:

.1 Conform to ASTM A653/A653M, minimum Grade D, 50 PSI (345 MPa) yield for 1.5 mm (.060 in.) material.

.3 Structural Metal Studs:

.1 Galvanized sheet steel formed to channel shape, of minimum gauge, sizes, and section properties to meet design requirements, and conforms to ASTM C955.

.4 Metal Stud Runners/Top and Bottom Tracks:

.1 Galvanized sheet steel formed to channel shape, having same width as studs, with tight fit and solid web, of minimum gauge to meet design requirements, but no less than gauge of metal studs, and conforms to ASTM C955.

.5 Metal Plates, Bridging, Gussets and Clips:

.1 Formed from galvanized sheet steel, of gauges, shapes and sizes required to meet design requirements determined for conditions encountered, and of same finish as framing members.

.6 Fastenings:

.1 Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized to 1.25 ounce per square foot and conforms to ASTM A153/A153M-09, Class B3, '12-24 x 7/8 HWH #4STLG' by Hilti Canada, or approved alternate.

.2 Anchorage Devices: Power driven, powder actuated, drilled expansion bolts, or screws with sleeves, as application dictates.

.3 Welding Materials: Conforms to CSA W59.

.4 Electrodes for welding shall have minimum 480 MPa tensile strength series, (E480XXX,E480S-X).

.7 Touch-Up Primer:

.1 Ready mixed, zinc-rich primer, and conforms to CAN/CGSB-1.181, 'Sealtight Galvafroid Zinc-Rich Coating' by W.R. Meadows of Canada Limited, or 'Zinc Clad No.7 Organic Zinc Rich Primer' by Sherwin Williams Company of Canada Ltd., or approved alternate.

.8 Dampproof Course:

.1 No. 15 asphalt building paper conforming to CAN/CGSB-51.32-M77.

2.4 Fabrication

.1 Fit and assemble work in shop where possible. Execute work according to details and reviewed shop drawings.

.2 Take measurements at the building for work which is to fit or be connected to steel, concrete framing or masonry, before commencing fabrication.

.3 Structural metal studs shall have one unreinforced service cut-out centred in the web of the studs and with the centreline of the cut-out a minimum of 455 mm (1 ft. 6 in.) from the bottom of the studs. In addition to the above, provide cut-outs for internal bridging as required. All unreinforced cut-outs shall conform to dimension limitations of Table 1, in the CSSBI M50-1987 Manual.

.4 Provide prepunched cut-outs in inner top track for anchor clearances so that deflection clearances are not reduced.

.5 Fabrication tolerances for cold formed steel framing members shall to Table 2 of the CSSBI M50-1987 Manual.

.6 Cutting of cold formed steel framing members shall be by "power saw" or "shear" methods. Cutting by "torch" method shall not be permitted.

.7 Steel thickness, exclusive of coating shall be marked on all cold formed steel framing members by embossing, or by stamping with indelible ink, or by colour coding method.

.8 Gauges and sizes of metal shall be adequate for various conditions.

3 Execution

3.1 Examination

.1 Verify at site that the work to receive the work of this section is free of irregularities detrimental to the installation and performance of the work and that it is located correctly and at proper levels before delivery and installation.

.2 Verify that building framing components are ready to receive work.

.3 Beginning of installation means acceptance of existing conditions.

3.2 Erection of studs

.1 Install components in strict accordance with manufacturer's written instructions.

.2 Methods of construction may be either piece by piece (stick-built), or by fabrication into panels (panelized) either on or off site. Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.

.3 Cold formed steel framing shall be erected true and plumb within the tolerances specified herein. Temporary bracing shall be employed wherever necessary to withstand all loads to which the structure may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for the safety and integrity of the structure. The Contractor shall ensure that during erection a margin of safety consistent with the requirements of the National Building Code and CAN/CSA-S136 exists in the uncompleted structure.

.4 Erection Tolerances:

.1 For the purposes of erection tolerances, "camber" is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis and "sweep" is defined as the deviation from straightness of a member or any portion of a member with respect to its minor axis.

.2 For wind bearing studs, out of plumbness shall not exceed 1/500th of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.

.3 For runners/tracks, camber shall not exceed 1/1000th of the member length.

.4 Studs shall seat into top and bottom runners/tracks. The gap between the end of the stud and the web of the runner/track shall not exceed 4 mm (5/32 in.) for wind bearing studs.

.5 Where cold formed metal framing is made in prefabricated panels, align adjacent prefabricated panels to provide surface continuity at the interface.

.6 Spacing of studs shall not be more than 3 mm (⅛ in.) from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.

.5 Align floor and ceiling runners/tracks, locate to wall or partition layout. Secure in place with screws or welding at maximum 610 mm (24 in.) O.C. Coordinate installation of sealant with floor and ceiling track.

.6 Place studs to meet design requirements as indicated on approved shop drawings, and not more than 50 mm (2 in.) from abutting walls, and at each side of openings. Connect studs to tracks using clips and ties, screws, or welding. Diameter of screws shall be equal to, or exceed the minimum diameter indicated on the reviewed shop drawings. Penetration of screws beyond joined materials shall be not less than three (3) exposed threads. Thread types and drilling capability of screws shall conform to the manufacturer's written recommendations to suit design requirements and conditions. Screws to be covered by sheathing materials shall have "low profile" type heads.

.7 Field cutting of cold formed steel framing members shall be by "power saw" or "shear" methods. Cutting by "torch" method shall not be permitted.

.8 Holes that are field cut into cold formed steel framing members shall conform to the dimensional requirements of Table 1, in the CSSBI M50-1987 Manual.

.9 Brace structural metal studs as required to meet design requirements and as indicated on reviewed shop drawings.

.10 Provide continuous dampproof course to underside of bottom runner/track.

.11 Construct corners using minimum of three (3) studs. Double studs at door, window jambs, and wall openings.

.12 Erect studs one piece full length. Splicing of studs is not permitted.

.13 Erect load bearing studs, brace, and reinforce to develop full strength to meet design requirements.

.14 Refer to drawings for height of partition framing.

.15 Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

.16 Install intermediate studs above and below openings to match wall stud spacing.

.17 Provide deflection allowance in stud bottom runner/track, directly below horizontal building framing for non-load bearing framing.

.18 Attach cross studs or furring channels to studs for attachment of fixtures anchored to walls. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

.19 Touch-up field welds and damaged galvanized surfaces with two (2) coats of zinc rich touch-up primer.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for the supply and installation of metal fabrications and miscellaneous metals required by related Sections.

.1 Shop fabricated ferrous metal items.

.2 Supports for Architectural Woodwork fabrications.

.3 Refer to the Article 3.5 – Schedule.

1.2 Administrative requirements

.1 Coordination: Coordinate with other work having a direct bearing on work of this Section.

.2 Coordinate the Work with installation of adjacent components or materials.

.3 Coordinate installation of anchorages for metal fabrications.

.4 Coordinate selection of shop primers with topcoats to be applied over them.

1.3 Performance requirements

.1 Design the following and similar items required to withstand live, static and dynamic loads, within acceptable deflection limitations, and the effects of earthquake motions, including comprehensive engineering analysis by a professional engineer, using performance requirements and design criteria specified or indicated, and as required by applicable codes.

.1 Under-counter steel supports.

.2 Ladders.

.3 Covers and gratings.

.4 Exterior glazing support angle and plates

.5 Miscellaneous framing and supports.

1.4 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings:

.1 Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, finishes and accessories. Include erection drawings, elevations, and details where applicable.

.2 Indicate welded connections using standard welding symbols. Indicate net weld lengths.

.3 Indicate proposed solutions for where design features compromise galvanizing process.

.4 For items specified to conform to structural performance requirements, prepare Shop Drawings under direct supervision of a professional structural engineer experienced in design of this work and licensed in the Province where the Project is located. Include framing member structural and physical characteristics, calculations, dimensional limitations.

.5 Each shop drawing to bear seal and signature of professional structural engineer licensed in the Province of Ontario.

1.5 Submittals for information

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Qualifications Data: For fabricator.

.3 Welders' Certificates: Certifying welders employed on the Work, verifying qualification within the previous 12 months to CSA W47 series, CSA W55.3, CSA W59, and CSA W59.2.

1.6 Quality assurance

.1 Fabricator Qualifications: Company specializing in performing the work of this section with minimum five documented experience and the following;

.1 Undertake welding only by fabricators certified by Canadian Welding Bureau under CSA Standard W47.1, Division 1 or 2.1.

.2 Connections Designed by Consultant:

.1 Submission of shop drawings for connections which have been detailed on Drawings by Consultant shall represent acceptance by Contractor that connection can be executed successfully.

.3 Other Connections:

.1 Design of other connections which cannot be selected from standard designs tabulated in CISC Handbook of Steel Construction shall be by a Professional Engineer, licensed in the Province of Ontario, experienced in structural steel connection design.

.2 Consultant will review connection arrangement to verify general conformance with overall design concept of structure.

.3 Connection design engineer shall be insured against professional liability in accordance with local professional engineers act in location of work and Authority Having Jurisdiction.

.2 Installer Qualifications: Fabricator.

.3 Welded Steel Construction: CSA-W59.

.4 Welded Aluminum Construction: CSA-W59.2.

1.7 Coordination

.1 Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

2 Products

2.1 Materials – general

.1 Preference shall be given to structural steel that is manufactured at Canadian mills.

.2 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Steel Sections and Plates: CAN/CSA-G40.20/G40.21, Grade 300W.

.2 Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40.

.3 Steel Tubing: ASTM A500, Grade B.

.4 Aluminum ladder components: ASTM B632, alloy 6106-T6.

.5 Custom Close Mesh Steel Bar Grating: Hot rolled, pickled and oiled black steel, ASTM A569; steel rods welded to steel bars minimum 5 mm thick x 50 mm flat bar in both directions 50 mm deep; 5 mm round bars spaced at max 15 mm o.c. to create max. Opening of 7.5 mm in width; Hot dip galvanized after fabrication.

.6 Expanded Metal Mesh: Standard Steel sheet, 1-1/2 #10 Standard, 80 % Open Area; Galvanized Hot Dipped Finish.

.1 Product: HS Item No. 4300151068 manufactured by McNichols Co. or approved alternate.

.7 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of fabricated item, of type compatible with material being fastened, corrosion resistant, strength and size to suit application. Wood plugs not permitted.

.8 Bolts, Nuts, and Washers: ASTM A307, ASTM A325, and ASTM A563, as applicable; galvanized to ASTM A153/A152M for galvanized components.

.9 Expansion Anchors: Anchor bolt and sleeve assembly capable of sustaining, without failure, a load equal to six (6) times the load imposed when installed in unit masonry and equal to four (4) times the load imposed when installed in concrete per ASTM E488.

.10 Material for Interior Locations: Carbon steel components zinc-plated to conform to ASTM B633, Class Fe/Zn 5.

.11 Welding Materials: Type required for materials being welded.

.12 Welding Filler Material: CSA W48.

.13 Galvanizing: hot dipped galvanizing with minimum zinc coating in accordance with Table 1 of CAN/CSA G164.

.14 Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

.15 Touch-Up Primer for Galvanized Surfaces: SPCC-Paint 20, Type II Organic zinc rich.

.16 Isolating Tape: Butyl, extruded, macro-polyisobutylene type, size and hardness to suit application.

.17 Grout: Prebagged, non-shrink, non-metallic, flowable, minimum 15 MPa compressive strength, 7.9 MPa pull-out strength. 'Sika Grout 212' by Sika Canada, or approved alternate.

2.3 Fabrication

.1 Fit and shop assemble items in largest practical sections, for delivery to site.

.2 Fabricate items with joints tightly fitted and secured.

.3 Continuously seal joined members by intermittent welds and plastic filler in concealed locations; provide continuous welds in exposed locations.

.4 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius and free of burrs.

.5 Cut holes for anchorages and for attachment of supported items. Ream holes drilled for fastening and anchors.

.6 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

.7 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

.8 Stainless Steel Items:

.1 Fabricate items in accordance with ASTM A380, free of surface discolouration or contamination of natural protective oxide coating, and free of carbon steel dust.

.2 Execute work in clean shops separate from areas where carbon steel is fabricated. Use clean tools and dies free of nicks and other damage which have not been for fabricating other types of steel or metals.

.3 Grind joints smooth and polish, free of crevice, without seams, and to match appearance of adjacent metal surface.

.9 Accommodate for expansion and contraction of members and building movement without damage to connections or members.

2.4 Quality of workmanship classification

.1 Quality of Workmanship Classification: Work of this Section shall conform to the workmanship classifications as defined in NAAMM AMP 555-92, and generally defined as follows;

.2 Class 1, where the work of this Section exposed to view by the Public:

.1 Exposed surfaces are finished smooth with pits, mill marks, nicks and scratches filled or ground off. Defects shall not show through painted or polished surfaces.

.2 Welds shall be concealed where possible. Exposed welds are ground to a small radius with a uniform sized cove unless noted otherwise.

.3 Distortions shall not be visible to the naked eye.

.4 Exposed joints are fitted to a hairline finish.

.3 Class 2, where the work of this Section is exposed to limited view and service areas:

.1 Exposed surfaces retain mill marks and moderate irregularities not visible to the naked eye from a distance of 9.0 metres.

.2 Exposed welds are ground with uniform sized cove.

.3 Minor distortions shall be permitted.

.4 Exposed joints shall have maximum gap of 1.5 mm.

.4 Class 3, where the work of this Section is concealed from view and where Class 3 considered acceptable by the Consultant in service or support areas:

.1 Exposed surfaces shall have no improvement from mill finish, except preparation necessary for galvanizing or priming.

.2 Exposed welds are not ground.

.3 Bolts, when used may be exposed.

2.5 Fabrication tolerances

.1 Squareness: 3 mm maximum difference in diagonal measurements.

.2 Maximum Offset between Faces: 1.6 mm.

.3 Maximum Misalignment of Adjacent Members: 1.6 mm.

.4 Maximum Bow: 3 mm in 1.2 m.

.5 Maximum Deviation from Plane: 1.6 mm in 1.2 m.

2.6 Finishes - steel

.1 General:

.1 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

.2 Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

.2 Steel:

.1 Prime Painting:

.1 Prepare surfaces to be primed in accordance with SSPC-SP 2.

.2 Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

.3 Do not prime surfaces in direct contact with concrete or where field welding is required.

.4 Prime paint items with two coats.

.2 Galvanizing:

.1 General: Advise Consultant of design features compromising galvanizing and make corrections prior to fabrication.

.2 Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M. Provide minimum 600 g/m^2 galvanized coating.

.3 Non-structural Items: Galvanized after fabrication to ASTM A123/A123M. Provide minimum 380 g/m^2 galvanized coating.

.4 Anchor bolts and Fasteners: Galvanized to ASTM A153/A153M.

.5 Prevent embrittlement of steel in accordance with ASTM A143.

.6 Touch up damaged areas in accordance with ASTM A780.

.7 Finished surfaces to be free of stains due to wetting.

.3 Prepare prime painted and galvanized surfaces for finish painting where indicated to receive finish paint specified in Section 09 90 00 - Painting.

.4 Powder Coat Finish:

.1 Where powder coat finishes are required prepare material with a 3 stage washer and zinc phosphate coating system. Thoroughly dry and apply a powder coat polyester finish in accordance with manufacturer's written instructions.

.3 Aluminum:

.1 Mill finish items, unless otherwise indicated or specified.

.2 Corrosion Protection: Coat concealed surfaces of aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

.3 Extruded Aluminum: Two (2) coats of clear lacquer.

.4 Cast Aluminum: Heavy coat of bituminous paint.

2.7 Source quality control

.1 Engage a professional structural engineer experienced in design and installation of this work and licensed in the Province where the Project is located to:

.1 Perform timely and regular inspections reviewing fabrication and welding.

.2 Verify Work conforms to applicable code.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that field conditions are acceptable and are ready to receive work.

.3 Verify dimensions, tolerances, and method of attachment with other work.

3.2 Preparation

.1 Clean and strip primed steel items to bare metal where site welding is required.

.2 Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction.

.1 Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 Installation

.1 Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

.2 Install items plumb and level, accurately fitted, free from distortion or defects.

.3 Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

.4 Field weld components indicated on Shop Drawings. Provide assemblies in one piece or in longest lengths possible.

.5 Perform field welding to CSA requirements.

.6 Obtain approval prior to site cutting or making adjustments not scheduled.

.7 After erection, touch up welds and abrasions with applicable primer, except surfaces to be in contact with concrete; galvanizing touch-up in accordance with ASTM A780.

3.4 Erection tolerances

.1 Maximum Variation from Plumb: 6 mm per storey, non-cumulative.

.2 Maximum Offset from True Alignment: 6 mm.

.3 Maximum Out-of-Position: 6 mm.

3.5 Site quality control

.1 Engage a professional structural engineer experienced in the design and installation of this work and licensed in the Province where the Project is located to:

.1 Perform timely and regular inspections.

.2 Verify installation conforms to applicable code.

.3 Prepare and submit inspection reports.

3.6 Schedules

.1 General:

.1 The following Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

.2 Where items specified as prime painted occur in humid areas, substitute prime paint finish for hot dip galvanized finish.

.2 Ladders:

.1 Supply and install all fixed access ladders as indicated and/or specified herein.

.2 Fixed access ladders shall be designed, fabricated and installed in accordance with the Ontario Building Code and the requirements of the Ministry of Labour's, Engineering Data Sheet 2-04 - Fixed Access Ladders.

.3 Fixed access ladders shall be designed by a Professional Engineer, licensed to design structures and registered in the Province of Ontario.

.4 Where required, provide steel flat bar safety cages and rest platforms to vertical steel ladders in accordance with the Occupational Health and Safety Act, R.S.O. 1990 C.O.1, Regulations for Industrial Establishments, R.R.O. 1990, O. Regulation 851 as amended by O. Regulation 516/92 and all other authorities having jurisdiction.

.5 Elevator Pit Ladders:

.1 Provide (one) 1 pit ladder for each elevator.

.2 Pit ladders shall be designed, fabricated and installed in accordance with the requirements of CAN/CSA B44, Safety Code for Elevators and Escalators.

.3 Quality of Workmanship Classification: Class 2.

.4 Finish: Prime paint finish. Apply one coat of shop primer to steel surfaces.

.6 Ladders - Interior:

.1 Quality of Workmanship Classification: Class 2.

.2 Finish: Prime paint finish. Apply one coat of shop primer to steel surfaces.

.7 Ladders – Exterior:

.1 Quality of Workmanship Classification: Class 2.

.2 Finish: Hot-dip galvanized after fabrication.

.3 Masonry Related Items:

.1 General:

.1 Supply Masonry related items to masonry and concrete trades as directed.

.2 Quality of Workmanship Classification: Class 2.

.3 Finish:

.1 Exterior - Hot-dip galvanized after fabrication.

.2 Interior - Prime paint finish. Apply one coat of shop primer to steel surfaces.

.2 Shelf Angles:

.1 Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally

slotted holes to receive ¾ in. (19 mm) bolts, spaced not more than 6 in. (150 mm) from ends and 24 in. (600 mm) o.c., unless otherwise indicated.

.1 Provide mitered and welded units at corners.

.2 Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angle brackets to cast-in-place concrete.

.3 Lateral supports for Masonry:

.1 Fabricate out of steel plate and rolled steel angles in accordance with details shown. Finish prime paint except at exterior walls where they shall be galvanized.

.2 Supply to Masonry Contractor for installation complete with sleeve anchors/bolts minimum 12 mm o.d. galvanized steel and washers. Drill or punch holes for anchor bolts as required.

.4 Loose Lintels:

.1 Angle lintels shall have a bearing of at least 150 mm at each end and if doubled shall be bolted or welded back to back. If angle seats are at different elevations, supply steel packing for the upper member or provide even common bearing.

.2 Where not specifically called for on the drawings, supply loose lintels over all masonry openings and recessed walls 600 mm or over, or in partitions, where a lintel is needed, including mechanical openings or recesses, or appropriate size, unless a reinforced block or concrete lintel is noted.

.3 Exterior shelf lintels supporting exterior masonry facings to be galvanized.

.4 Coordinate with Structural for lintels supplied by that Section.

.4 Bollards:

.1 Service areas:

.1 Galvanized steel pipe, 8.2 mm wall thickness x 150 mm diameter, 1,350 mm height above grade. Extend pipe minimum 900 mm below grade or floor, concrete filled,

crowned cap, prime paint finish. Finish paint by Section 09 90 00 – Painting.

.2 Landscape Bollards:

.1 Refer to landscape architects drawings and documentation.

.2 Coordinate lighting and power supply for bollards with Division 26.

.5 Service Trench Covers and Frames:

.1 Use proprietary product, unless otherwise indicated.

.2 Fabricate from galvanized steel in removable sections to of maximum 900 mm length for each section.

.3 Provide angle frame with hooked bar anchors for setting in concrete.

.6 Areaway Grates and Frames:

.1 Galvanized steel, welded construction.

.2 Fabricate grates from galvanized steel rods welded to galvanized steel bars minimum 5 mm thick x 50 mm deep.

.3 Provide angle frame with hooked bar anchors for setting in concrete.

.4 Coordinate with adjacent work. Provide Engineer reviewed framing and connections to building structure.

.5 Design for minimum design loading required by Authority having jurisdiction, and support for related work.

.6 Free area of grate to be 50 %.

.7 Hot dip galvanized finish after fabrication.

.7 Sump Pit Grating:

.1 Galvanized steel, welded construction.

.2 Fabricate grates from galvanized steel rods welded to galvanized steel bars minimum 5 mm thick bars x 25 mm deep, to suite design loading.

.3 Coordinate with Division 03 Section cast in place concrete, and Division 05 structural steel for angle frame with hooked bar anchors for setting in concrete.

.4 Free area of grate to be 50 %.

.5 Hot dip galvanized finish after fabrication.

.8 Under-Counter Steel Supports:

.1 Framing: Continuous channel / angle welded construction.

.2 Drill 6 mm diameter holes at each cross support for fastening of counter.

.3 Provide concealed steel section posts to support channels at front of counter, for building into wall.

.4 Provide posts with anchor plates and 9 mm diameter bolts for attachment to structure.

.5 Unless otherwise indicated, provide intermediate posts to support long counter spans.

.6 Conceal framing from view to greatest extent possible.

.7 Prime paint finish. Finish paint by Section 09 90 00 – Painting.

.9 Miscellaneous Framing and Supports:

.1 General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

.2 Concealed metal angles and support not included in Division 5 section structural steel, indicated to support exterior cladding and parapets.

.3 Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

.4 Furnish inserts for units installed after concrete is placed.

.5 Quality of Workmanship Classification: Class 3.

.6 Finishes: Prime paint finish for interior items, hot dip galvanized finish for exterior items. Finish paint by Section 09 90 00 – Painting.

.7 Install all units in accordance with approved shop drawings. Erect rigid, plumb and level.

.8 Glazed Screen Lateral Bracing:

.1 Provide and install steel channel and angle suspended support framing complete with all diagonal bracing required

for lateral stability, concealed in ceiling spaces for anchorage.

.9 Folding Partition Track Support.

.1 Provide and install steel channel and angle suspended support framing complete with all diagonal bracing required for lateral stability, concealed in ceiling spaces for anchorage.

.10 Ceiling Hung Toilet Partitions Supports:

.1 Provide and install steel channel and angle suspended support framing complete with all diagonal bracing required for lateral stability, concealed in ceiling spaces for anchorage.

.11 Overhead Door Frames:

.1 Supply 6 mm thick bent steel plate around openings, heads, and jambs to suit wall thickness and return 75 mm on either side of wall face. Provide extensions on interior side at head to accommodate track and operators to suit doors specified.

.2 Quality of Workmanship Classification: Class 2.

.3 Finish: Hot-dip galvanized after fabrication.

End of section

1 General

1.1 Section includes

.1 Supply all labour, materials, equipment, services and perform all operations required to complete all rough carpentry work to the full intent of the drawings and as herein specified.

1.2 Related requirements

.1 Section 05 40 00 – Cold Formed Metal Framing

.2 Section 06 10 00 – Rough Carpentry

.3 Section 07 21 00 – Thermal Insulation

.4 Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane

.5 Section 09 21 16 – Gypsum Wallboard

.6 Section 09 90 00 – Painting

1.3 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

1.4 Delivery, storage, handling and protection

.1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.

.2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Do not store seasoned materials under conditions that will cause their moisture content to increase.

.4 Protect edges and corners of sheet materials from damage during handling and storage.

.5 Store preservative-treated materials under cover, off the ground and protected from moisture.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Framing Lumber:

.1 Lumber for structural components shall be of species and grade specified, well seasoned, processed and stamped at same mill with appropriate grade markings. Conform to requirements of Standard Grading Rules for Canadian Lumber of National Lumber Grades Authority the (NLGA) with latest supplements, approved by the Canadian Lumber Standards Administrative Board.

.2 Framing, Furring, Strapping, Blocking:

.1 Spruce, 122c, "Standard" light framing, except as otherwise specified.

.3 Plywood Sheathing:

.1 Shall be ¾ in. thick and/or thickness as indicated on drawings, exterior grade at exterior locations, Douglas Fir plywood, veneer core, Select Sheathing - Tight Face, unsanded, "B" faces and conforming to CSA 0121-08.

.4 Plywood Roof Sheathing:

.1 Shall be minimum ½ in. thick, exterior grade Douglas fir plywood, veneer core, tongue and groove edges, Select Sheathing - Tight

Face, unsanded with non-slip surface one side, 'B' faces and conforming to CSA 0121-08.

.5 Rough Hardware:

.1 Provide rough hardware such as nails, spikes, staples, H-clips, bolts, nuts, washers, screws, clips, strap iron and including hardware for temporary enclosures. Nails for plywood shall be annular or spiral type, all other nails shall be spiral type. All nails, spikes and staples shall conform to CSA B111. All rough hardware shall be galvanized unless otherwise noted. Galvanizing shall conform to CAN/CSA-G164.

.6 All Other Materials and Hardware:

.1 Shall be as noted on drawings.

2.3 Pressure preservative treaded materials

.1 Pressure Preservative Treated Lumber: Lumber graded and stamped in accordance with applicable grading rules and standards of associations or agencies approved to grade lumber by Canadian Lumber Standards Accreditation Board in accordance with CAN/CSA O80 Series -08.

.1 Species: Pine or Spruce-Pine

.2 Grade: No.2 or better structural posts and lumber, pieces may be grade stamped or shipment certified by letter of compliance.

.3 Grading authority: NLGA, paragraph 131CC

.4 Material having twisted grain or structural defects affecting integrity of lumber will not be acceptable for this project.

.5 Use only material with radius edges, minimum 6 mm.

.6 Kiln dry lumber materials to 8 % moisture content or less.

.2 Pressure Preservative Treated Plywood: Treated in accordance with CAN/CSA O80 Series -08 using water-borne preservative to obtain minimum net retention of 4 kg/m³ of wood. Plywood or laminated materials shall be manufactured with exterior grade adhesives. After treatment, plywood shall be kiln dried to moisture content of 8 % or less.

2.4 Pressure fire retardant treated materials

.1 Treat by pressure impregnation with fire-retardant chemicals in accordance with CAN/CSA O80 Series -08 to provide classification for flame spread of not more than 25, smoke developed of not more than 75 in accordance with CAN4 S102.

.2 All fire retardant wood must comply with the requirements in AWPA Standard C20 for lumber and C27 for plywood.

.1 AWPA C20: Structural Lumber, Fire-Retardant Pressure Treatment, lumber materials shall only be of species listed. After treatment, lumber 50 mm or less in thickness shall be kiln dried to moisture content of 8% or less.

.2 AWPA C27: Plywood, Fire-Retardant Pressure Treatment, plywood or laminated materials shall be manufactured with exterior grade adhesives. After treatment, plywood shall be kiln dried to moisture content of 8 % or less.

.3 All species to comply with CAN4 S102 for surface-burning characteristics and shall bear identification showing classification and type of fire retardant.

.3 Each piece or bundle of fire-retardant treated material or panel to bear ULC inspection label or stamp attesting to FRS rating indicating flame spread, smoke developed, and fuel contributed classification meeting AWPA standard C20 and C27 for Type A Use.

.4 Fire retardant chemicals used to treat lumber must comply with FR-1 of AWPA Standard P17 and shall be free of halogens, sulphates and ammonium phosphate.

.5 Acceptable materials: Plywood and lumber materials treated by licensed applicators with fire retardant materials from the following:

.1 Hickson Corporation – Dricon FRTW;

.2 Hoover Treated Wood Products Inc. – Pyro-Guard;

.3 Chemical Specialties Inc. – D-Blaze; or

.4 Approved alternate.

3 Execution

3.1 Installation-general

.1 Consult with and co-operate with other Sections in advance and build-in or make provisions for installation of other work.

.2 Provide and fit in place all furring, strapping, battens, nailers, sleepers, grounds and blocking required to provide adequate properly placed fixing for all wood finishes, fitments and as required for the work of others trades.

.3 Blocking, strapping and other rough carpentry indicated shall not be regarded as complete or exact. Provide all rough carpentry work required, whether specifically shown or not. Grounds shall be of a thickness to provide for application of finishes. Room side surfaces of grounds shall be plumb and in true plane throughout.

.4 All nails shall be long enough so that at least half their length penetrate in to the second member. Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from edges.

.5 Blocking shall be through-bolted to structure.

.6 Anchor rough bucks to concrete or masonry with 3/8" diameter expansion bolts and shields or Drummond and Reeves security buck anchors, minimum three per jamb.

3.2 Wood blocking, cants and nailers

.1 Provide wood blocking, cants and nailers, where shown to be required as detailed. Bolt securely in place. Block under cants same thickness as installed roof insulation.

.2 Check mechanical, electrical, architectural drawings and provide all blocking, cants, nailers etc. required. Leave work ready for built-up bituminous roofing and prefinished sheet metal flashings.

3.3 Plywood panels

.1 Provide plywood panels required for electrical/telephone mounting of equipment and in other locations as indicated on drawings.

3.4 Roof sheathing

.1 Install roof sheathing with surface grain at right angles to the roof framing underneath with 3/32 in. gap between adjacent panels to allow for expansion.

.2 All roof sheathing panel edges that are not tongue and groove require supports of minimum 1½ in. x 1½ in. wood blocking securely fastened between roof framing members or use 'H' clips in conformance with O.B.C. article 9.23.15.1 and .2.

.3 Install roof sheathing to prefabricated wood trusses and framing using minimum 2 in. long annular or spiral type nails spaced 6 in. O.C. at edges and 12 in. O.C. along intermediate supports.

.4 Install roof sheathing to cold formed metal joist trusses and framing using minimum 6 x 1 5/8 in. long "bulge head" type drywall screws spaced 6 in O.C. at edges and 12 in. O.C. along intermediate supports.

3.5 Pressure preservative treaded wood installation

.1 Comply with AWPA M4.

.2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation. Allow first coating to fully soak into grain before applying second coating in accordance with manufacturer’s instructions.

.3 Remove with fine sandpaper, chemical deposits on treated wood to receive applied finish.

.4 Use only hot-dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of preservative treated materials.

3.6 Pressure fire retardant treated wood installation

.1 Field Cuts:

.1 Do not rip, mill or conduct extensive surfacing of fire retardant treated lumber, label will be voided.

.2 Only end cuts, drilling holes and joining cuts are permitted.

.3 All cuts on plywood will be considered end cuts.

.4 Fire-retardant lumber and plywood can be given a light sanding for cosmetic cleaning after treatment.

.5 Pre-cut to the greatest extent possible before treating.

.2 Fire retardant treated plywood used in structural applications shall be graded or span-rated material.

.3 Use only hot-dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of fire resistant treated materials.

.4 Where humidity conditions are such that moisture may condense between hardware and treated wood, hardware shall be back-primed with a corrosive-inhibitive paint.

.5 Back-prime at contact points and fasteners to prevent electrolysis when fire retardant framing members are used in metal buildings.

End of section

1 General

1.1 Section includes

.1 Custom Wood veneer Casework.

.2 Custom plastic Laminated (PLAM) Casework.

.3 Countertops.

.4 Cabinet hardware.

1.2 Performance requirements

.1 Design cabinets capable of withstanding the effects of earthquake motions determined according to applicable code. Provide anchorage on cabinets exceeding 1,200 mm in height or, where they are likely to be hazard from overturning.

1.3 Administrative requirements

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this Section.

.2 Coordinate the work with mechanical, electrical and electrical rough-in, installation of associated and adjacent components.

.3 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other sections to ensure that cabinets can be supported and installed as indicated.

.1 Coordinate metal reinforcement by Section 09 21 16 – Gypsum Wallboard with mounting requirements and wall cleats for wood paneling, base and upper cabinets and accessories.

.2 Pre-installation Meeting:

.1 Convene one (1) week before starting work of this Section; conduct meeting at Project site.

.2 Require attendance of the Consultant, Installer, Manufacturer and other parties directly affected by the work of this Section.

.3 Review preparation and installation procedures, coordination and scheduling required with related work, referenced installation standards, manufacturer's installation instructions and warranty requirements.

.4 Prepare and distribute minutes of meeting to Owner and participating parties.

1.4 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Product Data:

.1 Provide data for panel products, cabinet hardware and accessories, and finishing materials and processes.

.4 Shop Drawings:

.1 Indicate materials, component profiles, plans, sections and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.

.2 Show locations and sizes of cutouts and holes for plumbing items, electrical wiring, switches, and outlets, and other items installed in cabinets.

.5 Samples:

.1 Provide two 300 x 300 mm samples illustrating each cabinet and shelving unit finish.

.2 Provide two 300 x 300 mm samples illustrating each countertop finish.

.3 Provide two 400 mm x 400 mm fabricated and assembled outside corner samples illustrating joinery and finish of custom millwork.

.4 Provide two samples of drawer pulls and hinges illustrating hardware finish.

1.5 Submittals for information

.1 Qualifications Data: For Fabricator and Installer.

.2 Installation Data: Provide application instructions.

.3 Inspection reports.

1.6 Quality assurance

.1 Perform work in accordance with Architectural Woodwork Institute (AWI), Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Woodwork Institute's (WI) North American Architectural Woodwork Standards (NAAWS), Premium Grade.

.2 Fabricator Qualifications: Company specializing in fabricating Products specified in this section with minimum five (5) years' documented experience.

.3 Installer Qualifications: Company specializing in fabricating Products specified in this section with minimum five (5) years' documented experience.

1.7 Mock-up

.1 Provide mock-up of:

.1 Full size, one of each type of millwork unit.

.2 Full size, base cabinet and upper cabinet including plumbing accessories and fitments.

.2 Locate where directed by Consultant.

.3 Approved mock-up may remain as part of the Work.

1.8 Delivery, storage, and protection

.1 Protect units from moisture damage.

1.9 Environmental requirements

.1 During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Lumber materials

.1 Hardwood Lumber: NAAWS Premium Grade; maximum moisture content of 6 percent; of quality suitable for transparent finish, certified to FSC STD-04-004.

.2 Refer to Schedule of Finishes for basis of design natural wood species, type, and cut.

2.3 Sheet materials

.1 Sheet Products:

.1 Graded in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 4 requirements for quality grade specified;

.1 Veneer Face Grade: AA.

.2 Sheet Cores:

.1 Medium Density Fibreboard (MDF):

.1 Composed of wood fibres, medium density, FSC certified; of grade to suit application; sanded faces, formaldehyde free binder with 100 % recycled and recovered fibre conforming to ANSI A208.2. Moisture resistant MDF panel to be used in all high moisture locations.

.2 Acceptable Product:

.1 Dry locations:

.1 Roseburg Forest Products ‘Medite II’;

.2 Uniboard 'MDF Excel';

.3 Arauco 'Trupan'; or

.4 Approved alternate.

.2 Wet locations:

.1 Roseburg Forest Products ‘Medex’;

.2 Arauco 'Trupan Moisture Resistant';

.3 Uniboard 'NU Green MR-50'; or

.4 Approved alternate.

.2 Veneer Core Plywood:

.1 Non-Telegraphing, to AWCSA O153, Type II adhesive, Poplar plywood, exterior, waterproof, sound grade, good two sides, sanded faces without voids or defects, no added urea formaldehyde, 19 mm thick unless otherwise indicated or specified.

.3 Hardwood veneer core plywood:

.1 Veneer core plywood cores for solid surface countertops: CSA O153, Poplar plywood, exterior, waterproof, sound grade, good two sides, sanded faces without voids or defects, no added urea formaldehyde, 19 mm thick unless otherwise indicated or specified.

.2 Baltic Birch Plywood for drawers and drawer bodies: NAAWS premium grade, FSC Certified, Baltic Birch plywood with single piece face veneer, good two sides, sanded faces without voids or defects, no added urea formaldehyde, 12 mm and 15 mm thick.

2.4 Laminate Materials

.1 Plastic Laminate (PLAM): NEMA LD3, continuous (through) colour high pressure decorative laminate (HPDL), Grade VGS; selected from manufacturer’s full colour range, with matte and high gloss finishes.

.1 Refer to Schedule of Finishes for type, product and colour.

.2 Cabinet Liner: NEMA LD3, Grade CLS, not less than 0.5 mm thick.

.1 Colour: As selected by Consultant.

2.5 Casework

.1 Plastic Laminate Casework:

- .1 Grade: NAAWS Premium Grade.
- .2 Sheet Core: Minimum 19 mm thick MDF to meet NAAWS grade specified.
- .3 Construction Type: NAAWS construction type to be Frameless.
- .4 Cabinet and door interface: flush overlay.
- .5 Exposed Surfaces: HPDL, colour, finish and pattern direction, meeting requirements of NAAWS for Grade specified.
- .6 Exposed interior surfaces: HPDL matching exposed surfaces.
- .7 Semi-exposed surfaces: Cabinet liner matching exposed surfaces.
- .8 Edgeband: HPDL
  - .1 Edgeband at doors, drawer fronts, and false fronts: 3 mm thick. Colour and texture to match casework face.

.2 Drawers: NAAWS Premium Grade:

- .1 Side Construction: Baltic Birch Veneer core plywood core, 12 mm thick core, dovetailed or lock-shoulder jointed into 15 mm body and back.
- .2 Bottom Construction: Baltic Birch Veneer core plywood, 6 mm material, dadoed into body (subfront and back) and sides.
- .3 Drawer Face: Matching cabinet exposed surface finish and core material.
- .4 Finish:
  - .1 Side back and sub-face: to match casework semi-exposed finish.
  - .2 Drawer face: to match casework exposed surface finish.

.3 Wall Cabinets: NAAWS Premium Grade, with finish to match base cabinets.

- .1 Provide top and bottom Fillers and Corner Panels.
- .2 Provide scribes and fillers with a max. 25 mm exposed dim.
- .3 Underside of Cabinets: Type 'B' flush (one tight joint line visible)
- .4 Provide custom valances at underside of cabinets as shown.

.5 Wall Cabinet Bulkheads: Provide custom wood paneling as shown.

.6 Cabinet Backs (Wall Hung Cabinets): Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members.

.4 Shelving: NAAWS Premium Grade.

.1 Construction: To match Exposed panel products.

.2 Core: to meet NAAWS grade and loading requirements.

.3 Panel Edge Band: To match exposed panel product finishes.

.4 Provide adjustable shelves in all cabinets, set shelf standards flush with surface of gables unless shown or called for otherwise. Set shelf brackets within cabinets flush with underside of shelf.

.5 Provide custom dropped heavy duty front edges as shown.

2.6 Solid surfacing fabrications, countertops and trim

.1 Division 6 Section Solid Surfacing Fabrications; Fabrications, countertops and trim installed by Section 06 61 16 – Solid Surfacing Fabrication.

2.7 Plastic laminate countertops

.1 NAAWS Premium Grade.

.2 Plastic Laminate material and colour: Refer to Schedule of Finishes.

.3 Core material: Veneer core plywood for Wet Areas.

.4 Back splashes: butt joint per drawings.

.5 Front edges: as per drawings.

2.8 Custom locker support

.1 Custom Veneer core plywood with wood veneer Freestanding Benches:

.1 Frame: 19 mm Veneer core plywood.

.2 Joinery: in accordance with AWMAC premium grade standard.

.3 Edge Treatment: Solid wood matching face for species and cut with reveals as indicated

2.9 Accessories and auxiliary materials

.1 Adhesive: Type recommended by NAAWS to suit application.

.2 Fasteners: Size and type to suit application.

.3 Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; nickel plated finish in concealed locations and stainless steel finish in exposed locations.

.4 Concealed Joint Fasteners: Threaded steel.

.5 Tape: Aluminum foil, insulating and heat dissipating tape. Use butyl tape for isolating wood from masonry or cementitious materials.

.6 Stainless Steel Sheet: ASTM A 666, Type 304 with AISI No. 4 brushed finish; thicknesses as indicated.

.7 Steel Sections for Counter Supports: As specified in Section 05 50 00 – Metal Fabrications.

2.10 Hardware

.1 General: Manufacturer's products specified or indicated represent standard of quality required. Provide specified or indicated products or approved alternative products having the same functional and appearance characteristics and conforming to or exceeding the requirements of CAN/CGSB-69.25/ANSI/BHMA A156.9.

.2 Metal Hardware Finish: Nickel plate, unless otherwise specified.

.3 Hardware for 19 mm Thick Doors:

.1 Hinges: 170 degree swing, soft close, unless indicated otherwise, fully concealed, all metal; Product: Blum 90 series or Euromat Series by Hettich International, or approved alternate.

.2 Magnetic Latch: Magnetic, automatic opening, touch latch; Product: BP509690 by Richelieu or approved alternate.

.4 Hinges: Soft Close, Full metal, nickel plated, concealed, spring loaded, soft close, 110 and 170 degree hinges.

.5 Cabinet Door Pivot Hinge:

.1 Hinges: 270 degree swing, unless indicated otherwise, all metal; Product: 344.06.900 Aximat 300 TM Institutional Hinge by Häfele Co. or approved alternate.

.6 Piano Hinges: Full metal, 1.5 mm type 304 stainless steel, 50 mm wide continuous hinge.

.7 Hasp Lock: Hasp Cam Lock, formed for attachment with mechanical fasteners; Matt Nickel finish.

.1 Product: Item No. 235.17.600 Hasp Cam Lock by Hafele, C8173 or C8178 by Compx National or approved alternate.

.8 Drawer Slides: Electro-plated zinc screw mounted, heavy duty, full extension type with captive profile to eliminate side movement, soft close, positive in and out stops and, load capacity to suit drawer size with minimum static load rating of 27 kg for drawers 150 mm and less, and 40 kg for drawers over 150 mm in depth, lengths to suit application, side-mounted type.

.1 Product: Metabox 320 Series by Blum, Accuride Series 3832EC by Richelieu, or approved alternate.

.9 File Drawer Slides: Metafile System ‘ZRM55030’ by Richelieu or ‘TandemBox Filing Drawer, 500 mm deep’ by Blum or approved alternate.

.10 Drawer and Door Bumpers: Permanently fixed polyurethane type, clear colour.

.11 Pulls:

.1 Pull Type 1: Angled tab pull, satin stainless steel, projecting 39mm, 120 mm long; ADA compliant; Product: Mockett DP157-SSS Series or approved alternate.

.12 Elbow Catches: Two-piece design, to inactive cabinet / cupboard door leaf of paired locking doors.

.1 Product: 5540180 by Richelieu or approved alternate.

.13 Drawer and Hinged Door Locks: Cylindrical (cam) type, 6-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.

.1 Size to suit door or drawer thickness. Coordinate final keying requirements with Owner. Assume all locks keyed alike in each room.

.2 Provide a minimum of three (3) keys per lock.

.3 Product: Sargent 4142 or approved alternate.

.14 Shelf Supports:

.1 Shelf Brackets: Formed steel brackets, formed for attachment with lugs; satin finish.

.2 Pilasters: Recessed pilasters and clips, zinc plated steel; Product: 255 and 256 by Knape & Vogt or approved alternate.

.3 Pin shelf support: Nickel-plated steel pin shelf support, 5 mm diameter; Product: No. 282.38.708 by Hafele or approved alternate.

.4 Glass shelf support: Galvanized steel glass pin shelf support with cap, 5 mm diameter; Product No. 2814.41.906 by Hafele or approved alternate.

.15 Grommets: Plastic material for cut-outs, colour white;

.1 Grommet 1: 50 mm round; Product: TG Flip Top Series by Mockett, Round Grommet 76030 by Richelieu, or approved alternate.

.16 Levelers:

.1 Provide levelers as indicated. Purpose made to suit condition. Manufactured by listed hardware manufacturer in this section.

.17 Casters: Provide plate-mounted swiveling casters as manufactured by listed hardware manufacturer in this section.

.1 Provide three (3) casters without brake and one (1) matching caster with brake.

.18 Under counter hooks: ‘HJ-50’ type 304, #4 finish stainless steel hook by ‘Sugatsune’ or approved alternate.

.19 Coat Rod: Bright chrome plated steel rod and flanges, 32mm diameter rod.

.1 Product: CBH 762 rod with CBH 752 flanges by Canadian Builders Hardware Manufacturing Inc., 1212508140 rod with 2212512140 flanges by Richelieu, or approved alternate.

.20 Cable Tray: Interconnecting, L-shaped plastic brackets; Product: WM27-90 by Mockett or approved alternate.

2.11 Fabrication

.1 Fabricate to NAAWS Grade standards indicated in Part 2.

.2 Shop prepare and identify components for matching during site assembly.

.3 Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

.4 When necessary to cut and fit on site, provide materials with ample allowance for site cutting and scribing.

.5 Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

.6 Provide cut-outs for plumbing fixtures and fittings. Verify locations of cut-outs from site dimensions. Seal cut edges.

.7 Stainless Steel: Fabricate to required shapes and sizes, true to line and level. Mill joints to a tight, hairline fit. Cope or miter corner joints. Remove burrs and ease edges Remove sharp or rough areas on exposed surfaces;

.1 Base (Kick): Fabricate from 1.6 mm thickness stainless steel sheet with horizontal directional finish; heights as indicated on Drawings.

.2 Trim Plates: Fabricate from stainless steel sheet, thickness as shown with horizontal directional finish.

2.12 Shop finishing

.1 Factory finish all millwork to NAAWS Premium standards. No field finishing permitted except for minor retouching.

.1 Finishing of Concealed Areas and Back Priming: Apply two coats of sealer to concealed cabinets interiors and backs.

.2 Wood Finishes:

.1 Clear finish for wood veneer: NAAWS water based conversion varnish finish system; formaldehyde free and low VOC; Sheen: 12% sheen.

.1 Acceptable Product:

.1 Zenith by Valspar;

.2 Chemcraft 'Airguard Waterborne Clear TC'; or

.3 Approved alternate.

.3 Stainless Steel Finishes: AISI No. 4 brushed finish.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify adequacy of backing and support framing.

.3 Verify location and sizes of utility rough-in associated with work of this section.

3.2 Installation

.1 Install Work in accordance with NAAWS Premium Grade.

.2 Set and secure casework in place; rigid, plumb, and level. Provide anchoring to conform to seismic requirements.

.3 Use fixture attachments in concealed locations for wall mounted components.

.4 Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.

.5 Carefully scribe casework abutting other components, with maximum gaps of 1 mm. Do not use additional overlay trim for this purpose.

.6 Secure cabinet counter bases to floor using appropriate angles and anchorages.

.7 Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

.8 Isolate wood members in contact with masonry or cementitious construction with butyl tape.

.9 At junctions of counter and back splash and at junctions of cabinets and adjacent wall finishes, apply small bead of clear silicone sealant.

3.3 Adjusting

.1 Test installed work for rigidity and ability to support loads.

.2 Adjust moving or operating parts to function smoothly and correctly.

3.4 Cleaning

.1 Clean installed work.

.2 Clean casework, counters, shelves, hardware, fittings, and fixtures.

End of section

1 General

1.1 Section includes

.1 Polymer based solid surface (SS)

1.2 References

.1 ANSI ICPA SS1 Performance Standard for Solid Surface Materials.

.2 CAN/ULC S102 Test Method for Surface Burning Characteristics of Building Materials.

1.3 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings: Indicate all dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

.4 Samples: Submit two 50 x 50 mm samples of each colour and finish.

1.4 Closeout submittals

.1 Operation and Maintenance Data: Submit manufacturer's instructions for care and maintenance of solid surface materials including repair instructions.

1.5 Quality assurance

.1 Fabricator/Installer Qualifications: Company specializing in performing the work of this Section with minimum five (5) years’ experience and certified by the Manufacturer.

1.6 Delivery, storage and handling

.1 Do not deliver components to site until cabinetry or substrates are ready for installation. Store materials indoors prior to installation.

1.7 Warranty

.1 Provide ten (10) year manufacturer warranty against defects in materials and workmanship under normal usage, starting from the date of Substantial Performance. Warranty shall provide for all material and labour to repair or replace defective materials.

2 Products

2.1 Manufacturers

.1 Subject to conformance with the requirements of this Section provide product by manufacturer named as the basis-of-design or approved equivalent product by an acceptable manufacturer.

.2 Basis of Design: Refer to Schedule of Finishes.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Material

.1 Acrylic (SS): Homogeneous acrylic; not coated or laminated; meeting ANSI Z124.3 & Z124.6, Type 6. Superficial damage to a depth of 0.25mm shall be repairable by sanding and polishing.

.1 Colours: Refer to Schedule of Finishes.

.2 Configuration: Provide countertops with front and backsplash style as indicated.

.3 Backsplashes and Endsplashes: Where indicated, same material as countertop, thickness as recommended by manufacturer.

.4 Fabrication: Fabricate tops and backsplashes with square edges, in one piece to greatest extent possible, unless otherwise indicated.

2.4 Accessories

.1 Joint adhesive: Manufacturer's recommended adhesive designed to create chemically bonded, inconspicuous, non-porous joints.

.2 Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1-1967, UL listed.

.3 Sealant: Mildew-resistant, FDA/UL recognized silicone sealant in colour matching or clear formulations as specified.

2.5 Fabrication

.1 Fabrications to be performed by a Manufacturer Certified fabricator/installer.

.2 Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and Manufacturer's requirements.

.3 Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 50mm wide reinforcing strip of solid surface material under each joint.

.4 Provide holes and cutouts for plumbing and bath accessories as indicated on the drawings.

.5 Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

.6 Finish: All surfaces shall have uniform finish.

.1 Satin.

.7 Thermoforming: Comply with forming data from manufacturer.

.1 Construct matching molds of plywood to form component shape.

.2 Form pieces to shape prior to seaming and joining.

.3 Cut pieces larger than finished dimensions. Sand edges. Remove all nicks and scratches.

.4 Heat entire component uniformly between 135-163 °C during forming.

.5 Prevent blistering, whitening and cracking during forming.

.8 Cove backsplashes: Where indicated, fabricate 13 mm radius cove at intersection of counters and backsplashes. Form backsplashes using 13 mm material. Fabricate in shop or field.

3 Execution

3.1 Installation

.1 Install components plumb and level, in accordance with approved shop drawings and product installation details.

.2 Form field joints using Manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

.3 Provide backsplashes where indicated on the drawings. Adhere to countertops using Manufacturer's standard colour-matched silicone sealant.

.4 Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.

.5 Make plumbing connections to sinks in accordance with Mechanical.

.6 Rigidly anchor to substrate to prevent misalignment.

3.2 Tolerances

.1 Variation in component size: ± 3 mm.

.2 Location of openings: ± 3 mm from indicated location.

3.3 Protection

.1 Protect completed installation from damage with heavy kraft paper cardboard until date of final inspection.

3.4 Adjusting and cleaning

.1 Repair damaged and defective countertops to eliminate functional and visual defects; where not possible to repair, replace. Adjust joinery for uniform appearance.

.2 Remove all excess adhesives, sealants and other contaminates from installation and all adjacent surfaces. Clean countertops on exposed and semi-exposed surfaces.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation of a cold applied below grade waterproofing membrane system, as required for complete and proper installation:

.1 Fluid Applied Waterproofing Membrane

.2 Fabric Reinforcement

.3 Flashing Membrane

.4 Flashing Membrane Adhesives

.5 Mastics & Termination Sealants

.6 Drainage Board

.7 Protection Board

.8 Auxiliary Materials

1.2 Related requirements

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 03 35 00 – Concrete Finishing

.3 Section 07 21 00 – Thermal Insulation

.4 Section 31 23 33 – Excavation, Trenching and Backfilling

1.3 Reference standards

.1 American Society for Testing of Materials (ASTM):

.1 ASTM C836/C836M, Standard Specification for High Solids Content, Cold Liquid Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.

.2 ASTM D412, Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers – Tension

.3 ASTM D570, Standard Test Method for Water Absorption of Plastics

.4 ASTM D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting

.5 ASTM D903, Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

.6 ASTM D1227, Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing

.7 ASTM D1876, Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)

.8 ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

.9 ASTM D2243, Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings

.10 ASTM D3330, Standard Test Method for Peel Adhesion of Pressure Sensitive Tape

.11 ASTM D5385, Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes

.12 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials

.13 ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials

.14 ASTM E154, Standard Test Methods for Water Vapour Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 37.2, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing, and for Roof Coatings

1.4 Administrative requirements

.1 Coordination: Coordinate the Work of this Section with the installation of exterior substrate; Sequence work so that installation of fluid applied waterproofing membrane coincides with installation of substrate preparation without causing delay to the Work.

.2 Pre-Construction Conference: Arrange a site meeting attended by the Contractor, the Subcontractor, the Consultant, materials supplier(s), and

other relevant personal before commencement of work for this Section; as indicated in Section 01 31 19 – Project Meetings.

.1 Review methods and procedures related to installation, including manufacturer's written instructions;

.2 Examine substrate conditions for compliance with manufacturers installation requirements;

.3 Review temporary protection measures required during and after installation.

1.5 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit manufacturer’s data sheets covering the care and recommended maintenance procedures for incorporation into maintenance manuals.

.2 Certifications:

.1 Submit copies of manufacturers’ current ISO 9001 certification. Fluid applied waterproofing membrane, adhesives and associated auxiliary materials shall be included.

.3 Submit references clearly indicating that the fluid applied waterproofing membrane manufacturer has successfully completed projects on an annual basis of similar scope and nature for a minimum of fifteen (15) years. Submit references for a minimum of ten (10) projects.

.4 Submit manufacturers' complete set of standard details for the fluid applied waterproofing membrane showing a continuous plane of water tightness below grade.

.5 Provide material checklist complete with application rates and minimum thickness of adhesives and primers.

1.6 Quality assurance

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Submit in writing, a document stating that the applicator of the fluid applied waterproofing membrane specified in this section is recognized by the manufacturer as suitable for the execution of the Work.

.2 Perform Work in accordance with the manufacturer's written instructions of the fluid applied waterproofing membrane and this specification.

.3 Maintain one copy of manufacturer's written instructions on site.

.4 At the beginning of the Work and at all times during the execution of the Work, allow access to Work site by the fluid applied waterproofing membrane manufacturers' representative.

.5 Components used in this section shall be sourced from one manufacturer; including fluid applied waterproofing membrane, sealants, primers, mastics and adhesives.

1.7 Mock-ups

.1 Mock-ups: Construct mock-ups to verify selections made under submittals and to set quality standards for materials and execution in accordance with Section 01 45 00 – Quality Control for mock-ups and as follows:

.1 Where directed by Consultant, construct typical assembly, 2,134 mm x 2,134 mm (8 ft. x 8 ft.), incorporating substrate materials, fluid applied waterproofing membrane and adjacent materials including flashing, protection course, insulation, and drainage boards; showing fluid applied waterproofing membrane application details.

.2 Notify Consultant a minimum seven (7) days prior to mock-up construction.

.3 Review and acceptance of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Consultant specifically notes such deviations in writing.

.4 Once reviewed by Consultant, acceptable mock-up can form a permanent part of the Work, and will form the basis for acceptance for the remainder of the project.

.5 Remove and replace materials found not acceptable, at no additional cost to Owner.

1.8 Delivery, storage and handling

.1 Delivery: At the time of delivery, visually inspect all materials for damage. Note any damaged to materials on the receiving ticket and immediately report to the shipping company and the material manufacturer.

.1 Remove damaged materials from the site immediately.

.2 Storage:

.1 Store materials as recommended by manufacturer and conforming to applicable safety regulatory agencies. Refer to all applicable data including but not limited to MSDS sheets, Product Data sheets, product labels, and specific instructions for personal protection.

.2 Store materials off the ground and cover with a weather proof flame resistant sheeting or tarpaulin.

.3 Store role materials on end in original packaging.

.4 Store fluid applied waterproofing in closed containers outdoors.

.5 Store adhesives and primers at temperatures of 5 °C (41 °F) and above to facilitate handling.

.6 Keep solvent away from open flame or excessive heat.

.7 Protect rolls from direct sunlight until ready for use.

.3 Handling: Material shall be handled in accordance with sound material handling practices and in accordance with manufacturer's written instructions.

1.9 Coordination

.1 Ensure continuity of the water seal throughout the scope of this section.

.2 Ambient Conditions:

.1 Install materials outlined in this Section after completion of work by other Sections is complete; to provide adequate dry, clean, level, and plumb surfaces for installation and adhesion.

.2 Apply when ambient air and substrate temperatures are above temperature range indicated by fluid applied waterproofing membrane manufacturer, during time of install, and for a minimum of forty eight (48) hours after installation, unless otherwise indicated.

.3 Ensure surfaces are sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants.

.4 Ensure surfaces are dry prior to and a minimum of sixteen (16) hours after time of install.

.5 Do not permit traffic of any kind over unprotected waterproof membranes. Apply protection course as soon as possible in accordance with manufacturers written instructions.

1.10 Warranty

.1 Contractor Warranty: Warrant that the fluid applied waterproofing membrane and membrane flashings will stay in place and remain leak proof for the extent of the Contract Warranty.

.2 Manufacturer's Warranty: Fluid applied waterproofing membrane manufacturer must warranty the membrane and membrane flashings for leak coverage as a result of faulty materials for a period of ten (10) years from the date of substantial completion.

2 Products

2.1 Manufacturers

.1 Components and auxiliary materials must be obtained as a single-source from the assembly manufacturer to ensure total system compatibility and integrity.

.2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Henry Company;

.2 W.R. Meadows;

.3 Carlisle Coatings and Waterproofing;

.4 Tremco Commercial Sealants and Waterproofing; or

.5 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Fluid Applied Waterproofing Membrane:

.1 Cold applied, elastomeric, one component asphalt emulsion waterproofing membrane, in compliance with CGSB 37.2, containing not less than 60 % solids, and having the following characteristics:

.1 Solids by Weight: Not less than 60 % Solids.

.2 Application Temperature: 5 °C (40 °F) minimum.

.3 Tensile Strength: 320 kPa (50 psi)

.4 Elongation (ASTM D412): 2000 %

.5 Maximum VOC: 10 g/L

.6 Water Vapour Permeance (ASTM E96): 10 ng/Pa.m2.s., (0.2 perms)

.7 Hydrostatic Pressure Resistance: Passes 45 psi or 104 ft. at 65 mils

.8 Basis of Design Materials:

.1 Henry Company, Aqua-Bloc 720-38;

.2 W.R. Meadows, Hydralastic 836 Waterproofing Membrane;

.3 Carlisle, MiraSEAL Fluid-Applied Waterproofing Membrane;

.4 Tremco, TREMproof 250GC; or

.5 Approved alternate.

.2 Fabric Reinforcement: Manufacturer’s standard open weave glass fabric consisting of glass fibre yarn saturated with synthetic resins.

.3 Sheet Flashing: Nominal 1.6 mm (1/16 in.), manufacturer’s standard non-staining premanufactured elastomeric membrane and adhesive.

.4 Reinforcing Strip: Manufacturer's recommended fibreglass mesh or polyester fabric.

.5 Termination and joint Sealant: Polymer modified sealing compound, compatible with waterproofing; and as recommended by manufacturer for substrate and joint conditions.

.6 Drainage Board: 6 mm (¼ in.) thick, dimpled designed, premoulded, high impact polystyrene core board with needle punched, non-woven, filter fabric adhered to core face and film adhered to core back.

.1 Drainage Board Adhesive: As recommended by the membrane manufacturer.

.7 Protection Board: 6 mm (¼ in.) thick semi-flexible type protection board, consisting of a core of blended asphalt and mineral fillers, laminated between faces of asphalt saturated felts, conforming to DSM 9.90.60.

.1 Protection Board Adhesive: As recommended by membrane protection board manufacturer.

.8 Auxiliary Materials:

.1 Securement Bars (By Others): Continuous aluminum, stainless steel or galvanized metal, 3 mm x 25 mm x 25 mm (⅛ in. x 1 in. x 1 in.) in size and shall be pre-drilled for non-corrosive screw attachment on a maximum of 200 mm (8 in.) centers.

.2 Below Grade Insulation: As specified in Section 07 21 00 – Thermal Insulation.

3 Execution

3.1 Examination

.1 Verification of Conditions:

.1 Examine substrates to receive work and surrounding adjacent surfaces for conditions affecting installation.

.2 Strike masonry joints flush. Concrete surfaces shall be smooth and without large voids, honeycombing, spalled areas or sharp protrusions.

.3 Notify Consultant in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.

.2 Notify Contractor in writing of any conditions that are not acceptable.

.3 The installing contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this section in accordance with published literature. Commencement of Work or any parts thereof shall mean installers acceptance of the substrate.

3.2 Preparation

.1 All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants.

.2 Provide adequate protection of materials and work of this section from damage by weather, backfilling operations and other causes.

.3 Protect adjacent surfaces and Work of other trades from damage resulting from Work of this section. Make good such damage at no additional cost to the Owner.

.1 Provide sound handling and installation procedures to prevent and protect against spillage and overspray of materials specified in this Section.

3.3 Installation

.1 Non-Moving Substrate Crack Treatment and Corner Treatment:

.1 Penetrations and Projections:

.1 Coat penetrations, such as brackets, clips, braces, etc. that are set into the concrete with a 2.3 mm (90 mil) coating of fluid applied waterproofing membrane to height of wearing course and around projections to ensure a complete seal prior to coating the entire area.

.2 Flash penetrations subject to movement with fabric reinforcement set into a minimum thickness of 2.3 mm (90 mil) coating of fluid applied waterproofing membrane to required height on wall and at least 100 mm (4 in.) on slab. Embed fabric reinforcement into wet coating of fluid applied waterproofing membrane.

.2 Crack and Gap Treatment:

.1 Gaps up to 3 mm (⅛ in.) wide: Apply a coat of fluid applied waterproofing membrane at a minimum thickness of 1.5 mm (60 mil) and reinforce with fabric reinforcement. Embed 150 mm (6 in.) wide fabric reinforcement into wet coating of fluid applied waterproofing membrane.

.2 Gaps between 3 mm (⅛ in.) and 12 mm (½ in.) wide: Apply sheet applied flashing membrane onto primed substrate. Roll sheet applied flashing membrane to ensure full contact with substrate. Overlap end joint of sheet applied flashing membrane a minimum 75 mm (3 in.).

.3 Deck to Vertical Junctures:

.1 At monolithic deck to vertical junctures, apply fluid applied waterproofing membrane at a minimum thickness of 2.3 mm (90 mil) to required height on wall and a minimum 100 mm (4 in.) on slab. Embed fabric reinforcement into wet liquid applied waterproofing membrane.

.2 At non-monolithic deck to vertical junctures, apply flashing membrane to required height on wall and a minimum 100 mm (4 in.) on slab, set into wet liquid applied waterproofing membrane.

.2 Fluid Applied Waterproofing Membrane – Single Coat Application:

.1 Apply a full and continuous coat of liquid applied waterproofing membrane, at a rate of 2.0 l/m^2 (5 gal. U.S./100 ft.^{2}) to provide a

minimum wet thickness of 2.3 mm (90 mils) ensuring no pinholes or blisters. Allow liquid applied waterproofing membrane to fully cure prior to subsequent application coatings.

.2 Apply second coat of liquid applied waterproofing membrane if pinholes or blisters persist when curing.

.3 Protection Board Installation:

.1 Install protection board over the fluid applied waterproofing membrane to prevent damage from backfilling.

.2 Apply protection board adhesive in 13 mm (½ in.) wide strips spaced at 457 mm (18 in) o/c to fluid applied waterproofing membrane.

.3 Immediately embed protection board and press into adhesive to ensure full contact.

.4 Backfill once protection board adhesive has fully cured.

.4 Drainage Board Installation:

.1 Attach drainage board to surface using adhesive. Permanent fixing is achieved once backfilling operation is complete.

.2 Vertical Application: Place drainage board with fabric side outwards.

.1 Start at the top or bottom of the wall. Drain board may be applied horizontally or vertically.

.2 When installed horizontally, position edge of core with flange at the top. When installed vertically, align edge with flange at the upstream edge.

.3 Bottom panel should be placed behind the discharge pipe.

.3 Overlaps: Pull back loose fabric to expose core. Position core of second panel over the overlap flange of first level.

.1 Overlap in direction of water flow and adhere the overlapped fabric with adhesive to prevent soils and/or concrete from entering core.

.4 Corners: Bend drainage board for inside corners. Cut drainage board to reach corner, providing 100 mm (4 in.) of extra fabric to wrap around corner. Overlap fabric at joint.

.5 Insulation Installation:

.1 Co-ordinate with Section 07 21 00 – Thermal Insulation for insulating materials.

.2 Adhesive (Optional):

.1 Apply the insulation adhesive in a serpentine pattern to fluid applied waterproofing membrane.

.2 Immediately embed insulation into the adhesive and press firmly into place to ensure full contact. Apply additional adhesive if allowed to skin over.

.3 Fully butter all joints of insulation panels with adhesive during installation, except at expansion joints.

.4 Stagger the end joints of the insulation.

.5 Cut the insulation to fit closely to all protrusions and obstructions.

.3 Insulation Clips:

.1 Mechanically fasten insulation clips to the fluid applied waterproofing membrane with adhesive recommended by insulation clip manufacturer.

.2 Apply number of insulation clips as recommended by insulation manufacturer, in locations indicated in their written documentation.

3.4 Field quality control

.1 Final Observation and Verification:

.1 Final inspection of fluid applied waterproofing membrane shall be carried out by the Owner’s representative, and the contractor.

.2 Contact Manufacturer for warranty issuance requirements.

.2 Fluid applied waterproofing membrane is not designed for permanent UV exposure. Apply protection as soon as possible after installation of fluid applied waterproofing membrane. Refer to manufacturer published literature for product limitations.

3.5 Cleaning and protection

.1 Progress Cleaning: Leave work area clean at the end of each work day, ensuring safe movement of passing pedestrians.

.2 Waste Management: Co-ordinate recycling of waste materials and packaging at appropriate facility, diverting waste from landfill. Certified installer shall be responsible for ensuring waste management efforts are practiced.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation of the following:

.1 Board insulation including:

.1 Foundation and Underslab Insulation Board

.2 Concrete Faced Perimeter Insulation Board

.3 Mineral Wool Cavity Wall Insulation Board

.4 Mineral Wool Insulation for Curtain Wall

.2 Batt Insulation including:

.1 Thermal Batt insulation installed in metal stud cavity in exterior wall assemblies.

1.2 Related requirements

.1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 Reference standards

.1 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering

.2 American Society for Testing and Materials (ASTM):

.1 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics

.2 ASTM D2842-06, Standard Test Method for Water Absorption of Rigid Cellular Plastics

.3 Canadian General Standards Board (CGSB):

.1 CGSB 71-GP-24M, Adhesive, Flexible for Bonding Cellular Polystyrene Insulation

.2 CAN/CGSB-37.5, Cutback Asphalt Plastic Cement

.4 Canadian Standards Association (CSA):

.1 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Product Data: Provide product description, insulation properties, and preparation requirements.

1.5 Delivery, storage and handling

.1 Store insulation materials in dry areas, protected from wetting, sunlight and traffic. Store insulation board flat, on a flat surface, and to prevent edge damage and placing of materials on top of stored boards.

.2 Ensure that insulation board and adhesives are stored at a minimum temperature of 4 °C for twelve (12) hours before installation, and that freezable adhesives are stored only at temperatures above 0 °C at all times.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements

2.2 Materials

.1 Foundation and Under slab Insulation Board:

.1 Vertical Applications:

.1 Extruded expanded polystyrene meeting CAN/ULC S701, Type 4, minimum RSI value of 0.88 per 25 mm thickness (R

value of 5 per inch). Minimum compressive strength of 206 kPa.

.1 Styrofoam brand SM, by Dow Chemical Canada Inc.;

.2 Foamular C-300, by Owens-Corning Canada LP; or

.3 Approved alternate.

.2 Horizontal Applications:

.1 Extruded polystyrene meeting CAN/ULC S701, Type 4, minimum RSI value of 0.88 per 25 mm thickness (R value of 5 per inch). Minimum compressive strength of 275 kPa.

.1 Foamular 400 by Owens-Corning Canada Inc.;

.2 Styrofoam HIGHLOAD 40 by DOW Chemical Canada Inc.; or

.3 Approved alternate.

.2 Concrete Faced Perimeter Insulation Board:

.1 Construction:

.1 Perimeter Foundation Insulation: Extruded polystyrene board to ASTM C578 (CAN/ULC-S701) Type IV, rigid, closed cell, with integral high density skin, complete with integral 8mm (5/16 in.) thick latex-modified concrete facing.

.2 Board Size: 610 mm x 1220 mm x 59 mm (24 in. x 48 in. x 2-5/16 in.).

.3 Edges: Tongue and groove sides, square edge ends.

.4 Thermal Resistance (ASTM C 518): Long term aged R-value of 5/1 in. (0.03 sm K/W / 1mm).

.5 Foam Compressive Strength: ASTM D1621, minimum: 35 psi (240 kPa).

.6 Compressive Strength Total: ASTM D1621, minimum 40 psi (275.6 kPa).

.7 Water Absorption (ASTM D2842): <0.1 (0.7 % by volume maximum).

.8 Water Vapor Permeance (ASTM E96): 0.8 (50 ng/Pas m).

.2 Products:

.1 WallGUARD Concrete Faced Insulated Perimeter Wall Panels by T. Clear Corp.;

.2 Concrete Faced Insulation Wall Panels (CFI) by Tech-Crete Processors Ltd.; or

.3 Approved alternate.

.3 Semi-Rigid Insulation: Mineral Wool Board Insulation for exterior wall cavity behind cladding, CAN/ULC-S702 Type 1 or ASTM C612 Type IVB, mineral rock or slag fibre semi-rigid board, conforming to the following:

.1 Board Density: 65 kg/m^3.

.2 Water Vapour Permeance: 1555 ng/Pa s.sq. m.

.3 Minimum Thermal Resistance: RSI of 0.75 per 25.4 mm thickness.

.4 Board Size: 600 x length to suit space.

.5 Board Thickness: As indicated.

.6 Facing:

.1 Unfaced unless otherwise noted.

.2 Where Black facer is indicated, provide “32# Manniglas - 1882 Black” factory applied facer by Lydall or approved alternate.

.7 Board Edges: Square.

.8 Flame/Smoke Properties: 0 / 0, in accordance with CAN/ULC-S102.

.9 Acceptable Products:

.1 ‘CavityRock’ manufactured by Rockwool;

.2 ‘Rainbarrier 45’ manufactured by Thermafiber; or

.3 Approved alternate.

.4 Semi-Rigid Insulation: Mineral Wool Board Insulation for Curtain Wall spandrel panels, CAN/ULC-S702 Type 1 or ASTM C612 Type IVB, mineral rock or slag fibre semi-rigid board, conforming to the following:

.1 Board Density: 56 kg/m^3.

.2 Water Vapour Permeance: 1.807 ng/Pa s.sq. m.

.3 Minimum Thermal Resistance: RSI of 0.74.

.4 Board Size: 600 x length to suit space.

.5 Board Thickness: As indicated.

.6 Facing: Unfaced.

.7 Board Edges: Square.

.8 Flame/Smoke Properties: 0 / 0, in accordance with CAN/ULC-S102.

.9 Acceptable Products:

.1 ‘Curtain Rock’ manufactured by Rockwool;

.2 ‘MinWool Curtainwall’ by Johns Manville;

.3 ‘Versaboard’ manufactured by Thermafiber; or

.4 Approved alternate.

.5 Ridged Insulation Board:

.1 Polystyrene, extruded type, in accordance with CAN/ULC S701, Type 3, thermal resistance not less than RSI 0.87/1”; square edges, board size 406 mm x 2.4 m (16 in. x 8 ft.) x thickness required to achieve insulation value indicated on Drawings; minimum compressive strength 170 kPa at 10 % deformation in accordance with ASTM D1621-10, water absorption (% by volume) maximum 0.7 % in conformation with ASTM D2842-06:

.1 Product:

.1 Dow Styrofoam CavityMate;

.2 Owens-Corning Foamular CW25; or

.3 Approved alternate.

.6 Thermal Batt Insulation: Unfaced glass fiber thermal insulation, CAN/ULC-S702 Type 1, preformed glass fibre, in batt form; friction fit conforming to the following:

.1 Thermal Resistance:

.1 2.12 RSI for 89 mm cavity, or

.2 3.52 RSI per 152 mm cavity

.2 Acceptable Products and Manufacturer:

.1 ‘Comfortbatt’ by Rockwool;

.2 ‘EcoTouch PINK Fiberglas Thermal Batt Insulation’, by Owens Corning Canada LP;

.3 ‘Ultrabatt’ by Thermafiber;

.4 ‘TempControl™ Batts’ by Johns Manville; or

.5 Approved alternate.

2.3 Accessories

.1 Insulation Fasteners:

.1 Mechanical Fasteners: High quality, impact resistant plastic fastener system specifically designed for installation of board insulation materials; 38 mm (1½ in.) diameter, shaft length to suit insulation thickness and hot dipped galvanized fastener to suit substrate.

.2 Insulation Clips: Impale type, perforated 50 mm x 50 mm (2 in. x 2 in.) cold rolled carbon steel 1 mm (1/32 in.) core metal thickness, adhesive back; 1.6 mm (1/16 in.) diameter annealed steel wire spindle, length to suit insulation, 25 mm (1 in.) diameter self locking washers.

.3 Insulation Mechanical Fasteners: soft washer and pin type; direct fasten type; polyethylene washer, corrosion resistant fastener, pin length to suit insulation thickness.

.1 Acceptable Product:

.1 ITW Ramset ‘Insulfast’ Fastener; or

.2 Approved alternate.

.4 Perimeter Insulation Fasteners: Concrete faced insulation manufacturer’s standard concealed fasteners with groove mounting plate and fastening spline.

.2 Adhesive:

.1 Trowelable Polystyrene Insulation Adhesive: Trowel consistency, synthetic rubber based insulation adhesive compatible with polystyrene insulation in accordance with CGSB 71-GP-24M; suitable for application to temperature of -10 °C or lower, as approved by insulation board supplier.

.3 Felt Slip Sheet: No. 15 asphalt saturated, organic, unperforated felt conforming to CSA A123.3-05 (R2010).

.4 Slip Sheet Mastic: Cut back asphalt plastic cement conforming to CAN/CGSB-37.5.

.5 Protection Board: Pre-moulded, semi-rigid asphalt/fibre composition board, minimum (¼ in.) 6 mm thick, formed under heat and pressure as recommended by board insulation manufacturer for below grade installations.

3 Execution

3.1 Examination

.1 Before commencing work, ensure that all surfaces to which perimeter insulation board is applied are clean, reasonably smooth with no abrupt changes in plane, free of grease, and with protruding fins of mortar or concrete removed, and that the surfaces are otherwise acceptable for insulation application as specified.

3.2 Preparation

.1 Clean substrates of substances harmful to insulations; remove projections that interfere with insulation attachment.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 Installation

.1 Install insulation and accessories in accordance with manufacturer's written instructions applicable to products and application indicated and as follows:

.1 Use insulation that is undamaged, dry, and unsoiled.

.2 Maintain continuous thermal insulation, vapour barrier and air tightness for building spaces and elements, and as follows:

.1 Saw cut and trim insulation neatly to fit spaces; fill voids with foamed-in-place insulation compatible with installed insulation.

.2 Butt edges and ends tight

.3 Fit insulation tight against mechanical, electrical and other items protruding through the plane of insulation

.4 Use insulation free of broken or chipped edges

.5 Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise specifically shown or required to make up total thickness

.6 Fit insulation firmly against substrate using mechanical fasteners spaced in accordance with manufacturers recommended spacing and pattern; in addition, adhere insulation to uneven substrate surfaces and provide additional fasteners to eliminate air spaces between insulation and substrate

.7 Mechanically fasten insulation boards 50 mm (2 in.) in from edges at 305 mm (12 in.) centers

.2 Leave insulation joints unbonded over line of expansion and control joints; bond a continuous 150 mm (6 in.) wide strip of primary vapour membrane over expansion and control joints using compatible adhesive

.3 Protect insulation from damage until it is covered; replace any broken, sunburned, crushed or dented insulation immediately prior to covering; coordinate with back-filling operations

.4 Board Insulation: Install board insulation to vertical surfaces with adhesive applied in accordance with manufacturer's written instructions, and as follows:

.1 Exterior Application: Extend boards as indicated on Drawings to top of footing, installed on exterior face of perimeter foundation wall.

.2 Apply adhesive to the substrate by the "dab" method not less than 9.5 mm x 19 m (⅜ in. x ¾ in.) size at 150 mm (6 in.) centers; bed the insulation in the adhesive before the adhesive loses its tack or skins over.

.3 Protect below grade insulation on vertical surfaces from damage during backfilling by applying protection board; set in adhesive according to insulation manufacturer's written instructions.

.5 Concrete Faced Insulation:

.1 Layout concrete-faced insulation boards to maximize board sizes. Do not use boards less than 152 mm (6 in.) wide.

.2 Install concrete faced insulation board system in orientation as indicated or to maximize full sheets. Complete with fastening clips

and cap flashing in accordance with manufacturer's installation guidelines.

.6 Foundation and Under Slab Insulation: Extend boards as indicated on Drawings, and as follows:

.1 Lay boards on level compacted fill.

.2 Insulate structural slabs at entrances with insulation placed horizontally underneath the concrete, and insulate surrounding slabs on grade in the same way for a distance of 1 m (4 ft.) in every direction from the perimeter of the structural slab; omit perimeter insulation on adjacent foundations for the width of the structural slab.

.7 Cavity Wall Insulation: Fit courses of insulation between wall ties and other confining obstructions in cavity; butt edges tightly in vertical and horizontal directions and as follows:

.1 Install cavity insulation with a tight fit to substrate materials, provide adhesive and additional fasteners where uneven substrates cause air spaces behind insulation; apply adhesive to substrate in a continuous film not less than 3 mm (⅛ in.) thick when wet and bed the insulation into adhesive before adhesive loses its tack or skins-over.

.2 Apply insulation fasteners using a minimum of six (6) fasteners in two (2) rows located near the centre of the board along the narrow dimension and near the third points along the long dimension; secure boards with two clips at the centre where both dimensions are less than 610 mm (24 in.).

.3 Coordinate application of cavity wall insulation with installation of masonry ties and anchors specified in Section 04 21 13 – Brick Veneer Masonry.

.4 Apply sheet membrane vapour retarder behind Z-bars prior to installation of insulation between Z-bars supporting preformed metal cladding.

.5 Install insulation clips to walls before sheet membrane air barriers are applied.

.8 Semi-Rigid Insulation: Mineral Wool Board Insulation for Curtain Wall spandrel panels

.1 Install curtain wall in accordance with curtain wall system manufacture recommendations, and as indicated in Section 08 44 13 – Glazed Aluminum Curtain Wall.

3.4 Batt insulation

.1 Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

.2 Metal Framing: Place membrane air barrier on warm side of insulation; lap and seal sheet air barrier joints over member face.

.3 Tape seal tears or cuts in membrane air barrier.

3.5 Protection

.1 Protect installed board insulation from damage due to harmful weather exposures, physical abuse, and other causes.

.2 Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

End of section

1 General

1.1 Section includes

.1 This section includes requirements for supply and installation of under-slab vapour retarder required for the following:

.1 Continuous under-slab vapour retarder below slab on grade with finish floor material.

1.2 Related requirements

.1 Section 31 23 33 – Excavation, Trenching and Backfilling

1.3 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Action Submittals:

.1 Product Data: Provide product description, and preparation requirements.

.2 Certificates: Manufacturer's certificates attesting that products meet specification requirements.

.4 Informational Submittals:

.1 Installation Data: Manufacturer's special installation requirements, including preparation and installation requirements, techniques.

1.4 Quality assurance

.1 Contractor executing work of this Section shall employ installers having a minimum of five (5) years continuous Canadian experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 The below-grade vapour retarder shall be inspected by the Consultant prior to concrete work.

1.5 Storage, delivery, handling and protection

.1 Deliver materials on manufacturer's original skids, or in original unopened protective packing.

.2 Protect materials during transportation, storage and installation to avoid physical damage.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements

2.2 Materials

.1 Below slab sheet vapour retarder membrane: Manufactured from virgin resins, meeting the following performance requirements of ASTM E1745:

.1 Strength: ASTM E1745 Class A.

.2 Min Thickness: 0.38 mm (15 mils).

.3 Water vapour permeance: ASTM E 1745 Less than 0.01 Perms.

.2 Manufacturers: Subject to conformance with the requirements of this Section provide:

.1 ‘Perminator 15 mil’ by W. R. Meadows Inc.; or

.2 ‘Stego Wrap 15 mil Class A’ by Stego Industries LLC; or

.3 Approved alternate.

.3 Accessories:

.1 Polysulfide Sealant: Single component, chemical curing, capable of continuous water immersion, non-sagging type, as recommended by sheet vapour retarder manufacturer for use indicated.

.2 Seam Tape: Polyethylene self-adhering type, mesh reinforced, 50 mm, compatible with sheet material.

.3 Vapour-proofing Mastic: Mastic provided by vapour retarder manufacturer.

3 Execution

3.1 Inspection

.1 Check graded subgrade for conformity with elevations and cross-sections before placing material.

.2 Check for unstable areas and areas requiring additional compaction.

.3 Notify Consultant of unsatisfactory surfaces and conditions.

.4 Do not begin installation of material until deficiencies have been corrected.

3.2 Installation

.1 Install materials in accordance with manufacturer's instructions.

.2 Place, protect, and repair sheet vapour retarder according to ASTM D1709, ASTM E96, ASTM E154, ASTM E1643, ASTM E1745 and ASTM F1249 and manufacturer's written instructions.

.3 Install membrane over granular base to entire areas of subgrade as indicated.

.4 Lap joints 150 mm and seal with manufacturer's recommended tape or sealant; provide complete and continuous seal.

.5 Seal punctures in membrane before placing succeeding materials. Use patching material at least 150 mm larger than puncture and seal using tape or sealant.

.6 Apply sealants and tapes within recommended application temperature ranges and according to manufacturer’s written instructions.

3.3 Protection

.1 Take extreme care during trenching operations, installation of materials and backfilling not to damage or displace materials or other utilities.

End of section

1 General

1.1 Section includes

.1 Air leakage criteria for primary air seal building enclosure materials and assemblies.

.2 Air Vapour Barrier (AVB) materials and installation methods supplementing primary air seal materials and assemblies.

.3 Air seal materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.

.4 Through wall flashings.

1.2 Definitions

.1 Air Vapour Barrier Material: A primary element that provides a continuous barrier to the movement of air.

.2 Air Vapour Barrier Accessory: A transitional component of the Air Vapour Barrier that provides continuity.

.3 Air Vapour Barrier Assembly: The collection of Air Vapour Barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 Administrative requirements

.1 Coordinate work with installation of sheathing, cast-in-place concrete, unit masonry and other work having a direct bearing on work of this Section.

.2 Pre-installation Meetings: Convene two (2) weeks before starting work of this section.

.3 Sequencing:

.1 Sequence Work to permit installation of materials in conjunction with other retardant materials and seals, and air barrier assemblies.

.2 Do not install air barrier until items penetrating it are in place.

1.4 Performance requirements

.1 Air barrier membranes and flashings for this Project shall include characteristics and properties required by applicable codes for use as an air barrier.

.2 Provide continuity of air/vapour seal materials and assemblies in conjunction with materials described in related sections and other sections specifying exterior wall materials and assemblies.

.3 Provide full adhesion of air barrier membranes in accordance with performance values of membrane manufacturer’s tested assemblies.

1.5 Submittals for review

.1 Product Data: Provide product description, technical properties, and preparation requirements.

.2 Submit according to Section 01 33 00 – Submittal Procedures.

.3 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

1.6 Submittals for information

.1 Installation Data: Manufacturer's special installation requirements, including preparation and installation requirements, techniques.

2 Products

2.1 Materials – general

.1 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

.2 Source Limitations: Obtain primary air vapour barrier (AVB) materials and air vapour barrier accessories from single source from single manufacturer.

2.2 Air vapour barrier (AVB) – self adhesive sheet materials

.1 Self-Adhesive Modified (Rubberized Asphalt) Bitumen Sheet Membrane:

.1 Field membrane, transition membrane and flashings (through wall flashings)- Self-adhering membrane of rubberized-asphalt 0.8 mm integrally bonded to high density, cross-laminated polyethylene film 0.1 mm, formed into uniform flexible sheets of not less than 1 mm total thickness, interleaved with disposable silicone-coated release paper until installed. Use regular or low-temperature variety for temperature ranges specified by manufacturer. All related accessories such as primer, seam tape, mastic, fluid, and sealant shall be as recommended by, or provided by the same manufacturer as the air/vapour barrier material used.

.1 Thickness: 1.0 mm (40 mils).

.2 Air leakage: ASTM E283 - <0.01 L/s·m² @ 75 Pa.

.3 Water vapour permeance: ASTM E96 - 2.8 ng/Pa.m².s (0.05 perms).

.4 Low temperature flexibility: -30 °C.

.5 Elongation: ASTM D412 - modified -200 %.

.2 Manufacturer: Subject to conformance with the requirements of this Section, provide the following products by Henry Company Canada / Bakor, or approved alternate products named below:

.1 Self-Adhering Air/Vapour Barrier: 'Blueskin SA' and 'Blueskin LT' or approved alternate.

.2 Flashings: 'Blueskin TWF' or approved alternate.

.3 Other Acceptable Products:

.1 ‘Sopraseal Stick 1100T’ summer grade / winter grade by Soprema;

.2 ‘ExoAir 110/110LT’ by Tremco;

.3 ‘Air Shield/Air Shield LT’ by W.R. Meadows Inc.; or

.4 Approved alternate.

.2 Self-Adhesive Elastomeric Film Air Vapour Barrier Membrane:

.1 Self-adhered multilayer elastomeric film membrane with high tack acrylic adhesive.

.1 Thickness: 0.25 mm (10 mils).

.2 Air leakage: ASTM E283-91- <0.01 L/s·m² @ 75 Pa.

.3 Water vapour permeance: ASTM E96 - 8 ng/Pa.m².s (0.14 perms).

.4 Low temperature flexibility: ASTM D1970 -30 °C.

.5 Elongation: ASTM D882 – 700 %.

.2 Manufacturer:

.1 Self-Adhering Air/Vapour Barrier: 'Air and Vapour Barrier 3015 by 3M Canada ' or approved alternate.

.2 Flashings: '3015TWF by 3M Canada' or approved alternate.

.3 Accessories: Furnish auxiliary materials recommended by manufacturer for intended use and compatible with air vapour barrier (AVB) membrane.

.1 Flashing to counter flash metal flashings.

.2 AVB Transition Strip: Peel and stick membrane to transition between membranes.

.3 Primer: If required and as recommended by membrane manufacture for approved substrate, VOC compliant.

.4 Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes by membrane manufacturer.

.5 Termination bars and fasteners: Galvanized steel, Stainless steel and stainless fasteners.

2.3 Air vapour barrier (AVB) - liquid applied

.1 Seamless, non-permeable, single component fluid applied elastomeric membrane, low VOC, to provide air and vapour barrier on steel stud framing componentry:

.1 Thickness: 2.0 mm (80 mils).

.2 VOC Content: max. 100 g/L.

.3 Air leakage: ASTM E283, 0.000 L/s•m² @ 75 Pa.

.4 Vapour permeance: ASTM E96, 5 ng/Pa.m².s, (0.08 perms).

.5 Resistance to Mold, Mildew and Fungal Growth: ASTM D5590.

.6 Elongation: ASTM D412 - modifed, 800 %.

.2 Manufacturers: Subject to conformance with the requirements of this Section, provide the following products by Henry Company Canada / Bakor, or approved alternate products named below:

.1 Liquid-Applied AVB Membrane: 'Air-Bloc 32 MR' or approved alternate.

.2 Transition Strips: 'Blueskin SA' or approved alternate.

.3 Fabric Reinforcement: '990-60 Yellow Jacket Reinforcement' or approved alternate.

.4 Other Acceptable Products:

.1 'Sopraseal LM 200 S' by Soprema;

.2 'ExoAir 120' by Tremco;

.3 Air-Shield LM by W. R. Meadows; or

.4 Approved alternate.

.3 Accessories: Furnish auxiliary materials recommended by manufacturer for intended use and compatible with vapour barrier membrane:

.1 Auxiliary Membrane Materials: Provide transition membrane flashings, fabric reinforcement and associated primers and sealants as recommended by waterproofing manufacturer for application indicated.

.2 Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes by vapour barrier manufacturer.

2.4 Sheet metal flashing – backing

.1 Sheet Metal Flashing: ASTM A653M Steel Sheet, commercial quality galvanized to Z 275 designation. Sheet to be of the following minimum thicknesses:

.1 0.75 mm thick for up to 400 mm maximum unsupported span.

.2 0.90 mm thick for greater than 400 mm unsupported span.

.2 Stainless Steel Flashings (rigid flashings for SPF backing and all flashing in the Natatorium): ASTM A480, Type 304, soft temper; smooth finish.

.1 0.75 mm thick for up to 400 mm maximum unsupported span.

.2 0.90 mm thick for greater than 400 mm unsupported span.

.3 Accessories:

.1 Thinner and Cleaner for Butyl Sheet: As recommended by sheet material manufacturer.

.2 Tape: Bright aluminum self-adhering type, mesh reinforced, 50 mm wide, compatible with sheet material.

.3 Galvanized Steel Flat-Attachments: Minimum 1.5 mm thick x 35 mm wide strips of aluminum of galvanized sheet steel to ASTM A653/A653M - Steel Sheet, commercial quality galvanized to Z 275 designation with stainless steel fasteners and punched at 150 mm o.c.

.4 Power (pneumatic) Actuated Pins: Zinc coated .7.6 mm head ; 3.6 mm shank diameter concrete pin anchor system c/w plastic flute bushing to provide a min. 25 mm embedment. Carbide drill bits as supplied for fastener system by Manufacturer.

.5 Concrete (Masonry) Threaded Fasteners-Screws: Stainless Steel AISI Grade 410 coated self-tapping concrete anchor system for pre-drilled application. Min. 4.76 mm dia., length to suit and provide a min. 25 mm embedment. Carbide drill bits as supplied for fastener system by Manufacturer.

3 Execution

3.1 Examination

.1 Verify condition of substrate and adjacent materials.

.2 Ensure subgrade conforms to required elevations and is graded and compacted sufficiently to receive granular base.

3.2 Preparation

.1 Remove loose or foreign matter which might impair adhesion of materials. Ensure metal surfaces are free of sharp edges and burrs.

.2 Clean and prime substrate surfaces to receive sealants in accordance with manufacturer’s instructions.

.3 Prepare joints with reinforcement and liquid membrane or self-adhering sheets in accordance with manufacturer’s instructions.

3.3 Installation – sheet materials general

.1 Install materials in accordance with manufacturer's instructions.

.2 Apply air vapour barrier membrane complete and continuous to prepared and primed substrate in an overlapping shingle fashion and in accordance with manufacturer's recommendations and written instructions. Stagger vertical joints.

.3 Install air / vapour barrier sheets over solid substrate surfaces or as flashings to join air / vapour barrier materials of other sections or adjacent work, and maintain continuity of air/ vapour barrier seal of building envelope.

.4 Secure sheet seal with continuous galvanized steel flats with anchors. Caulk with sealant/mastic to ensure complete seal. Position lap seal over firm bearing. Provide sheet metal flashing for bearing.

.5 Lap sheet seal onto roof air/vapour barrier and seal with sealant. Position lap seal over firm bearing. Provide sheet metal flashing for bearing.

.6 Install sheet seal between window, curtain wall and door frames, and adjacent wall seal materials with sealant. Position lap seal over firm bearing. Provide sheet metal flashing for bearing.

.7 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

.8 Lap flashings with full contact on to surfaces as follows:

.1 Sheet laps: 75 mm.

.2 On to Walls or Columns: 100 mm.

.3 On to Roofs and Horizontal Surfaces: 150 mm.

3.4 Installation – self-adhesive sheet materials

.1 Install materials in accordance with manufacturer's instructions.

.2 If required, apply membrane primers for self-adhering membranes using equipment and application rates in accordance with manufacturer's instructions.

.1 Apply primer to poured concrete, metal and glass-faced wallboard substrates at rate recommended by manufacturer.

.2 Allow primer to dry prior to application of the membrane.

.3 Align and position self-adhered transition membrane, remove protective film and press firmly into place. Ensure minimum overlap at all end and side laps.

.4 Promptly roll all laps and membrane with a counter top roller to effect seal. Roll sheet flashings to substrates. Supplement with sealant as recommended by manufacturer.

3.5 Installation – spray membrane coating

.1 Install materials in accordance with manufacturer's instructions.

.2 Secure transition flashings; align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum overlap at all end and side laps. Supplement with sealant as recommended by manufacturer.

.1 Apply by spray or flat trowel a complete and continuous unbroken film of liquid air vapour barrier membrane at a wet film thickness of 3 mm. Overlap transition membranes a minimum of 50 mm. Spray apply around all projections ensuring a complete and continuous coating for the air seal.

.2 Ensure all projections including the backside of the sheathing, wall studs and accessories are properly covered and coated.

3.6 Manufacturer's site services

.1 Require site attendance of air/vapour barrier product manufacturers during installation of the Work. Schedule manufacturer’s review of work procedures at stages listed:

.1 Pre-installation Meeting: 1 review at Site and meeting with authorized Installers.

.2 Installation: three (3) reviews at Site: one (1) at commencement of Work; one (1) at 50 % completion of Work; one (1) upon completion of Work.

.2 Submit manufacturer’s written reports to Consultant describing:

.1 Date, time and location.

.2 The scope of work requested; procedures performed.

.3 Observed or detected non-compliances or inconsistencies with manufacturers' recommended instructions.

.4 Limitations or disclaimers regarding the procedures performed.

.5 Obtain reports within three (3) days of review and submit immediately to Consultant.

.3 Monitor and report installation procedures and unacceptable conditions.

.1 Inspect and review materials and workmanship including storage, handling and protection. Advise Consultant and Owner forty eight (48) hours in advance of inspections.

.2 Correct identified defects or irregularities.

.4 Remove and replace unacceptable installations.

3.7 Site quality control

.1 Owner will engage an independent testing agency to perform Building Envelope Field Performance Testing.

.1 Field testing will be performed to demonstrate that the installed work meets the performance requirements of these contract documents.

.2 Submit testing agency's written reports to Consultant.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation of factory formed, site assembled, non-structural, concealed fastener, architectural metal roofing system; including accessories required for weather tight installation; job site manufactured materials will not be acceptable for this project.

.2 Drawings indicate size, profiles, and dimensional requirements of metal roofing system and are based on the specific system indicated; do not modify intended aesthetic effects.

1.2 Related requirements

.1 Section 07 62 00 – Prefinished Metal Flashing and Trim

.2 Section 07 92 00 – Sealants

1.3 Reference standards

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM A755/A755M-11, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

.3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

.4 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board

.2 Canadian General Standards Board (CGSB):

.1 CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing

.3 Canadian Standards Association (CSA):

.1 CSA A123.3-05 (R2010), Asphalt or Tar Saturated Roofing Felt

.2 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members

.4 Canadian Sheet Steel Building Institute (CSSBI):

.1 CSSBI 20M-99, Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

.1 Architectural Sheet Metal Manual, 5th Edition, 1993

1.4 Administrative requirements

.1 Pre-Construction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings at project site with Contractor, Subcontractor and Consultant present before starting roof construction; purpose of meeting is to review methods and procedures related to roof construction and metal roofing system including; but not limited to, the following:

.1 Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

.2 Review methods and procedures related to metal roofing system installation, including manufacturer's written instructions.

.3 Examine deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.

.4 Review structural loading limitations of deck during and after roofing.

.5 Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roofing system.

.6 Review temporary protection requirements for metal roofing system during and after installation.

.7 Review roof observation and repair procedures after metal roofing system installation.

.8 Inspection agency will document proceedings, including corrective measures and actions required, and furnish copy of record to each meeting participant.

.2 Coordination:

.1 Coordinate metal roofing system with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leak proof, secure, and non-corrosive installation.

1.5 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data including; but not limited to, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roofing system and accessory.

.2 Shop Drawings: Submit shop drawings indicating fabrication and installation layouts of metal roofing system; details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details, identify between factory and site assembled work.

.3 Samples: Submit one (1) sample for each type of exposed finish required for Consultant’s verification of finishes, prepared in sizes as follows:

.4 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Coordination Drawings: Coordination drawings indicating locations of penetrations and roof mounted items.

1.6 Project closeout submissions

.1 Operation and Maintenance Data: Submit manufacturers written maintenance data for metal roofing system, include name of original installer and contact information for inclusion in maintenance manuals in accordance with Section 01 78 00 – Closeout Submittals.

1.7 Quality assurance

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Manufacturer: Obtain each type of metal roofing system through one source from a single manufacturer.

.2 Installer: Use only installers that are trained and qualified by factory formed roofing panel manufacturer, and who have experience in projects of similar complexity and scope.

1.8 Delivery, storage, and handling

.1 Delivery and Acceptance Requirements: Deliver components, metal roofing system, and other manufactured items to prevent damage or deformation; package metal roofing system for protection during transportation and handling.

.2 Storage and Handling Requirements: Unload, store, and erect metal roofing system in a manner to prevent bending, warping, twisting, and surface damage, and as follows:

.1 Protect metal roofing system to prevent wetting of materials, and as follows:

.1 Stack metal roofing system on platforms or pallets, covered with suitable weather tight and ventilated covering.

.2 Do not store metal roofing system in contact with other materials that might cause staining, denting, or other surface damage.

.2 Protect strippable protective covering on metal roofing system from exposure to sunlight and high humidity, except to extent necessary for period of metal roofing system installation.

.3 Protect foam plastic insulation from surface degradation, and as follows:

.1 Do not expose to sunlight, except to extent necessary for period of installation and concealment.

.2 Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.

.3 Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.9 Site conditions

.1 Site Measurements: Verify locations of roof framing and roof opening dimensions by site measurements before metal roofing system fabrication and indicate measurements on shop drawings.

.2 Established Dimensions: Establish framing and opening dimensions and proceed with fabricating metal roofing system without site measurements where site measurements cannot be made without delaying the Work, or allow for site trimming of panels; coordinate roof construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

.3 Ambient Conditions: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roofing system in accordance with manufacturers' written instructions and warranty requirements.

1.10 Warranty

.1 Provide manufacturer's standard form of warranty stating that manufacturer agrees to repair or replace components of metal roofing system that fail in materials or workmanship within specified warranty period; failures will be considered to include; but are not limited to, the following:

.1 Structural failures, including rupturing, cracking, or puncturing.

.2 Deterioration of metals, metal finishes, and other materials beyond normal weathering.

.3 Deterioration of finishes, peeling or cracking of coating, failure to adhere to bare metal, colour fading and chalking.

.2 Warranty Period:

.1 Finishes: Twenty (20) years from date of Substantial Performance.

.2 Weather Tightness: Five (5) years from date of Substantial Performance stating that manufacturer agrees to repair or replace metal roofing system failing to remain weather tight; including leaks, within specified warranty period.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Manufacturers

.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar setting systems may be incorporated into the work provided they meet the performance requirements established by the named products.

.2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Vicwest Steel Inc;

.2 Ideal Roofing;

.3 Agway Metals Inc.; or

.4 Approved alternate.

2.3 Performance requirements

.1 Design and construct roof so that completed installation will not leak.

.2 Structural Design Performance:

.1 Design Roof System to Resist:

.1 Maximum deflection not to exceed l/180 under system's own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:50 years.

.2 Design the systems so that there is no air or water infiltration under the positive and negative forces imposed by wind and gravity loads. Provide means of draining space between insulation and exterior skin, in accord with NRC Rain Screen Principles.

.2 Thermal movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, overstressing of components, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

.1 Temperature change (range): 20 °C, ambient; 40 °C, material surfaces.

2.4 Metal roofing system

.1 Panel Materials: Coated steel sheet with coil coating having galvanized finish using hot dip process and pre-coated using coil coating process in accordance with ASTM A755M, and as follows:

.1 Galvanized Steel Sheet: ASTM A653 structural quality Grade 230 or 340, having Z275 coating designation.

.2 Profile:

.1 Low sloped roof application, seamed joint at 610 mm (24 in.) complete with seams a minimum of 50 mm (2 in.) above the bottom of the ribbed profile.

.2 Basis of Design Material: Profile TSR System 1000 by Vicwest or approved alternate.

.3 Finish: Prefinished colour selected from manufacturer's standard range using Valspar WeatherX or Baycoat 10000 Series-Polyvinylidene Fluoride (PVDF) or approved alternate.

.2 Insulation:

.1 Rigid, mineral fibre insulation, with multiple layer of density with minimum density of 150 Kg/m^3 (9.36 lbs./ft.^{3}), thickness as indicated on drawings, and conforms to CAN/ULC-S702. R value of 4.3 per 25 mm tested to ASTM C518 at -4 °C (25 °F)

.1 'TOPROCK DD' by Rockwool Inc.; or

.2 Approved alternate.

.3 Clip and Fastening System:

.1 Sliding clip designed to accommodate expansion and contraction of the roof sheet. Made from galvanized material, thickness and length to suit design parameters.

.2 Provide thermal blocks between clips.

.4 Roof Fasteners:

.1 As specified by panel manufacturer to resist wind uplift and sliding snow forces.

.5 Gypsum roof sheathing; ASTM C1396; 16 mm thick unless otherwise indicated; primed finish with non-woven glass mats embedded in a water resistant treated gypsum core; minimum compression strength 500 psi.

.1 Product:

.1 ‘DensDeck Prime Roof Board’ manufactured by Georgia-Pacific Gypsum LLC;

.2 ‘Securock Gypsum Fiber Roof Board’ by CGC Inc.;

.3 ‘CertainTeed Glasroc Roof Board’ by CertainTeed; or

.4 Approved alternate.

.6 Waterproofing membrane/Ice and Water Shield Membrane:

.1 Minimum 40 mils thick, self-adhesive, reinforced, styrene butadiene styrene (SBS) modified asphalt protective membrane:

.1 ‘Blueskin ROOF RF 200’ Ice and water barrier, by Henry Company;

.2 ‘Lastobond Shield HT’ by Soprema; or

.3 Approved alternate.

.7 Flashing: As specified in Section 07 62 00 – Prefinished Metal Flashing and Trim.

.8 Sealants: In accordance with manufacturer's recommendation and Section 07 92 00 – Sealants.

2.5 Fabrication

.1 Fabricate and finish metal roofing system and accessories at the factory to greatest extent possible, using manufacturer's standard procedures and processes to obtain the indicated profiles and meeting dimensional and structural requirements for the Project.

2.6 Finishes, general

.1 Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

.2 Variations in appearance of abutting or adjacent pieces are acceptable if they are within ½ the range of reviewed samples:

.1 Noticeable variations in the same piece are not acceptable.

.2 Variations in appearance of other components are acceptable if they are within the range of reviewed samples and are assembled or installed to minimize contrast.

3 Execution

3.1 Examination

.1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roofing system supports, and other conditions affecting performance of work.

.2 Examine primary and secondary roof framing to verify that angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roofing system manufacturer.

.3 Examine roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roofing system manufacturer.

.4 Examine roughing-in for components and systems penetrating metal roofing system to verify actual locations of penetrations relative to seam locations of metal roofing system before metal roofing system installation.

.5 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

.1 Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

.2 Install auxiliary levelling substrate boards over metal deck; attach with mechanical fasteners into top flutes of steel to prevent wind uplift.

.3 Install flashings and other sheet metal in accordance with requirements specified in Section 07 62 00 – Prefinished Metal Flashing and Trim.

.4 Install eave angles, furring, and other miscellaneous roof system support members and anchorage in accordance with metal roofing system manufacturer's written recommendations.

3.3 Installation

.1 Ice And Water Shield:

.1 Install self adhering sheet ice and water shield, wrinkle free, on roof sheathing.

.2 Apply primer if required by manufacturer and install in accordance with temperature restrictions of ice and water shield manufacturer; use primer rather than nails for installing ice and water shield at low temperatures.

.3 Apply over entire roof in shingle fashion to shed water, with end laps of not less than 150 mm (6 in.) staggered 610 mm (24 in.) between courses and as follows:

.1 Overlap side edges not less than 89 mm (3½ in.).

.2 Roll laps with roller.

.3 Cover ice and water shield within fourteen (14) days.

.4 Install flashings to cover ice and water shield in accordance with requirements specified in Section 07 62 00 – Prefinished Metal Flashing and Trim.

.2 Thermal Insulation: Extend insulation in thickness indicated to cover entire roof in accordance with manufacturer's installation requirements.

.3 Metal Roofing System:

.1 Install metal roofing system in accordance with manufacturer's written instructions.

.2 Install exterior prefinished roof panels on panel support clips, using manufacturer's proper construction procedure. Ensure batten is positively locked for full length of roof. Close interlocking side joints by using a purpose-made seaming machine, as supplied by the manufacturer.

.3 Where indicated on approved shop drawings, secure the end-lap of metal roofing sheets in accordance with the manufacturer's specifications and details to provide a weather-tight seal. Exposed fasteners to match colour of the roof sheet.

.4 Provide notched and formed closures, sealed against weather penetration, at changes in pitch, and at ridges and eaves, where required.

.5 Use concealed fasteners when possible. Exposed fasteners to match colour of roof sheet.

.6 Lock all end joints and install gaskets, joint fillers, and sealants where required for weatherproof performance of metal roofing system; include types of gaskets, fillers, and sealants recommended by metal roofing system manufacturer.

.7 Use stainless steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

.8 Protect against galvanic action where dissimilar metals contact each other or corrosive substrates, by painting contact surfaces with bituminous coating, by applying rubberized asphalt ice and water shield to each contact surface, or by other permanent separation as recommended by metal roofing system manufacturer.

.9 Provide metal soffit panels full width of soffits and install panels perpendicular to support framing; flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

3.4 Accessory installation

.1 Install accessories with positive anchorage to building and weather tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

.2 Install components required for a complete metal roofing system assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

.3 Install flashing and trim in accordance with performance requirements, manufacturer's written installation instructions, and SMACNA recommendations; provide concealed fasteners where possible, and set units true to line and level; install work with laps, joints, and seams that will be permanently watertight and weather resistant.

.4 Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

.5 Provide for thermal expansion of exposed flashing and trim:

.1 Space movement joints at equally spaced intervals to a maximum of 3,050 mm (10 ft.) feet on centre with no joints allowed within 610 mm (24 in.) of corner or intersection.

.2 Form expansion joints of intermeshing hooked flanges, not less than 25 mm (1 in.) deep, filled with mastic sealant concealed within joints where lapped or bayonet type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof.

.6 Join gutter sections with riveted and soldered, or lapped and sealed joints:

.1 Attach gutters to eave with gutter hangers spaced not more than 1,220 mm (48 in.) on centre using manufacturer's standard fasteners.

.2 Provide end closures and seal watertight with sealant.

.3 Provide for thermal expansion.

.7 Join downspout sections with 38 mm (1½ in.) telescoping joints:

.1 Provide fasteners designed to hold downspouts securely 25 mm (1 in.) away from walls.

.2 Locate fasteners at top and bottom and at approximately 1,524 mm (5 ft.) on centre between top and bottom fasteners.

.3 Provide elbows at base of downspouts to direct water away from building.

.8 Install roof curbs at locations indicated on Drawings; install flashing around bases where they meet metal roofing system.

.9 Attach snow guards to metal roofing system with adhesive, sealant, or adhesive tape, as recommended by snow guard manufacturer; do not use fasteners that will penetrate metal roofing system.

.10 Form flashing around pipe penetration and metal roofing system; fasten and seal to metal roofing system as recommended by manufacturer.

3.5 Erection tolerances

.1 Shim and align metal roofing system units within installed tolerance of 6 mm (¼ in.) in 6 m (20 ft.) on slope and location lines as indicated and within 3 mm (⅛ in.) offset of adjoining faces and of alignment of matching profiles.

3.6 Site quality control

.1 Engage a factory authorized service representative to inspect completed metal roofing system installation, including accessories and to report results in writing to Owner and Consultant.

.2 Remove and replace applications of metal roofing system where inspections indicate that they do not comply with specified requirements.

.3 Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 Cleaning and protection

.1 Remove temporary protective coverings and strippable films, if any, as metal roofing system are installed, unless otherwise indicated in manufacturer's written installation instructions.

.2 Clean finished surfaces as recommended by metal roofing system manufacturer upon completion of metal roofing system installation; maintain in a clean condition during remainder of construction.

.1 Replace metal roofing system components that become damaged or have deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.

End of section

1 General

1.1 Section includes

.1 Aluminum plank panels.

.2 Thermally broken suspension system.

1.2 Related sections

.1 Section 07 21 00 – Thermal Insulation

.2 Section 07 27 00 – Membrane Air Barrier

1.3 Administrative requirements

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this section.

.2 Coordinate the Work for installation of air/vapour barrier seals, insulation and cladding attachment clips.

.3 Coordinate the Work with installation of windows, louvres, and components or materials.

1.4 System description

.1 Aluminum Plank Panels:

.1 Pre-finished aluminum extruded planks, supported by engineered carrier system, and thermally broken clips. Thermally broken clips and carrier system designed to minimize thermal bridging through cavity insulation, and ensure continuity of air/vapour barrier membrane. Engineer full system to be supported by substrate as indicated.

1.5 Performance requirements

.1 Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with Ontario Building Code and measured in accordance with ASTM E330.

.1 Panel anchorage system to be designed to provide removal of panels without disturbing adjacent panels and be totally concealed.

.2 Maximum Allowable Deflection of Panel: 1/180 of span.

.3 Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.

.1 Design soffit system secure and to accommodate expansion and contraction.

.2 System to accommodate differential slab deflection, inter-story drift, thermal movement and construction tolerances.

.4 Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

.5 Products: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials.

.6 Air/Vapour Barrier (AVB): Provide continuity of AVB at building enclosure elements in conjunction with vapour barriers specified in Section 07 27 00 – Membrane Air Barrier. Detailed airtight as the AVB at all penetrations and transitions.

.7 Not permitted: Oil canning, warping, or buckling of panel faces under full design loads.

1.6 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

.3 Shop Drawings:

.1 Indicate dimensions, panel profile and layout, spans, joints, construction details, methods of anchorage, method and sequence of installation.

.2 Indicate compliance with design requirements including analysis data signed and sealed by a professional structural engineer

licensed in the Province where the Project is located, and responsible for their preparation.

.3 Show plans, elevations, camber/bow/squareness tolerance, erection tolerance, drainage path from within the rainscreen cavity, wall membrane detailing and all interfaces to adjacent systems.

.4 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.5 Samples:

.1 Submit three samples of 400 mm long plank width as specified matching consultants supplied finish example.

.2 Modify finish and resubmit samples until final Consultant review and approval is obtained.

1.7 Submittals for information

.1 Qualification Data: For qualified fabricator and Installer.

.2 Installation Data: Specified trade association and manufacturer's special installation requirements.

.3 Manufacturer's Certificate: Certify that system meets or exceeds performance requirements and that products have been manufactured to ISO 9000 series requirements.

.4 Product Test Reports: Comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of metal soffit panel system.

.5 Professional Structural Engineer's Letters of Assurance:

.1 Provide letters or completed Owner-prescribed forms signed by the professional structural engineer used to perform inspections certifying that the formed metal wall panel system has been designed, fabricated and installed in accordance with the structural

performance requirements of this section and of the applicable codes, including verification that:

.1 Specified products have been used.

.2 Designs and installations as tested, have been installed on the Project.

.3 Loads and movement requirements have been achieved.

1.8 Quality assurance

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience by the manufacturer.

1.9 Mock-up

.1 Provide mock-ups as directed by Consultant in accordance with Section 01 33 00 – Submittal Procedures.

1.10 Delivery, storage, and protection

.1 Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

.2 Store prefinished material off ground protected from weather, to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

.3 Prevent contact with materials which may cause discolouration or staining.

.4 Materials shall not be exposed to wetting or damage.

.5 Remove and replace units that have become stained, watermarked, damaged or cracked.

1.11 Warranty

.1 Provide a fifteen (15) year warranty, starting from date of Substantial Performance, to include coverage for failure to meet specified requirements.

.2 Warranty: Include degradation of panel finish including colour fading caused by exposure to weather, water tightness, and integrity of seals.

2 Products

2.1 Materials – general

.1 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Aluminum plank panels

.1 Fabricated to ASTM B221/B221M. with bonded film finish is extruded aluminum with integrated venting system.

.2 Basis of Design: Model ‘101802’ 100 mm (4 in.) V Groove, Longboard Solid colour panels, with custom solid colour, fabricated by Mayne Coatings Corp., or approved alternate.

.3 Accessories: Prefinished aluminum: Provide with matching accessories and starter strips as required by listed basis of design manufacturer or approved alternate:

.1 Provide manufacturer’s recommended j-track, inside Corner, outside Corner, Starter Strip.

2.3 Thermally broken suspension system

.1 Engineered Thermal break clip: Pre-engineered thermally broken clip, for attachment of cladding and soffit system through insulation to supporting structure, and supporting additional framing, and soffit carrier system:

.1 ‘‘Enviro-Clip’ by Ontario Panelization;

.2 ‘ISO Clip’ by Northern Façade Ltd.;

.3 ‘T-Clip’ by Engineered Assemblies;

.4 ‘Cascadia Clip’ by Cascadia Windows and Doors; or

.5 Approved alternate.

.2 Carrier system: Formed and fabricated into a one directional pattern with carriers placed at o.c. spacing indicated in engineered shop drawings. Suspended building structure, and coordinated with work of Division 5 section engineered metal stud framing.

2.4 Accessory materials

.1 Panel End Caps: Formed, stamped, or milled end caps with matching finish

.2 Panel Splice: Formed aluminum insert designed to snap-fit between ends of two ceiling panels. Finish: To match panel.

.3 Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant; colour as selected.

.4 Sealants: In accordance with Section 07 92 00 – Sealants.

.5 Fasteners: Manufacturer's standard concealed type to suit application; with soft neoprene washers, stainless steel; fastener cap same colour as exposed panel. Exposed fasteners same finish as panel system.

.6 Isolation Coating: Bituminous paint, asphalt base.

.7 Anchors: stainless steel.

2.5 Finish

.1 To AAMA 2605 Performance Standard. Electrostatically applied fluromax powder coat finish system.

.1 Finish system: ‘Interpon D3000’ by Akzo Nobel, or approved alternate.

.2 Colour: Custom Colour to be later provided by Consultant.

2.6 Insulation

.1 Semi-ridged insulation: Mineral Wool Board Insulation for exterior wall cavity behind cladding.

.1 Refer to Section 07 21 00 – Thermal Insulation.

2.7 Components

.1 Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitred to required angles. Mitred internal corners to be back braced with pre-coated sheet stock to maintain continuity of profile.

.2 Expansion Joints: Same material, thickness and finish as exterior sheets type, of profile to suit system.

.3 Trim, Closure Pieces, Caps, Flashings, Fascia, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

.4 Anchors: Galvanized steel.

2.8 Fabrication

.1 Form sections true to shape, accurate in size, square, and free from distortion or defects.

.2 All panels to be formed to specified dimensions with tolerances to accommodate expansion and contraction between panels and structure.

.3 Form pieces in longest practicable lengths.

.4 Fabricate corners in one continuous piece.

.5 Fabricate flashings, trims and closures off site to be ready for install.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that building framing members are ready to receive panel system.

.3 Allow the Consultant to review the air/vapour barrier membrane prior to covering with insulation and soffit panel.

3.2 Installation – air vapour barrier

.1 Install a continuous membrane before support system components.

.2 Install in accordance with the requirements of Section 07 27 00 – Membrane Air Barrier.

3.3 Installation – support system

.1 Attach support system components at spacing’s required to achieve performance requirements.

.2 Install thermally isolated Supports clip over Air barrier membrane substrate in accordance with manufacture recommendations. Fasten through to building structure.

.3 Miscellaneous Framing: Install subgirts, base angles, sills, and other miscellaneous wall panel support members and anchorages according to metal wall panel manufacturer's instructions.

.4 Protect metal surfaces in contact with dissimilar metals, and cementitious materials with isolation coating.

3.4 Installation – insulation

.1 Refer to Section 07 21 00 – Thermal Insulation.

3.5 Installation – aluminum plank panels

.1 Install aluminum planks in accordance with manufacturer’s recommendations and reviewed engineered stamped shop drawings, and as follows.

.2 Install thermally broken clip system, from engineered sub-structure and as follows:

.1 Install thermally broken clips, in accordance with approved shop drawings.

.2 Install cavity insulation in accordance with Section 07 21 00 – Thermal Insulation thermally insulation, and between clips. Tightly fitted.

.3 Install supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications, and applicable codes and standards.

.4 Space suspension and carrier system as indicated on approved shop drawings.

.5 Adjust suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

.3 Install edge moldings and trim of type indicated at perimeter to conceal edges of metal pan. Method of edge trim attachment and design of edge trims to be as indicated in approved shop drawings.

.4 Do not use exposed fasteners, including pop rivets, on moldings and trim without prior written approval, or unless detailed otherwise.

.5 Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise indicated. Install directionally patterned or textured panels in directions indicated on approved shop drawings.

3.6 Erection tolerances

.1 Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1.6 mm.

.2 Maximum Variation from Plane: 3 mm in 3,000 mm, but not more than 6 mm in total plane.

3.7 Cleaning

.1 Clean installed work.

.2 Remove site cuttings from finish surfaces.

.3 Protect work from damage during construction. Make good damaged panels.

.4 Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for prefinished concealed fastener liner metal siding, complete with a system of girts, thermally broken clips, flashings and trims, using sheet metals and exposed fasteners, on the following installation applications:

.1 As an exterior wall cladding

.2 Provide specified system with labour, materials, and equipment required to fabricate and erect siding including cutting and penetrations, accessories, flashings, trims and closures necessary for a complete installation.

1.2 Related requirements

.1 Section 04 22 00 – Concrete Masonry Units

.2 Section 05 40 00 – Cold Formed Metal Framing

.3 Section 05 50 00 – Metal Fabrications

.4 Section 06 10 00 – Rough Carpentry

.5 Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane

.6 Section 07 62 00 – Prefinished Metal Flashing and Trim

.7 Section 07 92 00 – Sealants

.8 Section 09 21 16 – Gypsum Wallboard

1.3 Reference standards

.1 American Architectural Manufacturers Association (AAMA):

.1 AAMA 605.2, Voluntary Specification for High Performance Coatings on Architectural Panels and Extrusions.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-11, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process, Physical (Structural) Quality.

.2 ASTM A755/A755M-11, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

.3 Canadian Sheet Steel Building Institute (CSSBI):

.1 CSSBI 20M-08, Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications.

.2 CSSBI S8-08, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.

.4 Canadian Standards Association (CSA):

.1 CSA CAN/CSA S16-09, Design of Steel Structures

.2 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members

.5 Canadian General Standards Board (CGSB):

.1 CGSB 1.108-M89, Bituminous Solvent Type Paint

.6 The Society for Protective Coatings (SSPC)

.1 SSPC Guide 14 , Guide for the Repair of Imperfections in Galvanized, Organic, or Inorganic Zinc-Coated Steel Using Organic Zinc-Rich Coatings

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Submit manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

.4 Shop Drawings:

.1 Submit fully dimensioned shop drawings to Consultant showing construction, assembly, elevations, sections and interfacing with work of other Sections.

.2 No work of this Section shall be fabricated until shop drawings and all other related submittals, documentation, certifications and samples as required by this Section, have been reviewed by the Consultant.

.3 Details shall indicate metal thicknesses, areas to be sealed and sealant materials, gaskets, type of joints, flashings, trim, finishes, fasteners and welds, all anchorage assemblies and components and erection details.

.4 Shop drawings shall bear the seal of an engineer registered to practice in the place of Work, employed by the preformed metal siding manufacturer, and shall include complete design calculations for the system and documentation in regard to the reactions of the metal siding due to thermal expansion and contraction, positive and negative wind pressure and assurance that the thermal movement and wind forces have sufficient attachments, supports, bracing and anchorage.

.5 Thermal performance: Submit thermal analysis of complete wall assembly including thermally broken clip, and exterior cavity insulation ensuring effective R-value is achieved.

.5 Samples:

.1 Submit to the Consultant for approval, samples of materials and components to be used in the system, prior to fabrication of work together with name of manufacturer and technical literature. Submit 305 mm x 305 mm (12 in. x 12 in.) samples of metal, peel and stick membrane and Z-girts. Submit two (2) full size panels of metal siding.

.6 Safety Data Sheets:

.1 Submit WHMIS safety data sheets for inclusion with project record documents. Keep one (1) copy of WHMIS safety data sheets on Site for reference by workers.

1.5 Quality assurance

.1 Qualifications:

.1 Manufacturer and tradesmen executing the work of this Section shall have had a minimum five (5) years continuous Canadian experience in successful manufacture and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Erection of preformed metal siding systems shall be by workers especially trained and experienced in this type of work. Have a qualified representative at the job site to direct the work of this Section at all times.

.3 Retain a professional engineer, registered in the province of the Work, to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Document requirements including, but not limited to, the following:

.1 Seal and signature to shop drawings and design submittals requiring structural engineering.

.2 Field review of installed components.

.4 Conform to the requirements of the local Building Code, local by-laws and Authorities having jurisdiction.

1.6 Pre-installation conference

.1 Convene one (1) week before commencing Work of this Section to discuss expectations for fit and finish of wall system, quality of workmanship for installation of air/vapour retarders and insulation and relationship of wall system to adjacent components.

.2 Meeting shall be attended by the installer, manufacturer’s representative, Contractor and the Consultant.

.3 Manufacturer’s representative shall also provide frequent inspection visits during the course of work of this Section to assure quality and competence of membrane installation and panel alignment.

1.7 Design requirements

.1 Maximum deflection not to exceed L/180 under system's own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:50 years.

.2 Design sheet cladding to span continuously over at least four structural supports (three spans) and design fastening to structural supports to sustain factored loads in accordance with CAN/CSA S136-07.

.3 Calculate live load deflections in accordance with CSSBI 20M-08, as modified by the requirements of this Section.

.4 Provide for movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range from -40 °C to +50 °C, and wind loads noted above.

.5 Design the systems so that there is no air or water infiltration under the positive and negative forces imposed by wind and gravity loads. Provide means of draining space between insulation and exterior skin, in accord with NRC Rain Screen Principles.

.6 Final review and acceptance of work completed by this Section shall be carried out by the manufacturer's representative, the Consultant, Contractor and the Subcontractor.

1.8 Storage, delivery, handling and protection

.1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage locations. Do not load any area beyond the design limits.

.2 Adequately protect and crate all components against damage, dirt, disfigurement and weather.

.3 Assembled units and/or their component parts shall be transported, handled and stored in a manner to preclude damage. Accessory materials required for erection at the Site shall be delivered to the Site in manufacturer's labelled containers. Remove all units or components which are cracked, bent, chipped, scratched or otherwise unsuitable for installation and replace with new.

.4 Provide safe and adequate equipment on the Site to execute the work of this Section, hoisting, scaffolding, staging, safety protection equipment, tools, plant and other equipment required for the completion of the work of this Section.

.5 Delivered damaged materials or materials which do not comply with this Section shall be rejected by Consultant, removed from the Site and replaced with acceptable materials at Contractor's expense.

.6 Adequately protect the structure and work of all other trades during delivery, storage, handling and erection of the work of this Section.

.7 Preformed metal siding components being hoisted to the working level shall be adequately banded and carefully slung employing steel wire rope.

.8 Bundles shall be tag lined during the ascent of the hoisting operation. Precaution shall be taken to avoid damage to metal siding components and to prevent marring of exposed surfaces.

.9 Preformed metal siding components, after being positioned, shall be adequately secured in place as quickly as possible and prior to leaving the job site at the end of the working day.

.10 Loose bundles of preformed metal siding components shall be adequately secured at the completion of each working day.

.11 Scaffolds, platforms, ladders, and the like, required by the erector for installation of metal siding components shall be properly secured to prevent accidental movement or collapse.

1.9 Project conditions

.1 Make thorough examination of drawings and details. Determine the intent, extent, materials, and conditions of interfacing with work of other Sections and be fully cognizant of requirements.

.2 Inspect substrate surfaces on which the work of this Section is erected for any irregularities detrimental to the application and performance of the work of this Section. Confirm conditions satisfactory before proceeding.

.3 Co-ordinate and verify, by measurement at the job site, all dimensions affecting work of this Section. Notify Consultant, in writing, of all dimensions and/or conditions at variance with those on the reviewed shop

drawings, Contract Documents and/or detrimental to the proper and timely installation of materials. Direction regarding correction measures shall be obtained from Consultant prior to fabrication of the item affected. Insure the compatibility of adjacent items in relationship to the work of this Section.

.4 Do not perform work of this Section during period of rain, fog, sleet or snow, or upon surfaces covered with dust, water, dew, ice, frost or snow.

.5 Report to Consultant in writing, defects of work prepared by other trades and unsatisfactory Site conditions. Commencement of application implies acceptance of surfaces and conditions.

1.10 Coordination

.1 Coordinate work of this section with the requirements of Section 07 62 00 – Prefinished Metal Flashing and Trim, for specific requirements for supply of prefinished sheet metal flashing materials to other sections of the work as follows:

.1 Supply prefinished sheet metal flashings required for the project, regardless of sheet metal thickness and colour.

.2 Provide prefinished sheet metal flashings to installing trades, tension levelled and guillotine sheared to length ready for brake forming, fabrication and installation by installing trades.

.3 Coordinate with installing trades during bid period and provide unit prices for materials based on specified thickness and colour of flashing materials required under their respective scopes of work; installing trades will be responsible for carrying cost for flashing materials in their scope of work in their Bid Price.

.4 Requirements of this portion of the scope of work do not apply to extruded aluminum or other pre-manufactured flashing materials normally supplied by installing trades (i.e.: extruded aluminum curtain wall flashing and sills, preformed roof penetrations, non-prefinished sheet metal products).

.5 Subcontractor responsible for supply of metal wall and soffit cladding will only be responsible for fabrication and installation of flashings relating to their scope of work.

1.11 Warranty

.1 Warrant the work of this Section against defects in materials and workmanship in accordance with General Conditions, but for a period of five (5) years from date of Substantial Performance. Agree to promptly make good defects which become evident during warranty period without cost to the Owner.

.2 Without restricting the generality of the Warranty, defects shall include deformation, buckling, leakage, weather tightness, failure of anchors and fastenings, failure of paint coating and sealants.

.3 Promptly make good defects and/or failures in the Work upon written notification by the Owner. Remedy shall include labour, materials, equipment and services required to make good defective work, and to replace components and finishes and the Owner's property damaged or disturbed in the course of remedying defects.

2 Products

2.1 Manufacturers

.1 Basis of Design Products: Products named in this Section were used as the basis of design for the project; additional manufacturers listed offering similar products may be incorporated into the work of this Section.

.1 Ideal Roofing;

.2 Agway Metals Inc.; or

.3 Approved alternate.

.2 Acceptable Preformed Metal Siding Profile: Subject to compliance with requirements specified in this Section, profiles that may be incorporated into the Work include; but are not limited to, the following:

.1 Exterior Wall Cladding basis of design:

.1 AD 300 and AD 275 by Vic west; or

.2 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Steel:

.1 Sheet steel conforming to ASTM A653/A653M-11, structural quality, Grade 'A' with a minimized spangle zinc coating of Z275 conforming to ASTM A653/A653M-11 shall be used for girts, sub-grits, Z-bars, brackets, battens, retention clips, cleats, fascias, preformed metal siding panels, closures and flashings.

.2 Girts, sub-girts, Z bars, clips brackets shall be of the required base steel nominal thickness to meet design requirements. Thermal clips shall be slotted to minimize thru-metal conductivity.

.3 Preformed metal siding shall be of required base steel nominal thickness to meet design requirements. Metal flashings, fascias, copings, cap flashings, closures and the like shall be base steel nominal thickness of 22 gauge and thicker to suit application to prevent oil-canning.

.2 Finish:

.1 Fluoropolymer coil coating:

.1 Provide Metallic Coil Coating system with 70% PVDF (polyvinylidene fluoride), meeting AAMA 620/621, up to 4 coat to achieve specified colour. Fluropan Specialty Coatings and finishes by Vicwest or approved alternate.

.2 Colour: to match 6724 Metallic Silver Coating and 2897 Light Pewter finish by Vicwest or approved alternate.

.3 Finish location: exposed face of metal wall panel, where colour is indicated on drawing.

.2 Silicone Modified Polyester Coating:

.1 Provide WeatherXL by Vicwest, and manufactured by Sherwin Williams or approved alternate.

.2 Colour: Provide 56068 Black finish by Vicwest or approved alternate.

.3 Finish location: exposed face of metal wall panel, where colour is indicated on drawing.

.3 Concealed finish: to be manufactures standard, corrosion resistant finish for rain screen walls.

.3 Sealing Tape: Macro-polyisobutylene preformed sealant tape designed for use in metal cladding assemblies.

.4 Thermal Broken Clip: Purpose-made, custom fabricate to thickness of insulation; mechanically fastened to engineered metal studs, and concrete substrate; engineered with cladding support, and supporting cladding system, in combination with the cladding support system, meeting minimum thermal performance criteria specified. Subject to conformance with specified criteria provide:

.1 ‘Enviro-Clip’ by Ontario Panelization;

.2 ‘ISO Clip’ by Northern Façade Ltd.;

.3 ‘T-Clip’ by Engineered Assemblies;

.4 ‘Cascadia Clip’ by Cascadia Windows and Doors; or

.5 Approved alternate.

.5 Insulation

.1 Semi-Rigid mineral wool cavity insulation as specified in Section 07 21 00 – Thermal Insulation.

.6 Sealants And Gaskets:

.1 Sealants and gaskets shall be of types to allow for maximum movements anticipated, maintaining life cycle expectancy, adhesion and flexibility under temperature ranges of -25 °C up to +80 °C, without undue softening or deleterious effects.

.2 At sidelaps and end laps of panels, as required, factory applied butyl tape, or polyvinyl chloride "wedge fit" type extrusions.

.3 Perimeter Sealant: Refer to Section 07 92 00 – Sealants.

.7 Screws, Bolts, Nuts, Washers, Rivets And Other Fastening Devices:

.1 Provide concealed fasteners system for exposed cladding, flashing and all trim members.

.2 Mechanical fasteners used on underlayment; self tapping metal screws, type and length to suit application and securement plates to the approval of the Consultant.

.3 Concealed fasteners located within wall: No.12 teks, or approved alternate, self-drilling, self-tapping galvanized screws.

.8 Bituminous Paint:

.1 Conforming to CAN/CGSB-1.108-M, Type 2.

.9 Field Touch-Up Paint:

.1 Zinc rich anti-corrosion primer, conforming to SSPC Guide 14, and approved by the coil coating manufacturer. Top coating of type and colour to match finish sheet and to comply with VOC regulations identified in South Coast Air Quality Management District (SCAQMD).

.10 Air/Vapour Barrier membrane: Refer to Section 07 27 00 – Membrane Air Barrier.

2.4 Fabrication

.1 Co-ordinate and verify, by measurement at the job site, all dimensions affecting the Work. Submit written notifications documenting any and all field dimensions and/or conditions which are at variance with those on the reviewed shop drawings. The Contract documents and/or detrimental to the proper and timely installation of job site materials. The decision regarding corrective measures shall be obtained from the Consultant prior to the fabrication of the item affected. Ensure the suitability of adjacent items in relationship to the work of this Section.

.2 Report to Consultant in writing, defects in Work prepared by other trades and unsatisfactory Site conditions. Commencement of work shall imply acceptance of conditions.

.3 Workmanship shall be best trade shop and field practice known to recognized manufacturers specializing in work of this Section. Joints and intersecting members shall be accurately fitted to true planes, adequately and securely fastened and made completely weathertight. Component fastenings shall be concealed of adequate strength.

.4 Fabricate units to profile and sizes indicated complete with rabbets, interlocks, flashings, trim and filler sections, as required to interface with work of other trades.

.5 Fabricate all devices required for erection and adequate anchorage and attachment required to be built into or attached to the steel structural or steel deck and main building structure for the support of the Work.

.6 Anchorage brackets and devices shall be designed and fabricated to compensate for unevenness and dimensional difference in the structure and permit unrestricted expansion and contraction of framing members.

.7 Steel Welding: Conform with CSA W59-03 (R2008) and executed in accordance with CSA W47.1-09 or CSA W55.3-08.

.8 Fabricate preformed metal siding systems where indicated. The systems shall be formed to meet design requirements, and of prefinished steel sheet. The system shall be accurately cut and fitted, all fastenings shall be concealed. Method of attachment shall be to the Consultant's approval and clearly detailed on shop drawings. Panel faces shall be flat and true without waves, buckles or oil canning.

.9 Supply sufficient prefinished metal of same thickness and colours as the preformed metal siding to Section 07 62 00 – Prefinished Metal Flashing and Trim for his use in installing roof flashings.

.10 Form starter strips of same material as flashings 38 mm (1½ in.) wide and continuous.

.11 Exposed steel surfaces shall be smooth and free from imperfections such as warping, buckling, scratches, dents and abrasion.

.12 Thickness of metal shall be adequate for various conditions.

.13 Isolate where necessary to prevent electrolysis due to dissimilar metal to metal contact or metal to masonry or concrete. Use bituminous paint or other approved divorcing membrane.

3 Execution

3.1 Examination

.1 Examine substrates to receive the work of this section and ensure that work of other sections is complete and that there are no conditions which will adversely affect the work of this section.

.2 Notify the Consultant immediately of any unsatisfactory conditions. Do not proceed with the work of this section until unsatisfactory conditions have been corrected.

.3 Commencement of the work of this section implies acceptance of surfaces and conditions.

3.2 Installation

.1 Erect preformed metal siding and accessories in strict accordance with reviewed shop and erection drawings and manufacturer's instructions to give a complete and weatherproof system.

.2 Air/Vapour barrier (AVB):

.1 Refer to Section 07 27 00 – Membrane Air Barrier.

.3 Cavity insulation

.1 Refer to Section 07 21 00 – Thermal Insulation. Coordinate with installation of thermally broken cladding support.

.4 Thermally broken Clips:

.1 Install thermally broken clips as indicated in reviewed shop drawings intermittently spaced to receive sub-girt framing for support of prefinished sheet metal panels.

.5 Install girts, 'Z' girts, liner panels, sub-girts, cleats and retention clips and other attachment members necessary to complete the work of this Section.

.6 Co-operate with other trades to ensure proper installation and anchorage of work of this Section. Install steel bracing and framing and continuous clip angles and secure plumb and in line.

.7 Damaged, bent or dished sheets will be rejected.

.8 Place preformed metal siding against supporting substrate and adjust to final position before permanently securing. Bring each unit to bear evenly on framing.

.9 Align units to provide accurate fit with corresponding sections parallel and straight. Ensure complete nesting of interlocking and sealed side lap joint and fasten sheets to structural supports.

.10 Fasten exterior sheets of panels to horizontal sub-girts, using colour matching fasteners, where indicated.

.11 Install necessary closure and trim or neoprene closures at openings and penetrations, fastening at 305 mm (12 in.) O.C. Make cut-outs neatly by saw cutting.

.12 Where welding has been performed on work of this Section, or field cutting or scratches have been made, field coat such areas with touch-up paint after thoroughly cleaning affected surfaces.

.13 Seals:

.1 Fit flexible seals, tapes, formed gaskets and the like at locations required to provide air/vapour barriers and weathertight junctions. Ensure that end joints, between lengths of material have been properly sealed.

.2 Caulk junctions of preformed metal siding system components to themselves and work of other Sections with sealant in accordance with the requirements of Section 07 92 00 – Sealants, to maintain continuity of air/vapour and weather barriers.

.14 Rigidly connect all prefinished flashing pieces with specified colour matching fasteners at 305 mm (12 in.) O.C. along length. Use preformed corner pieces and erect with ample allowance for thermal movement.

.15 Furnish adequate quantity of prefinished flat stock flashing sheet to Section 07 62 00 – Prefinished Metal Flashing and Trim for forming and installation. Trim members in this category are cap flashing, base flashing and those specifically shown on drawings as being prefinished and in close proximity to roofing. Flashing pieces entirely remote from roofing flashing and the like are furnished in place under work of this Section.

.16 Install work of this Section only during period of no rain, fog, sleet or snow, or upon surfaces covered with dust, water, dew, ice, frost or snow.

3.3 Cleaning and clean-up

.1 Remove debris and surplus materials from the Site upon completion of work of this Section.

.2 Clean dirt, soil and misplaced sealants from preformed metal siding systems with recommended cleaners and solvents.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for the supply and installation of cold applied SBS modified bituminous membrane roofing system.

.2 Section includes:

.1 Preparation of Metal Deck Surface

.2 Deck Sheathing Board

.3 Vapour Retarder

.4 Roof Insulation

.5 Insulation Overlay Board

.6 Base Sheet Membrane

.7 Base Sheet Flashing

.8 Cap Sheet Membrane

.9 Cap Sheet Flashing

.10 Roof Walkways

1.2 Related requirements

.1 Section 06 10 00 – Rough Carpentry

.2 Section 07 62 00 – Prefinished Metal Flashing and Trim

.3 Section 07 92 00 – Sealants

1.3 Reference standards

.1 Canadian Roofing Contractors Association (CRCA):

.1 Roofing Specification Manual

.2 American Society for Testing and Materials (ASTM):

.1 ASTM C1002-04, Steel Drill Screws for the Application of Gypsum Board

.2 ASTM C1396/C1396M-06a, Standard Specification for Gypsum Board

.3 Canadian General Standards Board (CGSB):

.1 CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing

.2 CGSB 37-GP-64M, Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-up Roofing

.3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement

.4 CAN/CGSB-37.28-M89, Reinforced, Mineral Colloid Type, Emulsified Asphalt for Roof Coatings and Waterproofing

.5 CGSB 37-GP-9Ma, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing or Waterproofing

.4 Canadian Standards Association (CSA):

.1 CSA A123.4-04, Bitumen for Use in Construction of Built-up Roof Coverings and Dampproofing and Waterproofing Systems

.2 CSA B111-1974 (R2003), Wires, Nails, Spikes and Staples

.3 CSA O151-M1978 (R2003), Canadian Softwood Plywood

.5 Underwriters Laboratories Canada (ULC):

.1 CAN/ULC S107-03, Standard Methods of Fire Tests of Roof Coverings

.2 CAN/ULC S701-05, Thermal Insulation, Polystyrene, Boards and Pipe Covering

.3 CAN/ULC S702-97, Thermal Insulation, Mineral Fibre, Boards for Buildings and ULC S702.2-03, Mineral Fibre Thermal Installation for Buildings, Part 2: Application Guidelines

.4 CAN/ULC S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced

.5 CAN/ULC S770-2000, Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit copies of membrane manufacturers current technical data sheets describing the physical properties and recommended installation procedures.

.2 Shop Drawings:

.1 Submit sloped insulation manufacturer's proposed roofing diagrams and layouts for review by the Consultant.

.2 Submit membrane manufacturer's standard details that will be used for this project, indicate changes that must be made to make the details project specific for review by the Consultant.

.3 Informational Submittals:

.1 Certificates: Provide roofing system materials that are compatible with building vapour retarders specified under Section 07 21 00 – Thermal Insulation; submit a written declaration to the Consultant that roofing materials and components are compatible with wall air and vapour retarder membranes when requested by Consultant.

1.5 System performance

.1 General Performance: Installed membrane roofing shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

.2 Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

.3 Minimum Adhesion of Each Material: 1 MPa.

.4 Fire Hazard and Windstorm Requirements:

.1 Provide membrane roofing, base flashings, and component materials equivalent to requirements in as part of a membrane roofing system and as follows:

.1 Fire Hazard Classification: CAN/ULC-S107, Class C.

.2 Roof Assembly wind uplift requirements: tested in accordance with CSA A123.21-14, Standard test method for the dynamic wind uplift resistance of membrane-roofing systems.

.5 Expected Service Life: CSA S 478; Provide a fully adhered roofing system whose cap sheet and cap sheet flashings have a predicted service life of a minimum of twenty (20) years in accordance with requirements of Part 7 of CSA S 478.

.6 Thermal Resistance of Insulation: Minimum effective thermal resistance as indicated in accordance with CAN/ULC-S770-3 - LTTR testing and the following:

.1 Do not include other system componentry such as air surface films, structural materials, membranes, tapered insulation, roof sheathing component contributions in the calculation.

.7 Roof slope: Minimum 1 % slope to drain.

1.6 Quality assurance

.1 Obtain roofing membrane materials through one source from a single manufacturer and install using workers who are trained and approved by the roofing membrane manufacturer; maintain a full time experienced journeyman roofer, and at least one apprentice per crew on the Work at all times.

.2 Conform to Roofing Specifications as published by Canadian Roofing Contractors Association (CRCA) as a reference.

.3 Execute work of this section using an applicator approved by the membrane manufacturer, and capable of issuing a ten (10) year Performance Warranty.

.4 Pre-installation Conference:

.1 Convene a pre-installation conference at the site, one week prior to commencing work of this Section to review preparation and installation procedures and coordinating and scheduling required with related work.

.2 Require attendance of parties directly affecting work of this Section, including, but not limited to, the Owner's representative, Consultant, Contractor, Roofing Applicator and job foreman and Roofing Manufacturer's Representative.

.3 Contact Consultant two (2) weeks prior to pre-installation conference to confirm schedule.

.4 Record discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to roofing work, including the following:

.1 Tour, inspect and discuss condition of substrate, roof drains, roof drain final locations, curbs, penetrations and other preparatory work performed by other trades.

.2 Review structural loading limitations of deck and inspect deck for loss of flatness and for required mechanical fastening.

.3 Review roofing system requirements (drawings, specifications and other contract documents).

.4 Review required submittals, both completed and yet to be completed.

.5 Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

.6 Review required inspections, testing, certifying and material usage accounting procedures.

.7 Review weather and forecasted weather conditions, and procedures for coping with unfavourable conditions, including possibility of temporary roofing (if not a mandatory requirement).

1.7 Delivery, storage and handling

.1 All materials will be delivered and stored in conformance with manufacturers written requirements; they must remain in their original packaging, displaying the manufacturer's name, product name, weight, and reference standards, as well as all other indications or references considered standard.

.2 Store materials in a dry and properly ventilated area, away from any welding flame or spark and sheltered from the elements or any harmful substance. Only materials destined for same-day use can be removed from this storage area. In cold weather, store materials in a heated area at a minimum temperature of +10 °C and removed prior to application. If rolls cannot be stored in a heated environment, they may be pre-conditioned before installation, refer to manufacturers written recommendations on membrane application procedures.

.3 Store adhesives and emulsion-based waterproofing mastics at a minimum +5 °C. Store adhesives and solvent-based mastics at sufficiently high temperatures to ensure ease of application.

.4 Materials delivered in rolls will be carefully stored upright; flashing will be stored to avoid creasing, buckling, scratches or any other possible damage.

.5 Avoid material overloads which may affect the structural integrity of specific roof areas.

.6 Place plywood runways over the Work to enable the movement of materials and other traffic during construction of roofing.

.7 Protect surrounding surfaces against damage from roofing work. Where hoisting is necessary, hang tarpaulins to protect walls during delivery of materials from ground to roof.

.8 Materials will be rejected and be replaced at no extra cost to the Owner where materials are damaged by the elements, improper handling or other causes; remove rejected materials promptly from the site.

.9 Protect exposed surfaces of finished walls with tarp to prevent damage during roofing work, repair any damage caused to adjacent materials and finishes caused by roofing installation.

1.8 Site conditions

.1 Maintain roofing equipment in good working order.

.2 Apply roofing within the range of ambient and substrate temperatures recommended by roofing system manufacturer:

.1 Do not apply roofing to a damp or wet substrate.

.2 Do not apply roofing in snow, rain, fog, or mist.

1.9 Warranty

.1 Roofing Membrane Manufacturer: Provide manufacturer's warranty stating that they will repair or replace defective roofing (including labor) and base flashing materials that do not remain watertight, that splits, tears, or separates at the seams or from the substrate within the specified warranty period and as follows:

.1 Warranty Period: Twenty (20) years full system material and labour Warranty, starting from Substantial Performance for the Project.

2 Products

2.1 Manufacturers

.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar setting systems may be incorporated into the work provided they meet the performance requirements established by

the named products and provided they submit requests for substitution a minimum of ten (10) days in advance of Bid Closing.

.2 Subject to compliance with requirements, manufacturers offering membrane products that may be incorporated into the Work include, but are not limited to, the following:

.1 Soprema Inc.; or

.2 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements

2.3 Materials

.1 Adhesives: Manufacturers recommended adhesives specifically formulated for installation of materials outlined below, meeting the wind resistance rating indicated in this Section.

.2 Deck Sheathing Board: Glass mat faced, mould resistant roof sheathing boards having a treated gypsum core manufactured in accordance with ASTM C1177/C1177M-08, and as follows:

.1 Thickness: 13 mm (½ in.).

.2 Long Edges: Square.

.3 Location: Roof substrates over steel decks and sheathing for parapets.

.4 Acceptable Materials:

.1 Georgia-Pacific DensDeck;

.2 CGC Securock Glass-Mat Sheathing;

.3 CertainTeed GlasRoc Sheathing Roof Board; or

.4 Approved alternate.

.3 Vapour Barrier:

.1 Self-adhesive membrane composed of SBS modified bitumen, with a surface screen made of high-density polyethylene laminated between two (2) layers of polyethylene films.

.2 Resistance to water vapour transmission: 0.92 ng/Pa.s.m^2 (0.016 Perm).

.3 Basis of Design Product: SOPRAVAP'R by Soprema Inc. or approved alternate.

.4 Wood Roof Materials: Refer to Section 06 10 00 – Rough Carpentry.

.5 Insulation:

.1 Primary Flat Insulation: Polyisocyanurate foam rigid board roof insulation consisting of largest panels practical, having square edges, minimum LTTR Value 6/1 in., total thickness as indicated on Drawings, perpendicular from edge of roof to a minimum thickness of 50 mm (2 in.); conforming to ULC S704, Type 3, Class 2, with inorganic, coated glass facers manufactured to a tolerance not exceeding 3 mm (⅛ in.) from nominal size in any dimension:

.1 Basis of Design Product: Atlas ACFOAM III or approved alternate.

.2 Tapered Insulation Acceptable Materials: Tapered to maximum 13 mm (½ in.) low edge:

.1 Basis of Design Product: Atlas ACFOAM III or approved alternate.

.3 Drain Sump:

.1 One-piece, pre-manufactured, polyisocyanurate, 1,220 mm x 1,220 mm (4 ft. x 4 ft.) Gemini Drain Set, with minimum 13 mm (½ in.) per foot of slope, by Atlas Roofing Corporation and represented by Building Resource Inc., or approved alternate. Install at all drains.

.4 Tapered Edge Strip:

.1 Pre-manufactured, polyisocyanurate, tapered from 0mm to 50 mm (0 in. to 2 in.) in a 610 mm x 2,439 mm (2 ft. x 8 ft.) board by Atlas Roofing Corporation and represented by Building Resource Inc., or approved alternate. Install at all parapets, and other areas as needed and shown on the drawings.

.6 Insulation Overlay Board and Base Sheet Membrane:

.1 SBS modified base sheet membrane and polyester reinforcement, factory-laminated on a semi-rigid asphaltic board. The board measures 914 mm x 2,440 mm (3 ft. x 8 ft.).

.2 Top surface: Covered with thermofusible plastic film. The membrane side lap is 60 % self-adhesive and 40 % thermofusible.

.3 Thickness: 6 mm (¼ in.)

.4 Adhesive: As recommended by membrane manufacturer.

.5 End lap strip: SOPRALAP by Soprema Inc. or approved alternate.

.6 Basis of Design Product: SOPRASMART BOARD 180 by Soprema Inc. or approved alternate.

.7 Base Sheet Membrane Flashing:

.1 Membrane composed of SBS modified bitumen and glass mat reinforcement.

.2 Surface: Covered with a thermofusible plastic film and the underface is covered with a release protection film.

.3 Basis of Design Product: SOPRAFLASH FLAM STICK by Soprema Inc. or approved alternate.

.8 Base Sheet Membrane Flashing Primer: SBS synthetic rubbers, adhesive enhancing resins and volatile solvents.

.1 Basis of Design Product: ELASTOCOL STICK by Soprema Inc. or approved alternate.

.9 Cap Sheet Field Membrane and Cap Flashing:

.1 Membrane composed of SBS modified bitumen and composite reinforcement.

.2 Surface: Covered and protected by coloured granules and the underface is covered with a release protection film.

.1 Colour of Granules: white finish providing an SRI of 82. .

.3 Basis of Design Product: SOPRASTAR GR FLEX by Soprema Inc. or approved alternate.

.10 Metal Flashings: As indicated in Section 07 62 00 – Prefinished Metal Flashing and Trim.

.11 Roof Walkways:

.1 Waterproofing membrane composed of SBS modified bitumen and non-woven polyester reinforcement, used to protect membranes subjected to foot traffic.

.2 Surface: Covered with black granules; the underface is protected by a thermofusible plastic film.

.3 Basis of Design Product: SOPRAWALK by Soprema Inc. or approved alternate.

3 Execution

3.1 Examination

.1 Inspect completed roof deck and ensure that any defect of level or construction is corrected before proceeding with the work of this Section.

.2 Do not apply any roofing to surfaces which are dusty, rusty or covered in loose material, snow, water, ice or any other substance which might impair the bond of roofing materials.

.3 Verify that roof drains have been properly set and installed by the mechanical trade. Report any discrepancies to the Consultant so that they may be corrected.

.4 Ensure items projecting through roof are solidly set and reglets and nailing strips are in place.

.5 Inspect wood blockings, curbs and cants. Do not install roofing over such items if method of attachment is inadequate to withstand stresses imposed by thermal movement of roofing components.

.6 Start of roofing work will be interpreted as meaning roofing conditions are in accordance with manufacturer’s requirements.

3.2 Preparation

.1 Protect finished work to avoid damage during roof installation and material transportation.

.2 Install protective boardwalks to enable passage of personnel and materials without causing damage to installed roofing materials.

.3 Mount mechanical application devices on pneumatic tired wheels; use devices designed and maintained to operate without damaging insulation, roofing membrane or structural components.

.4 Do not place flame heated equipment on roof; provide and maintain a fire extinguisher adjacent to flame heated equipment at ground level in close proximity to heated equipment.

.5 Open flame torches and application equipment will not be permitted on the roof; use only electrically heated equipment where installation of roofing components requires heated equipment.

.6 Thoroughly clean all surfaces which are to receive the roofing and flashings by whatever means necessary to remove laitance, frost, snow, ice, water, debris, extraneous matter and other substances which could affect the proper performance of the work of this Section.

.7 Prime vertical surfaces with asphalt primer commencing at the top of the cant strip to the reglet or highest point as detailed. Allow sufficient time for the asphalt primer to cure and ensure that primer does not run into the building or stain wall faces.

3.3 Installation

.1 Prepare surfaces and complete roofing work specified in this Section in accordance with manufacturer's written instructions and guidelines.

.2 Install roofing elements on clean and dry surfaces; in a continuous operation when substrates are ready and as weather conditions permit.

.3 Seal seams in base sheets that are not covered by a cap sheet membrane in the same day; do not install cap sheet if any moisture is present at or within base sheet seams.

.4 Protect work of other sections during installation of work of this Section; repair or compensate other sections for damage caused by this Section.

.5 Deck Sheathing Board:

.1 Fasten deck sheathing board to upper flute surfaces of steel deck using a minimum of twelve (12) screws and washers for each 1,220 mm x 2,440 mm (4 ft. x 8 ft.) board; cut boards so that edges rest on centre of upper flutes using straight lines and sharp tools.

.2 Cut boards neatly where slopes change directions; do not break boards to conform to deck slopes; place boards perpendicular to deck flutes for continuous support at extremities.

.3 Stagger board in half-lengths, butted together to maintain flush top surface with minimal lippage between adjacent boards; seal joints with heat resistant tape in both directions to prevent asphalt leakage in finished areas.

.6 Vapour Retarder:

.1 Install self adhering vapour barrier membrane by unrolling vapour barrier membrane onto deck sheathing board substrate, starting at bottom of slope without removing silicone release sheet, and as follows:

.1 Align roll parallel to sheathing board supporting membrane.

.2 Peel back one end of silicone release sheet and adhere membrane to substrate; peel remaining release sheet at a 45 deg angle to avoid wrinkles in membrane.

.3 Cut roll and start again where membrane is not properly aligned to deck sheathing board; re-align membrane and overlap end of misaligned piece by 150 mm (6 in.).

.4 Overlap adjacent membranes by 75 mm (3 in.); overlap end laps by 150 mm (6 in.); stagger end laps by 305 mm (12 in.); place thin sheet of metal under end lap of membrane to provide structural support to lapped membranes.

.2 Overlap roof vapour barrier to wall air/vapour barrier using compatible continuity strip to provide continuity of building envelope.

.3 Install vapour barrier at insulation perimeters and around each element piercing insulation to provide sealed connections with base sheet at up-stands.

.7 Insulation:

.1 Adhere insulation to vapour barrier using manufacturer's recommended adhesive applied at rate recommended by manufacturer; adhere insulation at locations where roof deck will be visible in final installation.

.2 Install secondary insulation layer onto vapour barrier as the first layer, followed by installation of manufacturer's required primary flat insulation ready for installation of cold adhesive applied membrane roofing.

.3 Stagger vertical joints between primary insulation boards and secondary insulation modules and between two rows of insulation board.

.4 Install only as much insulation as can be covered by roof membranes in the same day.

.8 Cold Adhesive Applied Field Base Sheet and Insulation Overlay Board Installation:

.1 Install membrane base sheet in full bed of adhesive applied at rate recommended by roofing membrane manufacturer using a notched 5 mm (3/16 in.) neoprene squeegee starting at drain and perpendicular to slope.

.2 Apply base sheet in parallel strips, butting board joints up and covering the joints with self-adhesive strip attached to adjacent board.

.3 Roll surface installed membrane using a 30 kg steel roller to smooth membrane and to provide continuous and uniform adhesion to insulation.

.4 Seal lap joints of base sheet at end each workday; perform work without interruption to avoid tears and formation of fish mouths, air pockets or wrinkles.

.5 Cut off corners at end laps being covered by next roll.

.6 Terminate base sheet at top of cant or at perimeter.

.9 Cold Adhesive Applied Base Sheet Flashing:

.1 Apply base sheet flashing when primer coat is dry and in accordance with manufacturer's written instructions.

.2 Position pre-cut membrane pieces; peel back 100 mm to 150 mm (4 in. to 6 in.) of silicone release paper to hold the membrane in place at the top of the parapet, then gradually peel back remaining silicone release paper, pressing down on the membrane with aluminum applicator to provide good adhesion and to provide smooth transition between up-stand and field surface; smooth entire membrane surface with a roller for full adhesion.

.3 Cut off corners at end laps being covered by next roll.

.4 Seal overlaps at the end of each workday.

.10 Thermofusible Field Cap Sheet:

.1 Remove granules from side laps by embedding granules in torch-heated bitumen over a 75 mm (3 in.) width.

.2 Starting at drain, unroll membrane on base sheet, taking care to align the edge of the first selvedge with the edge of the roof.

.3 Cut off corners at end laps at areas to be covered by the next roll.

.4 Each selvedge will overlap the previous one along lines provided for this purpose, and will overlap by 150 mm (6 in.) at ends. Space end laps a minimum of 305 mm (12 in.).

.5 Heat-weld cap sheet membrane with torch onto base sheet to create a bleed out of 3 mm to 6 mm (⅛ in. to ¼ in.).

.6 During installation, be careful not to overheat the membrane or its reinforcements.

.7 Avoid the formation of wrinkles, swellings or fishmouths.

.8 Avoid walking over finished surfaces; use rigid protective walkways as needed.

.11 Thermofusible Cap Sheet Flashings:

.1 Install cap sheet flashings in 1,000 mm (3.25 ft.) wide strips.

.2 Each selvedge will overlap the previous one laterally along lines provided for this purpose, and will overlap by 150 mm (6 in.) the field surface.

.3 Space flashing membranes a minimum 100 mm (4 in.) with respect to the cap sheet membranes on the field surface, to avoid areas of excessive membrane thickness.

.4 Cut off corners at end laps on areas to be covered by the next roll.

.5 Use a chalk line to draw a straight line on the field surface, 150 mm (6 in.) from flashings and parapets.

.6 Use a torch and round-nose trowel to embed the surface granules in the layer of hot bitumen, starting from the chalk line on the field surface to the bottom edge of the flashing or parapet, as well as on the granulated vertical surfaces to be overlapped.

.7 Heat-weld cap sheet directly to base sheet membrane, proceeding from bottom to top.

.8 Avoid the formation of wrinkles, swellings or fishmouths.

.9 During installation, be careful not to overheat the membrane and its reinforcements.

.12 Walkways:

.1 Install walkways in compliance with requirements previously stipulated for cap sheet installation. Apply primer to cap sheet before installing walkways.

3.4 Field quality control

.1 An independent inspection and testing company appointed and paid for by the Owner may carry out inspection and testing.

.2 Arrange site meeting with roofing inspector three (3) weeks prior to commencement of work on site to review work and procedures specified in this Section.

.3 Cooperate with the inspector and afford all facilities necessary to permit full inspection of the work and testing of materials prior to their use.

End of section

1 General

1.1 Section includes

.1 Furnish labour, materials and other services to complete the fabrication and installation of;

.1 Cap and base flashing; curb flashings,

.2 Roof edge flashing,

.3 Flashing at intersection of roof with vertical surfaces,

.4 Break metal flashings where shown,

.5 Prefinished flashings where indicated,

.6 Any other flashing as indicated on the drawings or as required, including all materials and fitments required for the operation of any unit furnished, in the manner, direction and performance shown on the shop drawings and specified herein.

.2 Furnish, complete, all materials which shall be installed by other trades as specified and/or shown on the drawings including:

.1 Furnish to Section 04 21 13 – Brick Veneer Masonry all metal flashings and counter flashings which are to be built into masonry work.

1.2 Related requirements

.1 Section 04 21 13 – Brick Veneer Masonry

.2 Section 05 40 00 – Cold Formed Metal Framing

.3 Section 05 50 00 – Metal Fabrications

.4 Section 06 10 00 – Rough Carpentry

.5 Section 07 46 17 – Aluminum Plank Panels

.6 Section 07 46 19 – Metal Wall Panels

.7 Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane

.8 Section 07 92 00 – Sealants

1.3 Reference standards

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint

.2 CAN/CGSB-1.181-99, Ready Organic Zinc-Rich Coating

.3 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound

.3 Canadian Roofing Contractors Association

.1 CRCA Specifications Manual

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Submit shop drawings indicating material, thickness and finish.

.4 Submit duplicate 4 sq.in. samples of each type of sheet metal material, colour and finish for review by Consultant prior to fabrication.

1.5 Quality assurance

.1 Fabricator and tradesmen executing the work of this Section shall have had a minimum five (5) years continuous Canadian experience in successful manufacture and installation of Work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Erection of metal flashing systems shall be by workmen especially trained and experienced in this type of work. Have a senior, qualified representative at the job site to direct the work of this Section at all times.

1.6 Delivery, storage and handling

.1 Store materials flat at site under protection to prevent staining from the work of other trades or from collection of water on material and secured against wind damage.

.2 Carefully store preformed sheet metal work in such a manner as to prevent twisting, bending and rubbing.

.3 Protect sheet metal work from corrosive materials and dissimilar metals.

1.7 Warranty

.1 Warrant the work of this Section against defects in materials and workmanship in accordance with General Conditions, but for a period of two (2) years from date of Substantial Performance. Agree to promptly make good defects which become evident during warranty period without cost to the Owner.

.2 Without restricting the generality of the Warranty, defects shall include deformation, buckling, leakage, weather tightness, failure of anchors and fastenings, failure of paint coating and sealants.

.3 Promptly make good defects and/or failures in the work of this Section upon written notification by the Owner that such exist. Remedy shall include labour, materials, equipment and services required to make good defective work, and to replace components and finishes and Owner's property damaged or disturbed in the course of remedying defects.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Sheet Metal Materials: Prefinished galvanized sheet steel to ASTM A653/A653M-11 Grade A with G90 designation zinc coating to ASTM A653/A653M-11, factory precoated finish. .

.2 Hold-down, fastener clips – minimum 0.80 mm thick (20 ga) galv. steel sheet as above, unpainted.

.3 Nails, bolts screws and rivets: Material - galvanized steel, stainless steel or same metal as material to be fastened. Type - to approved samples.

.4 Bituminous Paint: Conforming to CAN/CGSB-1.108-M, Type 2.

.5 Field Touch-Up Paint: Zinc rich anti-corrosion primer, conforming to CAN/CGSB-1.181-92, “0.20Touch-Up Primer for Galvanized Surfaces: SPCC-Paint 20, Type II Organic zinc rich.” by W.R. Meadows of Canada Limited, or approved alternate; and top coating of type and colour to match finish sheet.

.6 Underlay for metal flashing: Asphalt laminated 3.6 to 4.5 kg kraft paper.

.7 Sealant: Multi-component, chemical curing epoxidized polyurethane type sealant conforming to CAN/CGSB-19.24-M90, 'DYmeric 240FC' by Tremco (Canada) Ltd., or approved alternate. Colour as selected later by Consultant. Provide primers, bond breakers and cleaning agents as recommended by the sealant manufacturer.

.8 All other materials not specifically described but required for a complete and proper installation of the work of this Section shall be new first quality of their respective kinds and subject to the approval of the Consultant.

2.3 Fabrication

.1 Fabricate metal flashings and other sheet metal work to applicable CRCA 'FL' series specifications and as detailed.

.2 Form flashings, counter flashings, scuppers and copings as required to suit each condition. Use prefinished sheet steel in all locations. Form pieces in 2,438 mm (8 ft. 0 in.) maximum lengths. Make allowance for expansion at joints.

.3 Fabricate sheet metal components with lines, arises and angles sharp and true and plane surfaces free from objectionable wave, warp or buckle.

.4 Mitre and seal corners with sealant. Form drip edging at 45 deg angle, secure with a continuous 0.80 mm thick (20 ga.) hold-down clip.

.5 Exposed edges of sheet metal shall be folded back to form a 13 mm (½ in.) wide hem on the side concealed from view. Prefabricate corner pieces for flashings and copings. The workmanship and methods employed for forming, anchoring, cleating and the provision for expansion and contraction of sheet metal work shall be to the approval of the Consultant.

.6 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.7 Fabricate scuppers and overflow scuppers to applicable CRCA 'FL' Series details and as detailed.

.8 Apply two (2) coats of bituminous paint to metal surfaces to be in contact with masonry, concrete, mortar or dissimilar metals.

.9 Fabricate sheet metal in thickness required to meet performance criteria, and minimum thickness indicated below:

.1 Downspouts: Minimum 0.55 mm Coil coated galvanized steel.

.2 Scuppers, trim, gravel stops, base flashing, eave flashing, and fascia: Minimum 0.70 mm thick coil coated galvanized steel.

2.4 Finishing

.1 Flashing at cap of preformed metal siding prefinished to match WeatherXL finish for 2897 Light Pewter finish by Vicwest, or approved alternate, in accordance with Section 07 46 19 – Metal Wall Panels.

.2 Provide 8000 series finished sheet for all prefinished metal flashing not exposed to view.

3 Execution

3.1 Examination

.1 Inspect substrate surfaces on which the work of this Section is erected for any irregularities detrimental to the application and performance of the Work. Confirm conditions satisfactory before proceeding. Report to

Consultant in writing, defects of work prepared by other trades and unsatisfactory site conditions. Commencement of work implies acceptance of surfaces and conditions.

3.2 Installation

.1 Metal flashing shall be in compliance with best sheet metal trade practice and shall in no way be contrary to sheet metal practice that will qualify for the Guarantee Certificate specified. Install with "S" lock expansion joints or standing seams incorporated on end of flashing length and all joints sealed with mastic.

.2 Provide continuous starter strips to present true, non-waving leading edge. Provide clips and anchor to backup in an approved manner to provide rigid, secure installation. Conceal fastenings in completed flashing. Lap, lock and seal all seams.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm (4 in.).

.4 Install sheet metal flashings, cap flashings and copings as indicated on drawings using flat lock seams. Make joints to permit thermal movement. Make surfaces free from buckling, warp, wave, dents, oil canning or other defects. Make corners square and surfaces straight and in true planes. Equally space joints in cap flashings to suit wall panel module. Space seams not farther apart than 2,439 mm (8 ft.).

.5 All sheet and strip flashing to be held in place by 14 gauge galvanized iron clips of a size and type to be determined by the construction requirements, except where specifically detailed on the drawings.

.6 Caulk flashing at cap flashing with sealant.

.7 Lock end joints and caulk with sealant.

.8 Use rubber-asphalt sealing compound for joints between sheet metal and bitumen.

.9 Supply rigid flashing, copings and sheet metal back-up to other trades where required to be built into other work at doors, windows, block openings, curbs and where shown on drawings.

.10 Take careful note of fans, vents, etc., on mechanical drawings to determine whether flashing and counter flashing is required or whether units are self-counter flashing.

.11 Caulking shall be installed as per written manufacturer's recommendations.

.12 Exposed fastenings will be permitted where indicated or where concealed fastening is not possible. Obtain Consultant's approval of exposed fastenings and methods of making same.

.13 If exposed screws or bolts are used, use cupped neoprene washers.

.14 Install scupper drains and overflow scupper drains as indicated on drawings, in strict accordance with CRCA manual.

3.3 Cleaning

.1 Remove, as the work progresses, all excess or foreign material which would set up or become difficult to remove from finished surfaces.

.2 Do all final cleaning upon completion of the Work of this Section. Leave building and Work in condition to meet the approval of the Consultant.

.3 Remove excess sealant by the moderate use of mineral spirits or other solvent acceptable by the sealant manufacturer.

End of section

1 General

1.1 Section includes

.1 Section Includes

.1 Prefabricated steel roof hatch, with integral support curbs, safety railings, operable hardware, and counter flashings.

.2 Safety Bar.

1.2 Related requirements

.1 Section 05 50 00 – Metal Fabrications

.2 Section 06 10 00 – Rough Carpentry

.3 Section 07 52 23 – Cold Adhesive Applied Modified Bituminous Membrane

.4 Section 07 62 00 – Prefinished Metal Flashing and Trim

.5 Section 07 92 00 – Sealants

.6 Section 09 90 00 – Painting

1.3 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings:

.1 Submit shop drawings showing construction and anchorage of roof hatches and accessories including, details of all elements of assembly and construction.

.2 Related items shown on shop drawings which are not intended to be supplied as part of the work of this Section, shall be so identified. All dimensions shall be clearly noted and methods of

fastening and anchoring detailed. Show accurately and identify all adjacent materials.

.4 Maintenance:

.1 On completion of work of this Section, supply maintenance instructions for insertion into Operating and Maintenance Manual.

1.4 Quality assurance

.1 Manufacturer Qualifications: Use a manufacturer that has completed roof hatch assemblies having similar extent and complexity as required for the Work of this Contract.

.2 Installers Qualifications: Use experienced installers having experience with roof hatch assemblies similar in material, design and extent as required for Work of this Contract with a record of successful in-service performance.

1.5 Warranty

.1 Warrant the work of this section in accordance with General Conditions but for a period of two (2) years from date of Substantial Performance and agree to repair or replace faulty materials or work which becomes evident during the warranty period without cost to the Owner and at the Owner's convenience.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Manufacturers

.1 Basis of Design Products: Products named in this Section were used as the basis of design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section.

.2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products

that may be incorporated into the Work include; but are not limited to, the following:

.1 Bilco Company;

.2 Lexcor;

.3 Acudor; or

.4 Approved alternate.

2.3 Roof hatches

.1 Manufactured Units:

.1 Size: 762 mm x 914 mm (30 in. by 36 in.).

.2 Curb: 14 gauge galvanized G90 steel; 1 in. rigid insulation; integral cap flashing to receive roof flashing system; extended flange for mounting.

.3 Cover: 14 gauge galvanized G90 steel with one inch glass fibre insulation retained by 22 gauge steel inner liner. Continuous gasket to provide weatherproof seal.

.4 Hardware: Manufacturer's standard manually operated type with compression spring operators, positive snap latch with turn handles inside and out and padlock hasp inside; automatic hold-open arm with vinyl covered grip handle for easy release; cadmium plated finish.

.5 Hinges: Heavy duty pintle type.

.6 Fasteners: Corrosive resistant fasteners recommended by roof hatch manufacturer.

.7 Basis of Design Material: Type S-20 by Bilco Canada, or approved alternate.

2.4 Safety post

.1 Telescoping safety post complete with adjustable mounting hardware for securing to any ladder rung size. Unit to be complete with safety bar handle and stainless steel fasteners.

.2 Basis of Design Material: Ladderup Safety Post, Model LU-1 by Bilco Canada; or approved alternate.

2.5 Roof hatch ladder

.1 Steel Wall Ladder: As specified in Section 05 50 00 – Metal Fabrications.

2.6 Safety rail

.1 Posts and Rails: Round, reinforced fire retardant yellow fiberglass treated with a UV inhibitor, complete with Self-closing gate.

.2 Hardware:

.1 Mounting brackets shall be 6 mm (¼ in.) thick hot dip galvanized steel.

.2 Hinges and post guides: 6063T5 aluminum.

.3 Fasteners: Type 316 stainless steel.

.3 Basis of Design Material: Bil-Guard Hatch Railing System, Model RL-S by Bilco Canada; or approved alternate.

2.7 Fabrication

.1 Fabricate free of visual distortions and defects. Weld corners and joints.

.2 Fabricate units weather tight with integral cap flashing, providing for removal of condensation.

.3 Prime paint; one coat.

.4 Spot weld hasp, latch and hinges to prevent removal from interior.

3 Execution

3.1 Installation

.1 Install in accordance with manufacturer's instructions. Co-ordinate with installation of roofing system and related flashings. Provide weather tight installation.

.2 Apply bituminous paint on metal surfaces of units in contact with cementitious materials and dissimilar metals.

.3 Safety Bar: Install in strict accordance with manufacturer's published instructions.

.4 Safety Rail: Attach hatch rail system to the cap flashing of the roof hatch, as recommended by safety rail manufacturer. No penetration of roofing material is required.

End of section

1 General

1.1 Section includes

.1 Systems comprising fireproof firestopping and smoke seal materials and accessories, at joints and penetrations in fire resistance rated wall, floor and roof assemblies, materials and components.

.2 Firestopping at joints at exterior curtain-wall/floor intersections.

.3 Rated foam seal joint system.

.4 Manufacturer's site services and site quality control.

1.2 Related requirements

.1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 Reference standards

.1 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S115, Standard Method of Fire Tests and Firestop Systems

1.4 Performance requirements

.1 Materials, accessories and application procedures listed by ULC, cUL, WHI (Intertek/Warnock Hershey) or OPL (Omega Point Laboratories), or tested in accordance with CAN/ULC-S115 to comply with building code requirements.

.2 Fire-Resistive Joint Systems:

.1 Generally, use listed assemblies types F, FT, FH or FTH, as applicable.

.2 Joints at Exterior Curtain-Wall/Floor Intersections: Use joint systems tested at a positive pressure differential of 2.49 per ASTM E2307.

.3 Firestopping Materials: CAN/ULC-S115 and ASTM E2307, and to achieve fire ratings indicated.

.4 Surface Burning of Exposed Materials: CAN/ULC-S102 with a minimum flame spread/smoke developed rating of 25/50.

.5 Engineering Judgment: Where there is no specific third party tested and classified firestop system available for a particular firestop configuration, provide an Engineering Judgment acceptable to the authority having jurisdiction.

1.5 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Product Data: Provide data on product characteristics, performance and limitation criteria, and indicating construction details accurately illustrating Project conditions. Include descriptions sufficient for identification at Project site.

.4 System Design Listings: Submit system design listings including design designations, locations and illustrations, from a qualified testing and inspection agency applicable, to each firestop configuration.

.1 Where Project conditions require modification to a qualified testing agency's illustration for a particular firestopping system condition, submit illustration, with modifications marked, approved by firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire resistance rated assembly.

.5 Firestop System Engineering Judgments: When required for acceptance by the authority having jurisdiction, Firestop System Engineering Judgment submissions shall:

.1 Clearly indicate that the recommended firestop system is an engineering judgment;

.2 Identify the job name, project location and firm which the engineering judgment is issued to.

.3 Be prepared, stamped and signed by a professional engineer, specializing in fire protection and licensed to practice in the place of the work.

.4 Be presented in appropriately descriptive written form with or without detail drawings where appropriate;

.5 Reference tested system(s) which the engineering judgment is based on;

.6 Include clear directions for the installation of the recommended firestop system;

.7 Include dates of issue and authorization signature as well as the issuer's name, address and telephone number.

.6 Samples:

.1 Submit samples of each type of firestop and smokeseal material and accessory.

1.6 Submittals for information

.1 Qualifications Data: For manufacturer and installer.

.2 Installation Data: Manufacturer's special preparation and installation requirements.

.3 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

.4 Delegated Design Submittals: Design firestopping assemblies required by the Contract Documents to withstand fire ratings indicated and in accordance with the Ontario Building Code.

.1 Provide manufacturer's standard listings where site conditions match standard assembly listing.

.2 Provide manufacturers engineered judgement with acceptance by authorities having jurisdiction, signed and sealed by the manufactures; fire protection engineer where assembly does not match standard assembly listing.

.5 Manufacturer's Field Reports: Indicate environmental conditions under which fireproofing materials were installed. Compatibility and Adhesion Test Reports: From manufacturer indicating the following:

.1 Materials have been tested for bond with substrates.

.2 Materials have been verified by manufacturer to be compatible with substrate.

.3 Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.7 Quality assurance

.1 Applicator shall be licensed by the manufacturer of fireproofing materials.

.2 Submit manufacturer's certification that materials meet or exceed specified requirements.

.3 Maintain flame and temperature ratings equal to surrounding materials.

.4 Single Responsibility: Perform work using single applicator having undivided responsibility for entire Project, including coordination with plumbing, mechanical and electrical installations.

.5 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer.

1.8 Delivery, storage, handling and protection

.1 Deliver materials in original, unopened packages bearing name of manufacturer and product identification.

.2 Store materials off ground, under cover, and away from damp surfaces.

1.9 Site conditions

.1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Provide ventilation to manufacturer's instructions in areas to receive solvent cured materials.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Select exposed firestopping products in walls and ceilings, capable of receiving specified paints.

.2 Do not use cementitious or rigid seals for:

.1 Re-entry penetrations.

.2 Penetrations in sound and vibration control assemblies.

.3 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

.4 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

.5 Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed”. Coordinate cast-in-place with Division 03 Concrete.

.6 Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain and inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The length of the sleeve shall be 12.4 inches. The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to

achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.

.7 Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11

.1 F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

.8 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.

.1 F-Rating: Minimum of one (1) hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

.2 T-Rating: when penetrant is located outside of a wall cavity, minimum of one (1) hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

.3 W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

.9 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

.1 L-Rating: Not exceeding 5.0 cfm/ft.^{2} of penetration opening at both ambient and elevated temperatures.

.10 Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.

.11 Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D 6904 with less than one (1) hour tack free time as tested in accordance with ASTM C 679.

2.3 Manufacturers

.1 Subject to compliance with requirements provide products of one of the following manufacturers:

.1 3M Fire Protection Products;

.2 Hilti Canada Ltd.;

.3 Specified Technologies Inc.;

.4 Tremco Inc.; or

.5 Approved alternate.

.2 Rated foam seal joint system:

.1 Emseal Joint Systems Ltd.; or

.2 Approved alternate.

2.4 Materials

.1 Exposed firestopping:

.1 Pourable (self-levelling) grade for openings in floors and other horizontal surfaces.

.2 Nonsag grade for openings in vertical and sloped surfaces unless indicated firestopping limits use of nonsag grade for both opening conditions.

.2 Formulated Compound of Incombustible Fibres: Formulated compound mixed with incombustible non-asbestos fibres.

.3 Fibre Stuffing: Minimum 64 kg/m^3 mineral or ceramic fibre stuffing insulation.

.4 Mechanical Device with Fillers: Mechanical device with incombustible fillers or silicone elastomer covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.

.5 Intumescent Putty: Intumescent putty compound which expands on exposure to surface heat gain, nonhardening dielectric, water-resistant, containing no solvents, inorganic fibres, or silicone compounds.

.6 Firestop Pillows: Formed mineral fibre pillows, reusable heat-expanding cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows from being easily removed.

.7 Composite Sheet: Intumescent rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

2.5 Rated foam seal joint system

.1 Rated foam seal joint system for exterior expansion joints for vertical or horizontal applications, exposed "visual" and hidden location inboard "cavity" seals and below expansion joint covers.

.2 Where rated foam seals are indicate, System shall perform waterproofing, fire-rating, movement-accommodation functions as well as contribute to thermal insulation and sound attenuation as the result of a single installation.

.3 Sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, two (2) hour rated, sealant system. Sealant system shall be comprised of the following components:

.1 Fire-retardant-impregnated foam pre-coated at the outer layers with waterproof silicone,

.2 Field-applied epoxy adhesive primer,

.3 Field-injected silicone sealant bands.

.4 Preformed and pre-compressed silicone "face” seals. Size as indicated on drawings.

.5 Movement: +50 %, -50 %.

.6 Joint system to maintain continuous air/vapour and moisture barrier in conjunction with adjacent air/vapour barrier systems specified in Section 07 27 00 – Membrane Air Barrier.

.7 Acceptable Product to match expansion joint size indicated:

.1 Emseal; "EMSHIELD WFR2, and SJS-FR1"; or

.2 Approved alternate.

.8 Colour:

.1 Non visible joints in Cavity and below expansion joint cover plate: standard Grey.

.2 Exposed to View: Custom colour to match adjacent finishes.

2.6 Accessories

.1 Provide components for each firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components recommended by firestopping manufacturer in accordance

with tested assembly being installed, and acceptable to authorities having jurisdiction.

.2 Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

.3 Dam Material: Permanent:

.1 Mineral fibreboard.

.2 Mineral fibre matting.

.3 Alumina silicate fire board.

.4 Sealants used in combination with other forming, damming and backing materials to prevent leakage of fill materials in liquid state.

.5 Fillers for sealants.

.4 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

.5 Water: Potable, clean and free from injurious amounts of deleterious substances.

2.7 Finishes

.1 Colour: Red unless otherwise noted.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping are ready to receive the work of this Section.

.3 Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Preparation

.1 Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

.2 Remove incompatible materials which may affect bond.

.3 Install backing and damming materials to arrest liquid material leakage.

.4 Mask adjacent surfaces to protect from spillage and over coating; immediately remove material from adjacent surfaces.

3.3 Application

.1 Apply primer and materials to manufacturer's written instructions, approved tested assemblies and details.

.1 Provide materials to maintain the fire separations in the project as indicated on the drawings.

.2 Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

.3 Apply firestopping material in sufficient thickness to achieve rating and to uniform density and texture.

.4 Tool or trowel exposed surfaces to a uniform finish.

.5 Compress fibred material to achieve a density of 25-40 % of its uncompressed density required for listed system.

.6 Place material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

.7 Place intumescent coating in sufficient coats to achieve rating required.

.8 Remove dam material after firestopping material has cured. Dam material to remain.

.9 Provide identification labels as specified.

.10 In non-fire rated construction indicated to prevent smoke movement, tightly pack voids of service penetrations and around openings with mineral wool insulation and sealant.

3.4 Identification

.1 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, prepreinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system

installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

.1 The words: "Warning: Through-Penetration Firestop System - Do Not Disturb"

.2 Contractor's name, address and telephone number.

.3 Designation of applicable testing and inspection agency.

.4 Date of installation.

.5 Manufacturer's name for firestop materials.

3.5 Manufacturer's site services

.1 Require site attendance of firestopping product manufacturer during installation of the Work. Schedule manufacturer’s review of work procedures at stages listed:

.1 Pre-installation Meeting: one (1) review at Site and meeting with authorized Installers.

.2 Installation: three (3) reviews at Site: one (1) at commencement of Work; one (1) at 50 % completion of Work; one (1) upon completion of Work.

.2 Submit manufacturer’s written reports to Consultant describing:

.1 The scope of work requested.

.2 Date, time and location.

.3 Procedures performed.

.4 Observed or detected non-compliances or inconsistencies with manufacturers’ recommended instructions.

.5 Limitations or disclaimers regarding the procedures performed.

.6 Obtain reports within three (3) days of review and submit immediately to Consultant.

.3 Monitor and report installation procedures and unacceptable conditions.

.1 Inspect and review materials and workmanship including storage, handling and protection. Advise Consultant and Owner forty eight (48) hours in advance of inspections.

.2 Correct identified defects or irregularities.

.4 Remove and replace unacceptable firestopping assemblies.

3.6 Site quality control

.1 Owner will engage an independent testing agency to perform the following special inspections and tests, and prepare reports in accordance with ASTM E2174 and ASTM E2393:

.1 Correct size of joint.

.2 Placement and anchorage of mechanical supports.

.3 Thickness of coatings.

.4 Correct use and location of backings and bond breaker materials.

.5 Adherence testing to verify material bond with substrate.

.2 Testing and inspecting of completed joints and seals shall take place in successive stages, and at a rate not less than one test per day for each Installer and material type. Where deficiencies are found or firestopping is damaged or removed because of testing, repair or replace firestopping to conform to requirements.

.3 Do not proceed with installations for the next area until test results for previously completed installations show conformance to requirements.

.4 Products and materials will be considered defective if they do not pass tests and inspections.

.5 Proceed with enclosing firestopping with other construction only after inspection reports are issued and installations conform to requirements.

.6 Submit testing agency’s written reports to Consultant.

3.7 Cleaning

.1 Clean installed work.

.2 Clean adjacent surfaces of firestopping materials.

3.8 Protection of finished work

.1 Protect installed work.

.2 Protect adjacent surfaces from damage by material installation.

3.9 Schedule

.1 Firestop the following conditions and as indicated:

- .1 Penetrations through fire resistance-rated construction.
- .2 Tops of fire resistance rated walls.
- .3 Intersections of fire resistance rated walls and non-fire rated walls.
- .4 Control joints in fire resistant rated construction.
- .5 Joints at exterior wall/floor intersections.
- .6 Openings and sleeves installed for future use through fire resistant rated separations.
- .7 Non-fire rated construction to prevent smoke movement. Pack void space at all service penetrations and other openings with either tightly packed Rock Wool insulation, or sealant, or a combination of both. The sealant need not be rated.

.2 Rated foam seal joint in rated assemblies including:

- .1 Rated foam seal joint at fire rated expansion joint location where fire resistance rating is required.
- .2 Expansion joints in concrete masonry units.

.3 Service Penetrations shall include but not limited to:

- .1 Mechanical Pipe Penetrations
- .2 Mechanical Damper Joints: Top only in floor dampers
- .3 Electrical Service Penetrations: Bus duct, etc.
- .4 Electrical Outlet Boxes: Receptacles, switches etc., in fire-rated GWB only.

End of section

1 General

1.1 Section includes

.1 Sealants and joint backing.

.2 Acoustic sealants.

.3 Compressible seals.

.4 Site quality control and manufacturer's site services.

1.2 Related requirements

.1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 Reference standards

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C509, Standard Specifications for Elastomeric Cellular Performed Gasket and Sealing Material

.2 ASTM C510, Standard Test Method for Staining and Color Change of Single-or Multicomponent Joint Sealants.

.3 ASTM C920, Standard Specification for Elastomeric Joint Sealants.

.4 ASTM C1021, Standard Practice for Laboratories Engaged in Testing of Building Sealants.

.5 ASTM C1184, Standard Specification for Structural Silicone Sealants.

.6 ASTM C1193, Standard Guide for Use of Joint Sealants.

.7 ASTM C1248, Standard Test Method for Staining of Porous Substrate by Joint Sealants.

.8 ASTM C1330, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

.9 ASTM D5893/D5893M, Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Manufacturer's Data: Submit manufacturer's literature describing each material to be used in the work of this Section. Literature shall contain a statement that the material complies with the specified standard.

.2 Structural Sealant Joint Design: Provide calculations for structural bite, dead load support, glueline thickness, shear, and other parameters. Include confirmation that design data provided by Consultant have been reviewed and approved by sealant manufacturer.

.3 Samples: Submit for approval and colour selection sample of each type of compound, recommended primers and joint filler or fillers proposed to be used.

.4 Submittals for Information:

.1 Qualifications Data: For Manufacturer and Installer.

.2 Installation Data: Manufacturer's special installation requirements.

.1 Indicate special procedures, surface preparation, perimeter conditions requiring special attention, and field quality control testing.

.3 Field reports.

.1 Site quality control report identifying procedures for site testing and verification.

.2 Manufacture site service report identifying materials have been installed in accordance with manufactures recommendations.

1.5 Quality assurance

.1 Applicator qualifications:

.1 Execute Work by applicators trained and approved by the manufacturer and having five (5) years proven experience.

.2 Independent inspection and testing agency:

.1 Qualification: In accordance with ASTM C1021.

.2 Conduct field inspection and testing of sealant with the manufacturer's representative for a minimum of 20 % of joints, including mixing of materials, joint preparation, priming, joint profile and thickness, application, adhesion, cohesion, and tooling.

.3 Prepare and submit inspection and test report results after each inspection. Include confirmation by the manufacturer that installation has been satisfactorily completed.

.3 Manufacturer's representative:

.1 Review Site conditions, joint design, and installer's qualifications. Report unsatisfactory conditions to Consultant.

.2 Check container labels, inspect preparation of substrate materials and review installation procedures forty eight (48) hours in advance of installation, and randomly test installed Work.

.4 Mock-up:

.1 Construct mock-up for each type of sealant to show location, size, shape, colours, and depth of joints complete with bond breaker, joint backing, primer, and sealant. Accepted mock-up may become part of finished Work.

.2 Remove mock-ups that do not form part of Work from Site during final cleanup, or when directed by Consultant.

.3 Allow forty eight (48) hours for Consultant to review mock-up before proceeding with sealant Work.

.5 Pre-installation meetings:

.1 Conduct meetings seven (7) Days in advance of sealant installation.

.2 Include Consultant, sealant manufacturer's representative, independent inspection and testing agency engaged by Contractor, and parties who are directly affected by the Work of this Section.

.3 Verify Contract requirements, substrate conditions, joint conditions and profile, weather conditions, and the manufacturer's installation instructions.

.4 Within seventy two (72) hours following the pre-installation meeting, prepare a pre-installation meeting report and issue to all parties in attendance.

.1 Clearly indicate the recommendations made during the pre-installation meeting, the required actions, and by whom.

1.6 Site conditions

.1 Apply sealants only to completely dry surfaces, and at air, substrate and material temperatures above minimum established by manufacturer's written specifications.

1.7 Delivery, storage handling and protection

.1 Deliver all materials to the jobsite in their original, unopened containers, with all labels intact.

.2 Receive and store materials as recommended by materials manufacturer.

.3 Maintain containers and labels in undamaged condition.

1.8 Warranty

.1 Provide a five (5) year warranty from date of Substantial Performance, to include coverage for failure to meet specified requirements.

.1 Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

.2 Provide manufacturer's twenty-year material warranty, starting from date of Substantial Performance, for installed silicone sealant.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials – interior sealants

.1 Non-Traffic Locations:

.1 Silicone Sealant: Single component, conforming to ASTM C920 Type S, Grade NS, use NT.

.2 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 ‘Spectrem 3’ by Tremco Sealants;

.2 ‘DOWSIL 795’ by Dow Corning; or

.3 Approved alternate.

.2 Non-Traffic Locations requiring Paintable Sealant:

.1 Latex Joint Sealant, Paintable: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP Grade NF; single component, non-sagging, non-staining, non-bleeding.

.2 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 ‘Tremflex 834’ by Tremco Sealants;

.2 ‘Sonolac’ by BASF Building Systems;

.3 ‘AC-20+ Silicone’ by Pecora Corporation; or

.4 Approved alternate.

.3 Traffic Locations:

.1 Polyurethane Sealant: Single component, self-levelling, conforming to ASTM C920, Type S Grade P, Use T, class 25.

.2 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 ‘Sikaflex 1CSL’ by Sika Canada Inc;

.2 ‘MasterSeal SL-1’ by BASF Building Systems;

.3 'Urexpan NR-201' by Pecora Corporation;

.4 'Vulkem 45' by Tremco Sealants;

.5 'Novalink SL Self-leveling sealant' by Chemlink Advanced Architectural Products; or

.6 Approved alternate.

.4 Control Joints in Ceramic Tile, joints in 90 º corners in tile without prefabricated corners, joints between tile and solid surface countertops, joints between tile and hard surface countertops and all other surfaces in Kitchens and Toilet Rooms, and around Plumbing Fixtures:

.1 Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses NT; G and O, single component, non-sagging, non-staining, mildew resistant; formulated with fungicide; colour as selected.

.2 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 'Tremsil 200' Silicone Sealant by Tremco Sealants;

.2 '786' Sealant by Dow Corning for all applications except floors;

.3 'Tub, Tile Ceramic Silicone Sealant' by Dow Corning; or

.4 Approved alternate.

.5 Control Joints in Ceramic Tile Floors NOT in Kitchens and Toilet Rooms:

.1 Polyurethane Sealant: Multi component, chemically curing, self-levelling, colour as selected.

.2 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 'THC 900/901' by Tremco Sealants;

.2 'Dymeric 240FC' by Tremco Sealants; or

.3 Approved alternate.

2.3 Exterior sealants

.1 Exterior Joints to Perimeters of Openings: Select one of the following to suit requirements of condition indicated.

.1 Silicone Sealant: Single component, 100 percent silicone rubber, medium modulus, moisture-curing, non-sagging, non-staining, non-

bleeding; colours as selected; ASTM C920, Grade NS, Class 50 and complying with the following:

.1 SWRI Certificate of Validation.

.2 Modulus @ 50% Extension, ASTM C1135: Maximum 55 psi.

.3 Elongation Capability, ASTM D412: Minimum 235 percent.

.4 Stain Free Performance, ASTM C1248: No staining.

.5 Shore A Hardness: Range 15 to 35.

.6 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 '791' by Dow Corning at paint-finished metal surfaces;

.2 '795' by Dow Corning for anodic-finished metal surfaces;

.3 'Silpruf SCS2700 LM' or 'Silpruf SCS2000' by GE under licence by Momentive Performance Materials Inc.;

.4 'Spectrum 2' by Tremco; or

.5 Approved alternate.

.2 Silicone Sealant: Single component, 100 percent silicone rubber, low modulus, moisture-curing, non-sagging, non-staining, non-bleeding; colours as selected; ASTM C920, Grade NS, Class 100/50 and complying with the following:

.1 SWRI Certificate of Validation.

.2 Modulus @ 50 % Extension, ASTM C1135: Maximum 25 psi.

.3 Stain Free Performance, ASTM C1248: No staining.

.4 Shore A Hardness Range: 15 to 20.

.5 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 '790' by Dow Corning;

.2 'Silpruf LM SCS2700' by GE under licence by Momentive Performance Materials Inc.;

.3 'Spectrum 1' by Tremco; or

.4 Approved alternate.

.2 Traffic Locations: Horizontal expansion joints in concrete walks and pavements.

.1 Polyurethane Sealant: Single component, self-levelling, conforming to ASTM C920, Type S Grade P, Use T, class 25.

.1 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 ‘Sikaflex 1CSL’ by Sika Canada Inc.;

.2 ‘Sonolastic SL-1’ by BASF Building Systems;

.3 ‘Urexpan NR-201’ by Pecora;

.4 ‘Vulkem 45’ by Tremco;

.5 ‘Novalink SL’ by Chemlink Advanced Architectural Products; or

.6 Approved alternate.

.3 Structural Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, non-sagging, non-staining, fungus-resistant, non-bleeding; neutral curing; VOC content less than 50 g/l; compatible with system components; 138 kPa minimum tensile strength; specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in assemblies indicated.

.1 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 ‘795’ by Dow Corning;

.2 ‘UltraGlaze SSG4000’ or ‘UltraGlaze SSG4000AC’ by GE under licence by Momentive Performance Materials Inc.;

.3 ‘Proglaze SSG’ by Tremco; or

.4 Approved alternate.

.2 Colour: Black, gray, or both as determined by Consultant, unless otherwise specified.

2.4 Compressible seal

.1 Exterior Compressible seal:

.2 Silicone pre-coated, preformed, pre-compressed, self-expanding, binary sealant system of expanding polyurethane foam impregnated with water

based, stabilized, polymer modified acrylic with factory applied silicone coated bellows, complete with field applied liquid silicone corner bead in matching colour, depth of seal as recommended by manufacturer.

.1 Colorseal by Emseal Corporation, standard colour; or

.2 Approved alternate.

2.5 Acoustic sealant

.1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.2 Product: Subject to compliance with requirements of this Section provide one of the following products:

.1 ‘CP-506 by Hilti;

.2 ‘Sheetrock Acoustical Sealant’ by USG;

.3 ‘AC-20 FTR’ or ‘AIS-919’ by Pecora; product as recommended by manufacturer for application indicated; or

.4 Approved alternate.

.3 Accessories: As recommended by manufacture to achieve minimum STC rating listed.

2.6 Accessories

.1 Primers:

.1 Type recommended by sealant manufacturer for substrate, to promote adhesion and to prevent staining of adjacent surfaces for conditions encountered.

.2 Joint backing:

.1 Extruded, round, solid section, skinned surface, closed cell, soft polyethylene foam gasket stock, compatible with primer and sealant materials.

.2 30 % to 50 % oversized.

.3 Shore A hardness of 20, tensile strength 140 kPa to 200 kPa, in accordance with ASTM C1330.

.4 Bond breaker type surface.

.3 Bond breaker tape:

.1 Polyethylene tape or other plastic tape recommended by sealant manufacturer to prevent sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint.

.2 Provide self-adhesive, pressure sensitive tape where applicable.

.3 Do not use material impregnated with oil, bitumen, non-curing polymer or similar deleterious material.

.4 Cleaning agents:

.1 Recommended by sealant manufacturer.

.2 Free of oily residues or other substances capable of staining or harming joint substrates and adjacent surfaces.

.5 Masking tape:

.1 Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

3 Execution

3.1 Inspection

.1 Verify at site that joints and surfaces conditions provided will not adversely affect execution, performance or quality of completed work.

.2 Ensure masonry and concrete have cured twenty eight (28) days minimum.

.3 Ascertain that sealers and coatings applied to substrates are compatible with sealant used and that full bond of the sealant and substrate is attained. Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and adhesion, if necessary.

.4 Verify that specified recommended environmental conditions are present before commending work.

.5 Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.

.6 Do not start work of this Section until conditions are satisfactory.

3.2 Preparation

.1 Clean joint surfaces using joint cleaner as necessary, to remove dust, paint, loose mortar, and other foreign matter and dry joint surfaces.

.2 Remove dust, silt, scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

.3 Remove oil, grease and other coatings from non-ferrous metals with approved cleaning solvent.

.4 Ensure surfaces are free of frost, rust, lacquers, laitance, release agents, moisture or other matter which might adversely affect adhesion of sealant.

.5 Examine joint sizes and correct as required to allow for anticipated movement and to achieve proper width/depth ratio per manufacturer's written recommendations for specified sealant.

.6 Support joint filler on horizontal traffic surfaces against vertical movement which might result from traffic loads or foot traffic.

.7 Prepare surfaces as recommended by sealant manufacturer.

.8 Fully remove existing sealant scheduled to be removed and replaced with new sealant, in areas indicated on the Drawings.

.1 Follow manufacturers procedures for removal of existing sealant and test areas for adhesion of new sealant. Provide the Consultant with field report identifying results of adhesion testing.

.9 Install joint backing material or apply bond breaker tape to achieve correct joint depth and prevent three-sided adhesion.

.10 To protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or sealing.

.11 Prime sides of joints using two (2) cloth method in accordance with manufacturer's directions immediately prior to sealing.

.12 Before any sealing is commended, a test of the material shall be made for indications of staining, poor adhesion or other undesirable effects.

.13 Seal joints in surfaces to be painted before painting. Where surfaces to be sealed are prime painted in shop before sealing, check to make sure prime paint is compatible with primer and sealant. If incompatible inform

Consultant, consult the manufacturer, and change primer and sealant to approved compatible types.

.14 Check form release agent used on concrete for compatibility with primer and sealant. If incompatible inform Consultant and change primer and sealant to approved compatible types or clean concrete to Consultant's approval.

3.3 Installation

.1 Perform Work in accordance with manufacturer’s recommendations for Products and applications indicated, unless more stringent requirements apply.

.2 Use Products without additives or adulteration. Use one manufacturer's Product for each location in accordance with Sealant Location Schedule at end of this section.

.3 Perform Work in accordance with ASTM C1193, and ASTM C919 for Acoustic Sealant.

.4 Joint backing:

.1 Install joint backing to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

.1 Depth of recess: Maintain 2:1 joint width to depth ratio.

.2 Where recess is less than specified depth, cut back surface of recess to specified depth.

.2 Do not leave gaps between ends of joint backings.

.3 Do not stretch, twist, puncture, or tear joint backings.

.4 Remove absorbent joint backings that have become wet before sealant application and replace with dry materials.

.5 Support joint backing on horizontal surfaces against vertical movement which might result from pedestrian or vehicular traffic loads.

.5 Install bond breaker tape between sealant and back of joints where joint backing is not used.

.6 Apply sealant immediately after adjoining Work is in condition to receive sealant Work and as follows:

.1 Apply sealant in a continuous bead using gun with correctly sized nozzle. Use sufficient pressure to completely fill joint recess.

.2 Ensure sealant has full, direct uniform contact with, and adhesion to, side surfaces of recess. Superficial pointing with skin bead is not acceptable.

.7 Tooling:

.1 Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified to form smooth, uniform sealant bead, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains, or other defects.

.2 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.

.3 At recesses in flush surfaces, finish sealant with concave face and flush with face of material at each side.

.8 Immediately remove excess sealant and droppings.

.9 Ensure sealant bead is uniform in colour.

.10 Cure in accordance with the sealant manufacturer's recommendations. Do not cover up sealants until proper curing has taken place.

.11 Remove defective sealant and reapply.

3.4 Site quality control

.1 Joint Sealants: Perform adhesion tests on exterior sealants in accordance with manufacturer's written instructions and ASTM C1193, Method A – Field-Applied Sealant Joint Hand Pull Tab.

.1 Perform test no later than twenty one (21) days after installation at a rate of one test every 300 m of installed sealant.

.2 Structural Sealant: Perform adhesion tests on exterior sealants in accordance with manufacturer's written instructions and ASTM C1401, Method B – Hand-Pull Tab (Non-destructive).

.1 Perform five tests for first 300 m of applied silicone sealant and one test for each 300 m seal thereafter or perform one test per floor per building elevation minimum.

.2 For sealant applied between dissimilar materials, test both sides of joint.

.3 Remove sealants failing adhesion test, clean substrates, reinstall sealants and perform retesting.

.4 Maintain test log and submit report to Consultant indicating tests, locations, dates, results, and remedial actions.

.5 Maintain record of conditions and temperatures during application.

3.5 Manufacturer's site services

.1 Require site attendance of each sealant manufacturers, during installation of the Work. Start sealant application in presence of manufacturer's technical representative.

.2 Monitor and report installation procedures and unacceptable conditions.

3.6 Cleaning

.1 Clean surfaces adjacent to joints. Immediately remove sealant smears or other soiling resulting from application of sealants.

.2 Remove masking tape and other residue.

.3 Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.7 Protection

.1 Protect joint sealants:

.1 During and after curing period from contact with contaminating substrates.

.2 From damages by construction operations or other causes.

.2 If damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated sealants immediately.

End of section

1 General

1.1 General requirements

.1 General Conditions, Supplementary Conditions and Division 01 apply to this section.

1.2 Section includes

.1 This Section includes requirements for supply and installation of the following:

.1 Exterior and Interior Steel Doors

.2 Exterior and Interior Steel Door Frames

.3 Sidelight Frames

.4 Fire rated door and frame assemblies

1.3 Related requirements

.1 Section 07 92 00 – Sealants

.2 Section 08 70 00 – Hardware

.3 Section 08 80 00 – Glazing

.4 Section 09 90 00 – Painting

1.4 Definitions

.1 Base Metal Thickness: Thickness dimensions are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic coated steel sheets.

.2 Opening Sizes: door sizes indicated on Drawings are considered nominal dimensions, measured from frame rabbet width and height, with allowances for nominal clearances between head, jamb and door bottom in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

1.5 References

.1 American National Standards Institute (ANSI):

.1 ANSI/SDI A250.7-1997 (R2002), Nomenclature for Standard Steel Doors and Steel Frames

.2 ANSI/SDI A250.11-2001, Recommended Erection Instructions for Steel Frames.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

.3 ASTM A924/A924M-10a, Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process.

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 1.132-M90, Primer, Zinc Chromate, Low Moisture Sensitivity

.2 CAN/CGSB 41-GP-19Ma-78(1984), Rigid Vinyl Extrusions for Windows and Doors

.3 CAN/CGSB 82.5-M88, Insulated Steel Doors

.4 Canadian Standards Association (CSA):

.1 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding)

.5 Canadian Steel Door Manufacturers Association (CSDMA):

.1 Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2007

.2 Fire Labelling Guide, 2009

.6 National Fire Protection Association (NFPA):

.1 NFPA 80-2010, Fire Doors and Windows

.2 NFPA 252-2012, Fire Tests of Door Assemblies

.7 Underwriters Laboratories Canada (ULC):

.1 CAN4 S104-M80 (R1985), Fire Tests of Door Assemblies

.2 CAN/ULC S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC S104

.3 CAN4 S106-1980 (R1985), Standard Method for Fire Tests of Window and Glass Block Assemblies

1.6 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data:

.1 Submit product data for each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, fire resistance ratings, and finishes.

.2 Shop Drawings:

.1 Show each type of frame, door, hardware blanking, reinforcing, tapping and drilling arrangements, metal gauges, thicknesses and finishes.

.2 Show details of doors including vertical and horizontal edge details.

.3 Submit door and frame schedule identifying each unit. Each unit shall bear a legible identifying mark corresponding to that listed in the door and frame schedule.

.3 Samples:

.1 Supply for Consultant's review, if requested, sample of frame corner showing construction, workmanship and finish.

.4 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Source Quality Control Submittals: Submit information on zinc coating treatment and primer spot treatment, including instructions for surface treatment before site painting and any restrictions or special coating requirements.

.5 Certificates: Submit the following certificates or letters of compliance:

.1 Oversize Compliance: Submit oversize construction evidence indicating compliance with fire labelling for door and frame assemblies required to be fire protection rated and exceeding size limitations of labelled assemblies.

1.7 Quality assurance

.1 Manufacturer: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer, and as follows:

.1 Fabricate work of this Section to meet the requirements of the Canadian Steel Door and Frame Manufacturer's Association, Manufacturing Specification for Doors and Frames as a minimum, and as further modified in this section.

.2 Fabricator shall be a member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.

.2 Supplier: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer.

.3 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.

.4 Testing Agencies: Provide doors produced under label service program of a testing agency acceptable to Authorities Having Jurisdiction, and as follows:

.1 Steel Fire Rated Doors and Frames: Labelled and listed by an organization accredited by Standards Council of Canada for ratings specified or indicated.

.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:

.1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.2 Fabricate all rated doors, frames and screens to labelling authority standard.

1.8 Delivery, storage and handling

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.

.2 Adequately protect units against rust and damage during manufacture, delivery and storage.

.3 Store materials on planks in a dry area and cover to protect from damage. Make good immediately any damage done. Clean scratches and touch-up with rust-inhibitive primer.

1.9 Site conditions

.1 Site Measurements: Verify actual dimensions of openings by site measurements before fabrication and indicate measurements on shop drawings; coordinate fabrication schedule with construction progress to avoid delaying the Work.

.2 Established Measurements: Establish dimensions and proceed with fabricating doors and frames without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements

2.2 Materials

.1 Sheet Steel:

.1 Exterior Doors and Frames: Galvanized, AS120, steel sheets in accordance with ASTM A924/M924-14; coated to meet requirements of ASTM A653/A653M, Commercial Steel (CS), Type B; stretcher levelled standard of flatness where used for face sheets.

.2 Interior Doors and Frames (Normal Humidity): Electrolytic zinc coated steel sheets in accordance with ASTM A879/A879M-12, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher levelled standard of flatness.

.2 Gauges:

.1 Door and Screen Frames:

.1 Gauge: 16 msg

.2 Doors (Honeycomb or Polystyrene Core):

.1 Door Faces:

.1 Gauge: 18 msg.

.3 Top and Bottom End Channels:

.1 Gauge: 18 msg.

.4 Reinforcements:

.1 Lock and Strike Reinforcements:

.1 Gauge: 16 msg.

.2 Hinge Reinforcements:

.1 Gauge: 10 msg.

.3 Flush Bolt Reinforcements:

.1 Gauge: 16 msg.

.4 Door Closer or Holder Reinforcements:

.1 Gauge: 12 msg.

.3 Anchors:

.1 As required to suit condition.

.4 Rubber Bumpers:

.1 Three (3) per door.

.5 Weatherstrip:

.1 Extruded aluminum with vinyl insert #W13 for head and jambs and #W5 for pairs of doors without mullions, manufactured by Crowdertrack Limited; or

.2 Approved alternate.

.6 Door Cores:

.1 Interior doors, except fire rated doors: Structural small cell; 25 mm (1 in.) maximum, kraft paper honeycomb; minimum weight 36 kg/ream; minimum density 16.5 kg/m^3; sanded to required thickness.

.2 Exterior doors: Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701-11, Type 4, minimum thermal resistance R-Value of 4.5/25 mm thickness.

.7 Adhesives:

.1 Core Adhesive: Heat resistant, single component adhesive recommended by manufacturer.

.8 Touch-Up Primer: Rust inhibitive primer meeting CAN/CGSB 1.132, touch up zinc coatings using shop applied primer; grey or red coloured primer, clear primer not acceptable; provide additional primer for site touch-up to repair damaged zinc and shop applied coatings.

.9 Accessories:

.1 Glazing Stops:

.1 Glass mouldings: Formed steel having 0.8 mm (1/32 in.) metal core thickness, screw fixed.

.2 Accurately fit and butt at corners glazing trim and stops; located on secure side of door, or interior of room window frame.

.2 Sealant: As specified in Section 07 92 00 – Sealants.

.3 Glass and Glazing: As specified in Section 08 80 00 – Glazing.

.4 Door Silencers (Bumpers or Mutes): Manufacturer's standard black or grey neoprene silencers; three silencers on strike jambs of single door frames; two silencers on heads of double-door frames; stick on bumpers are not acceptable.

.10 Materials for fire rated doors shall conform to ULC or ULI requirements.

2.3 Fabrication and manufacture

.1 Gauges of metal shall be as specified. No deviations or substitutions will be accepted

.2 Doors are to be fabricate doors to 45 mm overall thickness, and size as indicated on drawings.

.3 Reinforcing specified is the minimum acceptable. Provide additional reinforcement where required to ensure a permanent, rigid, trouble free installation able to withstand the stresses of heavy commercial usage.

.4 Cut, shear, straighten and work the steel in manner to prevent disfigurement of the finished work.

.5 Punch frames for rubber door bumpers.

.6 Fill seams, joints and weld depressions with epoxy metal filler, disc sand to a smooth, flat, uniform scratch-free surface, with all arrises sharp and true to line. Drilled and punches holes shall be reamed and have all burrs removed.

.7 Finished work shall be free of warp, open seams, buckles, weld and grind marks and other surface defects detrimental to the production of a good paint finish.

.8 Fastenings shall be concealed except those required for loose glazing stops.

.9 Welding shall conform to CSA W59-03 (R2008).

.10 Hardware Requirements:

.1 Blank, mortise, reinforce, drill and tap doors and frames to receive templated hinges and other hardware as required. Check hardware lists for requirements.

.11 Frames:

.1 Fabricate frames to profiles shown. Frames shall be fabricated to suite the header conditions of masonry work. Mitre corners of frames. Cut frame mitres accurately and weld continuously on inside of frame. Fabricate header frame to suit. Where site welding or splicing is required due to size of unit, the location of field joints shall be shown on the shop drawings and strictly adhered to.

.2 Protect strike and hinge reinforcements and other openings with mortar guard boxes welded to frame.

.3 Cutouts in doors for mortise lock sets shall be fitted with leaf spring clips and back limit stop to facilitate easy positioning and setting of locksets.

.4 Weld floor clip angles to inside of each jamb profile, two holes in each for anchorage to floor. Where required provide adjustable type floor clip angles.

.5 Fit frames with channel or angle spreaders, two per frame, to ensure proper frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting and during construction.

.6 Where frames occur in masonry provide and adjustable T-strap type or wire type anchor for every 2 ft. 0 in. of jamb length. Special anchors for frames to be set in concrete shall be as detailed.

.7 Construct door frames of labelled fire doors as approved by ULC or ULI. Ratings for frames shall match doors. Locate label on the frame jamb midway between the top hinge and the head of door frame so that it is concealed when the door is closed.

.8 Provide continuous weatherstripping at head and jambs of exterior door frames. Properly secure in place with screws and adjust as required.

.9 Insulate exterior frames to provide continuous thermal barrier in exterior frames.

.12 Doors:

.1 Fabricate doors to present one continuous face free from joints, tool markings and abrasions.

.2 Reinforce, stiffen honeycomb doors with small cell honeycomb core laminated to the inside faces of panels. The core shall completely fill the inside hollow of the door.

.3 Reinforce around frame openings required for glazing or louvers. Provide glazing stops with countersunk oval head screws.

.4 Exterior doors shall be completely filled with polystyrene foam core.

.5 Reinforce door edges with channel reinforcing. Bevel stiles 3 mm (⅛ in.). Assemble by tack welding and fill.

.6 Provide flush top edge on exterior doors.

.7 Fabricate fire rated door assemblies in accordance with ULC or ULI requirements. Provide labels for all fire rated doors. Locate label on the door midway between the top hinge and the head of the door so that it is concealed when the door is closed.

.8 Provide cutouts in doors for glazed lites as indicated on drawings and schedules. Glazing stops shall be square formed steel in single piece lengths sized to suit. Accurately mitre corners and finish in proper plane. Secure stops in place with flush, countersunk screws.

.13 Finishing

.1 Shop apply zinc rich primer to repair damaged zinc coatings arising from fabrication; cure primer fully before shipping to site; include compatible primer for site finishing and correction of surface abrasions to zinc coatings and factory applied primer.

.2 Remove weld slag and splatter from exposed surfaces.

.3 Fill and sand smooth tool marks, abrasions and surface blemishes to present smooth uniform surfaces.

3 Execution

3.1 Examination

.1 Examine substrates, door swing arcs, areas of installation and conditions affecting installation for compliance with requirements for manufacturer's installation tolerances and other conditions affecting performance of work of this Section.

.2 Verify roughing-in for embedded and built-in anchor locations before installing frames.

.3 Verify door and frame size, door swing and ratings with door opening number before installing frames.

.4 Installation of hollow metal doors and frames will denote acceptance of site conditions.

3.2 Installation

.1 Install steel doors, frames, and accessories in accordance with reviewed shop drawings, ANSI A250.11, CSDMA Installation Guide, manufacturer's data, and as specified in this Section.

.2 Door Frames:

.1 Remove temporary spreaders before installing door frames, leaving exposed surfaces smooth and undamaged.

.2 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set; limit of acceptable frame distortion 2 mm (1/16 in.) out of plumb measured on face of frame, maximum twist corner to corner of 3 mm (⅛ in.); align horizontal lines in final assembly.

.3 Brace frames rigidly in position until adjacent construction is complete; install wooden spreaders at third points of frame rebate to maintain frame width, install centre brace to support head of frames 1 mm 4 ft. and wider in accordance with ANSI A250.1; do not use temporary metal spreaders for bracing of frames.

.4 Install glazing materials and studded door silencers.

.5 For frames over 1,220 mm (4 ft.) in width, provide vertical support at the centre of head.

.3 Frame Tolerances: Install frames to tolerances listed in ANSI A250.11, and as follows:

.1 Squareness: Maximum 0.8 mm (1/32 in.) measured across opening between hinge jam and strike jamb.

.2 Plumbness: Maximum 0.8 mm (1/32 in.) measured from bottom of frame to head level.

.3 Alignment: Maximum 0.8 mm (1/32 in.) measured offset between face of hinge jamb and strike jamb relative to wall construction.

.4 Twist: Maximum 0.8 mm (1/32 in.) measured from leading edge of outside frame rabbet to leading edge of inside frame rabbet.

.4 Doors:

.1 Fit hollow metal doors accurately in frames within clearances required for proper operation; shim as necessary for proper operation.

.2 Install hardware in accordance with manufacturers' templates and instructions.

.3 Adjust operable parts for correct clearances and function.

.4 Install glazing materials and door silencers.

.5 Install fire rated doors within clearances specified in NFPA 80-2010.

.6 Install louvers and vents.

.5 Adjusting and Cleaning

.1 Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of air-drying primer compatible with factory applied primer, and as follows:

.1 Clean exposed surfaces with soap and water to remove foreign matter before site touch-up.

.2 Finish exposed site welds to a smooth uniform surface and touch-up with site applied rust inhibitive primer.

.3 Site apply touch-up primer on exposed surfaces where zinc coating or factory applied primer has been damaged during installation or handling.

End of section

1 General

1.1 Section includes

.1 Flush wood doors; flush configuration; fire rated and non-fire rated.

.2 Factory finishing wood doors.

.3 Factory machining for hardware.

1.2 Related requirements

.1 Section 08 11 13 – Steel Doors and Frames

.2 Section 08 70 00 – Hardware

.3 Section 08 80 00 – Glazing

.4 Section 09 90 00 – Painting

1.3 Reference standards

.1 AWMAC (Architectural Woodwork Manufacturers' Association of Canada) - Quality Standards Illustrated (QSI), latest edition.

.2 CAN/CSA-0132.2 Series - Wood Flush Doors.

1.4 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

.3 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.4 Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, door/transom rebates, special bevelling, special blocking for hardware, factory machining criteria, factory finishing criteria.

.5 Samples:

.1 Submit three sets of finished samples of each species and cut of wood to be used. Veneer samples minimum 304 mm x 304 mm. Each sample set of three to represent range of colour and grain expected

.2 Colour Samples of Factory Finishing: submit samples not less than 102x152 mm size labeled with sample production date, of representative finish indicating range of colour and variation that can be expected.

.3 Construction Samples. Corner sections with door faces, edges, and core representative of the specified door type(s). Corner samples to be not less than 152 x 228 mm.

.4 Field Quality Control Sample: Provide one extra full sized door panel, of most common type of door construction specified to be randomly selected in field and cut apart to verify specified construction.

1.5 Submittals for information

.1 Qualifications Data: For Manufacturer.

.2 Installation Data: Manufacturer's special installation requirements.

1.6 Quality assurance

.1 Quality Standard: Perform work in accordance with Architectural Woodwork Institute (AWI), Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Woodwork Institute's (WI) North American Architectural Woodwork Standards (NAAWS), Premium Grade.

.2 Finish doors in accordance with NAAWS, Premium Grade.

.3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years' documented experience.

1.7 Regulatory requirements

.1 Fire Rated Door and Transom Panel Assembly: Labelled and listed to CAN4-S104 or NFPA 252.

.2 Installed Fire Rated Door and Transom Panel: Conform to NFPA 80 for fire rated class as indicated.

1.8 Delivery, storage, handling and protection

.1 Package, deliver and store doors in accordance with referenced Quality Standard.

.2 Package doors individually in plastic bags.

.3 Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.9 Warranties

.1 Provide manufacturer's standard five (5) warranty covering repair or replacement of doors and transom panels that fail in materials or workmanship, as determined in accordance with Quality Standard.

.1 Include coverage for delamination of veneer, warping or bowing beyond specified installation tolerances, defective materials and telegraphing core construction.

.2 Include installation and finishing to repair or replacement of defective doors and transom panels.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Acceptable manufacturers

.1 Lambton Doors;

.2 Lynden Door Inc.;

.3 Baillargeon Doors Inc.;

.4 VT Industries; or

.5 Approved alternate.

2.3 Flush wood doors

.1 Doors to meet requirements of ANSI/WDMA Heavy Duty performance values.

.2 AWMAC Grade: Premium (Architectural).

.3 Thickness of door: 45 mm

.4 Door Facing:

.1 Exposed wood veneer (WD): Graded in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 4 requirements for quality grade specified; Grade: A and as follows:

.1 Exposed wood veneer: Refer to Schedule of Finishes, of quality suitable for transparent finish, certified to FSC STD-04-004.

.1 Veneer Matching: Book match

.2 Matching of Wood Veneer Leaves within a Panel: Balanced match.

.2 Cross banding Behind veneer finish: Minimum 1.6mm thick of composite material.

.3 Adhesive: Type recommended by NAAWS to suit application.

.5 Door Core Material:

.1 Solid core wood doors: Urea Formaldehyde free agrifiber or solid Particleboard Core. Meeting performance criteria specified.

2.4 Solid core wood doors

.1 5 ply construction consisting of bonded and sanded core with no voids.

.2 Thickness of door: 45 mm

.3 Stile and rail frame with wood lock blocks bonded to core as a complete assembly prior to application of face panels, factory finished.

.4 Adhesive: Low VOC, Type I PVA waterproof adhesive.

.5 Edge Material: Exposed vertical edges and horizontal edges. Hardwood vertical edges of wood species, to match veneer with clear factory finish.

2.5 Fabrication

.1 Fabricate non-fire rated doors and transom panels in accordance with Quality Standard requirements.

.2 Fabricate fire rated doors and transom panels in accordance with Quality Standard and in accordance with regulatory requirements specified. Attach fire rating labels to doors and transom panels.

.3 Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.

.4 Install glazing in accordance with Section 08 80 00 - Glazing. Provide flush moldings.

.5 Vertical Exposed Edge of Stiles: Of same species as veneer facing.

.6 Fit door edge trim to edge of stiles after applying veneer facing.

.7 Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.

.8 Factory fit doors and transom panels for frame opening dimensions identified on shop drawings.

.9 Provide edge clearances in accordance with Quality Standard.

.10 Overlap and recess tops of doors at transom panels; doors and transom panels flush both faces.

2.6 Factory finishes

.1 Factory finish doors and transom panels in accordance with Quality Standard and reviewed sample on all edges of door, and as follows:

.1 Transparent Finish: Grade NAAWS Premium Grade, waterbased polyurethane, satin sheen. Stain as selected by Consultant from verification samples.

.2 Seal all horizontal edges, edges of cutouts, and mortises with colour sealer.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that opening sizes and tolerances are acceptable.

.3 Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

.4 Doors should not be delivered to site until the Humidity in building is between 25-55 %.

3.2 Installation

.1 Install non-fire rated doors in accordance with Quality Standard.

.2 Install fire rated doors to NFPA 80 latest version.

.3 Align and fit doors in frames with uniform clearances and bevels. Align factory-fitted doors in frames for uniform clearance at each edge.

.4 Set transom panels in concealed acoustic sealant. Remove visible sealant.

.5 Restore finish of factory-finished doors before installation, if fitting or machining is required at site.

.6 Trim door height by cutting bottom edges to a maximum of 19 mm. Trim fire rated door height at bottom edge only, in accordance with fire rating requirements.

.7 Machine cut for hardware for non-fire rated doors.

.8 Coordinate installation of doors with installation of frames and hardware specified in other Division 08 Sections.

3.3 Installation tolerances

.1 Conform to Quality Standard for fit and clearance tolerances.

.2 Conform to referenced Quality Standard requirements for maximum diagonal distortion.

3.4 Adjusting

.1 Touch up finished items after installation.

.2 Adjust doors for smooth and balanced door movement.

.3 Adjust closer for full closure.

End of section

1 General

1.1 Section includes

.1 Fire rated and non-fire rated access door and frame units for access to equipment or spaces where similar items are not specified in plumbing, mechanical, and electrical Sections;

.1 Wall and ceiling locations.

.2 Oversized aluminum access doors for plumbing chase access.

1.2 Performance requirements

.1 Fire-Resistance Ratings: As indicated. Where not indicated, not less than that of adjacent construction.

.2 Fire Rated Access Doors and Frames: Units conforming to NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test methods and that are listed and labelled by ULC or another testing and inspecting agency acceptable to authorities having jurisdiction:

.1 NFPA 252 or UL 10B, as acceptable to authorities having jurisdiction, for fire rated access door assemblies installed vertically.

.2 NFPA 288 for fire rated access door assemblies installed horizontally.

1.3 Administrative requirements

.1 Coordination: Coordinate with other work having a direct bearing on work of this Section.

.1 Coordinate the work with other work requiring access doors.

.2 Coordination Drawings: Participate in the provision of the Coordination drawings; refer to Section 01 31 00 – Project Management and Coordination.

1.4 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

.3 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.4 Samples: Submit two 300 x 300 mm samples of each type of access unit, illustrating frame configuration, anchors and hardware.

.5 Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

.1 Include joinery, including concealed welds, anchorage, expansion provisions, flashing and drainage, and wall trim.

.2 Include samples of hardware and accessories involving colour selection.

.3 Include samples of each type of finish and colour.

1.5 Submittals for information

.1 Installation Data: Manufacturer's special installation requirements, rough-in dimensions and fire resistance ratings.

1.6 Closeout submittals

.1 Record Documentation: Record actual locations of all access units.

1.7 Quality assurance

.1 Perform Work in accordance with Underwriter’s Laboratory of Canada (ULC) Assembly Design requirements or designs of another testing and inspecting agency acceptable to authorities having jurisdiction.

.2 Source Limitations: To greatest extent possible obtain each type of access door and frame from single source from single manufacturer.

1.8 Regulatory requirements

.1 Conform to applicable code for fire rated access doors.

.2 Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.

2 Products

2.1 Materials – general

.1 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Manufacturers

.1 Subject to conformance with the requirements of this Section provide products by one of the following manufacturers:

.1 Milcor Inc.;

.2 Nystrom Inc.;

.3 Bauco Access Solutions Inc.; or

.4 Approved alternate.

2.3 Access units - walls

.1 Fire Rated Metal Wall Access Door and Frame Unit: Flush, Insulated, Gypsum Board Construction.

.1 Frame: 1.6 mm thick.

.2 Door Panel: Minimum 1.02 mm thick welded pan door panel insulated with non-combustible filler. Self-closing, self-latching, with interior latch release.

.3 Hinges: Fully concealed pin type, or continuous piano, 175 degree opening.

.4 Latch: Ring turn latch.

.5 Rating: 1.5 hour “B” label at rated partitions, unless noted otherwise.

.6 Sizes: Minimum 300 mm square for single valves, for hand access, 400 mm square for groups of valves, 600 mm square for body access.

.7 Style: To match style of product 'UFR' by Milcor, or approved alternate.

.2 Fire Rated Metal Wall Access Door and Frame Unit: Exterior, Insulated, Masonry and Gypsum Board Construction.

.1 Door: 1.02 mm galvanized steel, insulated sandwich type construction.

.2 Frame and Flange: 6063-T5 extruded aluminum, 2 mm thick.

.3 Hinge: Stainless steel continuous piano type.

.4 Latching / Locking Device: Key operated chrome plated handle.

.5 Insulation/Density/Thermal Resistivity: Foam type, 36 kg/m^3 (2.25 lb/cu. ft), RSI 2.3.

.6 Gasket: Extruded Santoprene.

.7 Sizes: 300 x 300 mm.

.8 Style: To match style of product 'XTL' by Nystrom, or approved alternate.

.3 Non-Fire Rated Metal Access Door and Frame Unit: Flush, Gypsum Board or Masonry Construction.

.1 Frame: 1.6 mm.

.2 Door Panel: Minimum 1.9 mm thick, integral attachment flange and drywall bead for flush installation.

.3 Hinges: Fully concealed pin type, or continuous piano type, 175 degree opening.

.4 Latch: Ring turn latch.

.5 Sizes: Minimum 300 mm square for single valves; 400 mm square for groups of valves and 600 mm square for body access.

.6 Style: To match style of product 'DW' by Milcor or approved alternate for gypsum board partitions, and 'M' by Milcor or approved alternate for masonry walls.

.4 Non-Fire Rated Concealed Access Door and Frame Unit: Recessed, Gypsum Board Construction.

.1 Frame: Minimum 2.28 mm thick.

.2 Door Panel: Minimum 1.6 mm thick door panel recessed to receive drywall. Integral attachment flange and drywall bead for flush installation.

.3 Hinge: Fully concealed pivot rod hinge.

.4 Latches: Screw driver operated cam latch.

.5 Sizes: 300 x 300 mm size for hand access; 600 mm square size for man entry, unless indicated otherwise.

.6 Style: To match style of product ‘DW’ by Milcor, or approved alternate.

2.4 Access units - ceilings

.1 Fire Rated Metal Ceiling Access Door and Frame Unit: Flush, Insulated, Gypsum Board Construction.

.1 Frame: 1.6 mm thick.

.2 Door Panel: Minimum 1.02 mm thick welded pan door panel insulated with non-combustible filler. Self-closing, self-latching, with interior latch release.

.3 Hinges: Fully concealed pin type, or continuous piano, 175 degree opening.

.4 Latch: Ring turn latch.

.5 Rating: 1.5 hour “B” label, unless otherwise indicated.

.6 Sizes: 300 mm square for single valves, for hand access; 400 mm square for groups of valves; 600 mm square for body access.

.7 Style: To match style of product ‘ATR’ by Milcor, or approved alternate.

.2 Non-Rated Metal Ceiling Access Door and Frame Unit: Flush and Recessed, Gypsum Board Construction:

.1 Frame: 1.6 mm thick.

.2 Door Panel: Minimum 1.9 mm thick. Integral attachment flange and drywall bead for flush installation.

.3 Hinges: Fully concealed pin type, or continuous piano, 175 degree opening.

.4 Hardware: Screwdriver slot, quarter turn cam rock for interior locations.

.5 Sizes: 300 mm square for single valves, 400 mm square for groups of valves, and 600 mm square for body access.

.6 Styles: Flush panel for gypsum board; recessed panel for acoustical ceilings.

2.5 Fabrication - wall and ceiling units

.1 Fabricate components free of visual distortion or defects. Weld corners and joints.

.2 Provide for means to drain condensation occurring within components or assembly to outside.

.3 Weld, fill, and grind joints to ensure flush and square unit.

.4 Fit components for airtight or weather tight assembly, as applicable.

2.6 Oversized aluminum access doors

.1 Non-Rated Aluminum Door and Frame Unit:

.1 Frame: Heavy Duty door frame with applied stop, 3.2 mm thick; manufacturers standard depth

.2 Door Panel: Heavy Duty Minimum 1.9 mm thick. Integral attachment flange and drywall bead for flush installation.

.3 Hinges: Fully concealed pin type, or continuous piano, 175 degree opening.

.4 Hardware: Screwdriver slot, quarter turn cam rock for interior locations.

.5 Sizes: As indicated.

.6 Styles: Flush panel.

.7 Finish: Anodized Aluminum.

.8 Basis-of-Design Product: ‘Series 100BE Full Flush Doors’ manufactured by Cline Doors, or approved alternate.

.9 Substitutions: Refer to Section 01 25 00 – Substitution Procedures.

2.7 Finishes

.1 Interior and Dry Locations:

.1 Base Metal Protection: Prime coat units with alkyd baked on primer.

.2 Finish: Refer to Division 09 Section Painting.

.3 Stainless Steel: Where indicated, AISI Type 304, satin finish.

.2 Exterior, Wet Areas:

.1 Wet Areas: Type 316, Stainless Steel, AISI No. 7 polished and buffed finish; oil-ground, 180-grit finish followed by buffing and passivation.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that rough openings for door and frame are correctly sized and located.

.3 Verify and coordinate locations with Consultant prior to installation.

.1 Provide access panels or doors wherever any valves, traps, dampers, cleanouts, and other control items of mechanical, electrical; overhead door and swing door operator motors and controls are concealed in wall or partition, or are above ceiling of gypsum board or non-accessible ceiling system.

3.2 Installation

.1 Install units to manufacturer instructions.

.2 Install frames plumb and level in opening. Secure rigidly in place.

.3 Position unit to provide convenient access to concealed work requiring access.

.4 Adjust units for smooth operation.

End of section

1 General

1.1 Section includes

.1 Exterior, Standard Lift, thermally broken Aluminum Framed Sectional Door

.2 Lift hardware and door tracks,

.3 Power operator and controls.

1.2 Performance criteria

.1 Design sectional overhead insulated metal doors to operate at 1 kPa wind pressure, without detrimental effects.

.2 Seismic Performance: Design and size doors to withstand the effects of earthquake motions determined in accordance with applicable code

.1 Doors shall remain in place without separation of any parts when subjected to seismic forces specified.

.3 Operation Cycles: Provide door components and operators capable of operating for not less than 100,000 cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.3 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Provide general construction, component connections and details, and material finishes.

.3 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.4 Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, details of adjacent construction, and installation details. Show locations of devices for release system and means of access.

.1 Wiring Diagrams: For power, signal, and control wiring.

.2 Prepare Shop Drawings under direct supervision of a professional engineer.

.1 Include support framing items structural and physical characteristics, calculations, dimensional limitations.

.2 Each shop drawing to bear seal and signature of the professional engineer.

.5 Samples: Submit two (2) door slats and two (2) guides, 12 in. (300 mm) in size illustrating shape, and finish. Include paint finish colours for selection.

1.4 Submittals for information

.1 Qualifications Data: For Installer and professional engineer.

.2 Field quality control reports.

.3 Installation Data: Manufacturer's special installation requirements, including installation sequence and procedures, adjustment and alignment procedures.

1.5 Closeout submittals

.1 Operation and Maintenance Data: Indicate lubrication requirements and frequency, periodic adjustments required.

1.6 Quality assurance

.1 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience and approved by the manufacturer.

1.7 Project/site conditions

.1 Environmental Requirements

.1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.

.2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials; and regarding labelling and

provision of material safety data sheets acceptable to Human Resources Development Canada.

.3 Maintain temperature and humidity recommended by materials manufacturer's before, during and after installation.

.4 Conform to manufacturer's recommended temperatures, relative humidity and substrate moisture content for application and curing of adhesives and sealants including special conditions governing use.

1.8 Warranty

.1 Correct defective Work within a five (5) year period after Date of Substantial Performance.

.2 Warranty: Include coverage for electric motor and transmission.

.1 Provide five (5) year manufacturer warranty starting from Date of Substantial Performance for electric operating equipment.

2 Products

2.1 Materials – general

.1 Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components

.2 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Manufacturer and system

.1 Basis of Design: 'Alumatite A175' by Richards Wilcox Door Systems Limited or approved alternate.

2.3 Aluminum framed sectional door

.1 Aluminum sections fabricated from Stiles and Rails: 6063 - T6 aluminum alloy extrusions.

.1 Section joints: 6.3 mm ship-lap.

.2 Section Thickness: 44 mm.

.3 Center Stiles: 51 mm wide.

.4 End Stiles: 162 mm wide.

.5 Top Rail: 162 mm wide.

.6 Bottom Rail: 162 mm wide.

.2 Glazed Infill Panel:

.1 Provide 13 mm Sealed Insulated Glass Units, tempered glass, and warm edge spacer in accordance with Division 08 Section Glass Glazing.

.3 Insulated Bottom Section:

.1 Provide THERMATITE BOTTOM SECTION (Security Kick Panel) Insulated sections fabricated from pre-painted, hot dipped galvanized, steel sheet; with rigid polyurethane insulation core, CFC and HCFC free, face sheet stucco embossed and rib reinforced. Minimum R16.

.4 Spray foam insulation: Polyurethane expanding foam filled insulated rails and stiles with water resistant feature.

2.4 Counterbalancing system

.1 Doors shall be equipped with helical wound torsion springs having a minimum spring life of 100,000 cycles.

.2 Spring material shall be made of high tensile wire.

.3 Doors shall be supplied with solid steel shaft keyed the entire shaft length, in accordance with manufacturer's specifications.

2.5 Hardware

.1 Material: Zinc coated steel hinges and fixtures. Ball bearing rollers with hardened steel races.

.2 Seals:

.1 Standard continuous, replaceable dual seals between sections.

.2 Standard bottom seal: Vinyl bulb shaped astragal retained in bottom rail of the bottom section.

.3 Top seal: PVC/Vinyl type.

.4 Jamb seal: Dual fin vinyl/aluminum.

.5 Jamb seal: ADCA mount vinyl.

.3 Operation: Electric.

2.6 Hardware – track

.1 Track: Provide track as recommended by manufacturer to suit loading required and clearances available.

.2 Roll form door tracks 75 mm deep, heavy duty minimum 3 mm galvanized steel, mounted on continuous formed steel angles.

.3 Provide complete track assembly including brackets, bracing and reinforcing for rigid support of the track for the required door type and size. Slope tracks at proper angle from vertical to ensure tight closure at jambs when the door is closed. Weld or bolt to track supports.

.4 Track channel shall allow temperature change movements of the door to take place when subjected to extreme temperature variance between inside and outside.

.5 Reinforcements and Supports

.1 Provide galvanized steel track reinforcement and support members. Secure, reinforce and support tracks as required for size and weight of door to provide strength and rigidity and to ensure against sag, sway and detrimental vibration during opening and closing of doors.

.2 Support and attach tracks at opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal tracks with continuous angle in accordance with manufacturer's specification for size and weight of door.

.6 Hardware:

.1 Provide heavy-duty fully adjustable roller brackets to each end reinforcement plate as per manufacturer's recommendations. Use self-tapping fasteners to secure brackets to the door sections.

.2 Provide heavy-duty, rust-resistant hardware, with galvanized fasteners, to suit type of door.

.3 All bottom corner brackets shall be equipped with adjustable roller brackets. All brackets shall feature the locking wedge on the cable fastener for complete adjustments.

.4 Provide heavy-duty rollers, with ten (10) steel ball bearings in case-hardened steel races. Extend roller shaft through both brackets where double brackets are required. Provide roller tires to suit size of track.

.5 Vibration Isolators: Barry C-1010/Mason BRA-40 and Barry WR3-060/Mason HG-38 or approved alternate.

.7 Cable Drum:

.1 Provide cast aluminum cable drums grooved to receive the proper diameter cable for the weight of the door with two extra safety wraps and dual locking screws.

2.7 Electric operation

.1 Equipped with Automatic SFL push/pull, centre mount, geared trolley type openers, 208 V, 3-phase, 3/4 H.P. with emergency alarm and cable located within arm's reach, and c/w high torque anti-slip double V-drive belt.

.2 Provide: Rotary limits.

.3 Four inch friction clutch.

.4 #41 drive chain.

.5 Cast iron traveller.

.6 Hammond control panel Nema 12 mounted on wall using M.T.E. Controls 1.5 second time delay, or approved alternate.

.7 Power Supply: Refer to Electrical drawings and Division 26 of the Specifications.

.8 Heavy duty electrical motor, controller units, remote stations, relays and other electrical components to CSA and ULC approval with CSA enclosure type NEMA12.

.9 Control Panels:

.1 Tamper proof, open, close, stop push button station with keyed lock-out by door manufacturer. Provide two (2) keys with each control panel station.

.10 Sensors:

.1 Motion detector: mounted above overhead door on concrete header which will identify cars as they approach the overhead door. When detector activates, timer will reset, or if door is closing door will reopen allowing vehicle to enter the underground. When door is fully closed detector becomes inactive.

.2 Safety Photo Sensor: designed to identify pedestrians or vehicles travelling through opening.

.11 Safety Edge: Wireless, Featheredge on the leading edge of the bottom section wired to reverse the door closing in case it detects an obstruction.

.12 Programmable Receive: Overhead door can be opened from exterior by STAR programmable receiver using mini transmitter complete with logbook.

.13 Electrical Wiring and Conduits:

.1 To meet CSA standards and conforming to electrical code and OBC requirements.

2.8 Locking (electric operation)

.1 Shall be chain lock having electrical interlock switch so that the electric operator cannot start when the lock is engaged, with provisions for padlocks (by others).

2.9 Miscellaneous

.1 Provide all wood blocking, shims, bolts, washers, anchors, expansion shields, wiring, connectors and all other miscellaneous items necessary to complete the work of this Section.

2.10 Finishes

.1 Aluminum finish:

.1 Colour Finish: Powder coated to AAMA 2605 Standard.

.1 Colour: To be later selected by Consultant.

.2 Concealed Steel Items:

.1 Galvanized in accordance with ASTM A123 to 120 g/sq.

.2 Touch-Up Primer for Galvanized Steel Surfaces SPCC Paint 20 zinc rich.

3 Execution

3.1 Examination

.1 Examine substrates to receive the work of this section and ensure that work of other sections is complete and that there are no conditions which will adversely affect the work of this section.

.2 Notify the Construction Manager immediately of unsatisfactory conditions. Do not proceed with the work of this section until unsatisfactory conditions have been corrected.

.3 Commencement of the work of this section implies acceptance of surfaces and conditions.

3.2 Installation

.1 Install doors, tracks and operating equipment complete with necessary hardware, jamb and head mould stops, anchors, brackets and accessories.

.2 Install manually operated sectional overhead insulated metal doors where indicated on drawings.

.3 Install electrically operated sectional overhead insulated metal doors where indicated on drawings.

.4 Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress. Isolate motor mounts using "BRA Captive Mounts" type BRA-40, isolate track/frame anchors with other specified isolators. Compress washers 20 %.

.5 Install control panel stations for electric operators to be operated from floor level and located where indicated on drawings and where not indicated, as directed later by Consultant. Clearly identify each control panel station as to its function and which door it controls.

.6 Mount counterbalance mechanism with manufacturer's fully adjustable ball bearing brackets at each end of shaft. Furnish torsion shaft centre support bearings as required for size and weight of doors.

.7 Fasten vertical track assembly to framing at maximum 24 in. O.C.

.8 Install weather seals at heads, jambs and door bottoms as recommended by door manufacturer to form a continuous weathertight seal at door perimeter.

.9 Doors shall fit snugly to all edges of jambs and heads of frames and shall operate smoothly and freely under all conditions of operation. Position door in opening to ensure no drifting upward or downward.

.10 Control Wiring (Electric Operation):

.1 Supply and install complete all necessary control wiring to connect all parts of the equipment from electrical disconnect switch supplied and installed by Division 26. Run wiring in metal conduit, wire ducts or raceways concealed in the finished work. All electrical work and materials shall as minimum to comply with the requirements of the Canadian Electrical Code.

3.3 Adjusting

.1 Upon completion of work of this Section, and when directed by the Consultant, adjust and lubricate sectional overhead doors, check and adjust controls, ensure that all equipment and mechanisms are operating smoothly

3.4 Cleaning

.1 Clean and make good to the Consultant's approval, surfaces soiled or otherwise damaged in connection with the work of this Section. Contractor shall pay the cost of replacing finishes or materials that cannot be satisfactorily cleaned.

.2 On completion of the work of this Section, remove all debris, equipment and excess material from the site that results from the work of this Section.

3.5 Demonstration

.1 Demonstrate the operation, control and safety features of each door to the Consultant and the Owner.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for the supply and installation of interior and exterior storefront systems and aluminum framed doors.

1.2 Related requirements

.1 Section 08 44 13 – Glazed Aluminum Curtain Wall

.2 Section 08 70 00 – Hardware

1.3 References

.1 Aluminum Association (AA):

.1 Aluminum Design Manual, Latest Edition

.2 American Architectural Manufacturers Association (AAMA):

.1 AAMA 501-05, Methods of Test for Exterior Walls

.2 AAMA 611-12, Voluntary Specification for Architectural Anodized Aluminum

.3 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

.4 AAMA 2603-13, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

.5 AAMA 2604-13, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coating on Aluminum Extrusions and Panels

.6 AAMA 2605-13, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coating on Aluminum Extrusions and Panels

.7 SFM-1-87, Aluminum Storefront and Entrance Manual

.3 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-06, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.2 ASTM A167-99 (R2004), Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.3 ASTM B209/209M-04, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

.4 ASTM B221/B221M-05, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

.5 ASTM B308/B308M-02, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles

.6 ASTM B429-02, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

.7 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

.8 ASTM E331-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

.9 ASTM E783-02(2010), Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

.10 ASTM E1105-00(2008), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference

.4 Canadian Standards Association (CSA):

.1 CAN/CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels

.2 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures

.3 CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum.

.4 CSA W59-03(2008), Welded Steel Construction (Metal Arc Welding), Metric.

.5 CSA W59.2-M1991(R2013), Welded Aluminum Construction

.5 Canadian Welding Bureau (CWB Group Industry Services):

.1 CWB 112E, 93-1, Welding Symbols Study Guide

.2 CWB 113E, 94-1, Weld Quality and Examination Methods Study Guide

.6 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International):

.1 Surface Preparation Guidelines:

.1 SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates

.2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems

1.4 Work supplied but installed by other sections

.1 Supply inserts, anchors and other items to be built into work of other sections and required for support of aluminum framed entrances and storefronts.

.2 Provide clear instructions and, if required setting templates to ensure accurate setting of components.

1.5 Quality assurance

.1 System Manufacturer's Qualifications:

.1 Minimum five (5) years continuous Canadian experience in successful production of work of type and quality specified. Submit proof of experience upon Consultant's request.

.2 Erector's Qualifications:

.1 Manufacturer's forces or forces licensed by manufacturer. Work of this section shall be performed by workers trained and experienced in the type of work specified. A manufacturer's representative shall be at the site during erection of system to direct the various stages of operations.

1.6 Administrative requirements

.1 Pre-Construction Meeting: Conduct a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings, on site to review methods and procedures related to aluminum framed entrances and storefronts including, but not limited to, the following:

.1 Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

.2 Review location and alignment of vertical and horizontal elements as they relate to the aesthetic criteria indicated on the Drawings, and the technical requirements indicated on the shop drawings.

1.7 Design and performance requirements

.1 Details and information indicated on drawings are schematic, showing general intent only and shall not be considered or construed to be the engineering design for the system or to be complete or adequate to meet the design criteria.

.2 Make thorough examination of drawings and details, check anchorage, structural deflections, shading factors, size and shape of glass, system of sealing, location of heating units, interfacing requirements with work of other sections and other factors influencing design and performance of aluminum framed entrances and storefronts.

.3 Design interior storefront to the following performance requirements:

.1 Uniformly distributed design load of 0.72 kPa (15 psf) and to resist all loads required by Part 4 of the Ontario Building Code where the storefront or screen acts as a guard as defined by the Ontario Building Code design storefront and glass assembly.

.4 Design Exterior entrances and storefronts in accordance with Section 08 44 13 – Glazed Aluminum Curtain Wall. Design, fabricate and erect storefront framing system to meet or exceed the following minimum requirements:

.1 Design system based on the rain screen, pressure equalization principle. The storefront system must form an air sealed envelope

on the building. Ensure that all ties to other building envelope components are air sealed.

.2 Design components to sizes and profiles indicated, reinforced if required, to limit deflection to L/200 maximum under positive and negative peak wind design gust pressures, in accordance with OBC Climatic Design Data (50 year probability), in accordance with ASTM E330-90.

.3 Make provisions to accommodate thermal and structural movement, including building structural framing deflection and creep, in component parts of system and fastenings without joint seal failure, glass breakage and other detrimental effects.

.4 Prevent water infiltration into building through system, when system is subjected to water spray at 5 gals/sf/hr maintained for 15 minutes with static pressure difference across system of 4 psf, in accordance with ASTM E331-86.

.5 Limit air infiltration and exfiltration through system to maximum .02 cfm/sf when subjected to static pressure of 1.57 psf, in accordance with ASTM E283-84.

.6 Provide effective vapour seal at inside face of system, designed to prevent detrimental condensation and ice build-up within system.

.7 Prevent condensation and frosting on inside surfaces of system when subjected to outside temperature of -25 deg C and 15 mph wind and inside temperature of +20 deg C/25% R.H.

.8 Limit temperature difference between central and edge portions of any pane of glass to less than the maximum permissible value stated by glass manufacturer.

.9 Design thermal barrier connection to achieve complete metal-to-metal separation between main framing and glass retention members except for screw fasteners. Assembled frame section shall have a maximum "U" factor of .455 Btu/(sf/hr/deg F).

1.8 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Shop Drawings:

.1 Furnish complete shop and erection drawings required for the work of this section to the Consultant for review prior to fabrication. Shop drawings shall bear the seal and signature of a Professional Engineer registered to practise at the Place of Work.

.2 Co-ordinate shop drawings for work of this section with those for other trades to ensure correct interface details required to provide watertight installation.

.3 Shop drawings shall incorporate plans, elevations, sections and details for all work in this Section. The details shall show and specify all metal and glass thicknesses, types and finishes; areas to be sealed and sealant materials; gaskets; glazing methods; direction and magnitude of thermal expansion; type of construction including joinery, fasteners and welds; all anchorage assemblies and components; connections, fastenings, shapes and finishes; the fabrication and erection tolerances for the work in this section and the adjoining related work of other sections.

.4 Product Data:

.1 Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

.5 Test Data:

.1 If requested by Consultant, submit test data from a recognized independent testing agency, acceptable to Consultant, verifying that specified requirements are being met. Test results may be from a previous testing program conducted on a system similar to that specified herein.

.6 Samples:

.1 Submit duplicate minimum 51 mm x 102 mm (2 in. x 4 in.) samples of each type of aluminum finish specified. Upon Consultant's request, furnish samples of glass types, gaskets, tapes and sealants.

.7 Safety Data Sheets:

.1 Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on site for reference by workers.

.8 Maintenance and Glazing Instructions:

.1 On completion of work of this section, supply maintenance and glazing instructions for insertion into the Operating and Maintenance Manual.

1.9 Storage, delivery, handling and protection

.1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location.

.2 Assembled units and their component parts shall be transported, handled and stored in a manner to preclude damage of any nature.

.3 Ship and store pre-glazed units in upright position only or use method which will positively prevent extrusion of sealants and shifting of glass within framing.

.4 Accessory materials required for erection at the site shall be delivered to the site in manufacturer's labelled containers.

.5 Remove all units or components which are cracked, bent, chipped, scratched or otherwise unsuitable for installation and replace with new.

1.10 Site conditions

.1 Provide safe and adequate equipment on the site to execute the work of this section, including scaffolding, staging, hoisting, safety protection equipment, tools, plant and other equipment required for the completion of the work of this section.

.2 Site Measurements: Verify actual locations of structural supports for aluminum framed entrance and storefront systems by site measurements before fabrication and indicate measurements on Shop Drawings.

.3 Established Dimensions: Establish dimensions and proceed with fabricating aluminum framed entrance and storefront systems where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.11 Warranty

.1 Provide a five (5) year warranty to correct defective Work, starting from date of Substantial Performance; include coverage for complete system against failure to meet specified requirements.

.2 Warrant insulating glass units in accordance with Section 08 80 00 - Glazing.

.3 Provide ten (10) year manufacturer warranty for metal finishes, starting from date of Substantial Performance. Failures shall include excessive fading, non-uniformity of colour, cracking, peeling, delamination and corrosion.

.4 Warranties shall include removing and replacing covering and adjacent components and finishes. Warranty period shall recommence on remedied work.

2 Products

2.1 Manufacturers

.1 Basis-of-Design products are named in this Section; additional manufacturers offering similar aluminum framed entrance and storefront systems may be incorporated into the work provided they meet the performance requirements established by the named products.

.2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 Alumicor Limited;

.2 Oldcastle Building Envelope;

.3 Kawneer Canada Ltd.;

.4 US Aluminum; or

.5 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Aluminum:

.1 Extrusions: AA6063-T5 alloy, anodizing quality, conforming to ASTM B221-92a.

.2 Plate and Sheet: AA1100-H14 alloy, anodizing quality unless otherwise indicated minimum 3 mm (0.125 in.) thick, conforming to ASTM B209-92a.

.3 Thresholds and Sills: AA6061-T6 alloy, anodizing quality, conforming to ASTM B221-92a.

.4 Exposed surfaces of aluminum shall be free of die marks, scratches, blisters, "leave-off" marks, or other blemishes, whether left unfinished or finished.

.5 Aluminum Welding Materials: Conforms to CSA W59.2.

.2 Structural Steel Sections and Steel Plate:

.1 Conforms to CAN/CSA-G40.20/G40.21, Grade 300W. Hollow steel sections shall conform to CAN/CSA-G40.20/G40.21, Grade 350W, Class H.

.2 Steel Welding Materials: Conforms to CSA W59.

.3 Galvanized Steel Sheet:

.1 Commercial grade, stretcher levelled or temper rolled conforming to ASTM A525-91b with galvanized zinc G90 (Z275) coating conforming to ASTM A526/A526M-90.

.4 Insulating Glass and Spandrel Panel: As indicated in Section 08 80 00 – Glazing.

.5 Glazing Materials: As indicated in Section 08 80 00 – Glazing.

.6 Insulation Materials: As indicated in Section 07 21 00 – Thermal Insulation.

.7 Sealant Materials: Refer to Section 07 92 00 – Sealants.

.8 Zinc Rich Paint:

.1 Ready mixed, zinc rich primer conforming to CAN/CGSB-1.181, 'Sealtight Galvafroid Zinc-Rich Coating' by W.R. Meadows of Canada Limited, or 'Zinc Clad No.7 Organic Zinc Rich Primer' by Sherwin Williams Company of Canada Ltd, or approved alternate.

.9 Bituminous Paint: Conforming to CAN/CGSB-1.108, Type 2.

.10 Fasteners: "400" Series stainless steel, or "300" Series stainless steel.

.11 Flexible Flashings: As indicated in Section 04 21 13 – Brick Veneer Masonry.

.12 Firestopping: Refer to Section 07 84 00 – Firestopping and Smokeseals.

.13 Aluminum Flashings: As indicated in Section 07 62 00 – Prefinished Metal Flashing and Trim.

.14 Aluminum Sills:

.1 Extruded or formed type aluminum sills, minimum 2 mm (3/32 in.) thick, with three coat fluoropolymer thermal setting enamel finish to match aluminum caps.

2.4 Exterior entrance doors

.1 Manufacturer's extruded aluminum glazed doors for manual swing operation, reinforced as required to withstand traffic conditions.

.2 Exterior Door Type 1:

.1 Construction: Medium stile, thermally broken frame sections.

.2 Glazing Method: Square stops for sealed glazing, with non-removable glazing stops on outside of door.

.3 Basis-of-Design Material:

.1 Alumicor Insuldoor Canadiana Entrance Doors Basic Door Series 600A; or

.2 Kawneer 560 Insulclad Thermal Entrances Series; or

.3 Approved alternate.

2.5 Interior entrance doors

.1 Interior Door Type:

.1 Construction: Medium stile, non-thermally broken frame sections.

.2 Glazing Method: Square stops for single glazed doors, with non-removable glazing stops on outside of door.

.3 Basis-of-Design Material:

.1 Alumicor Canadiana Entrance Doors, Basic Door Series 600A; or

.2 Kawneer 560 Entrances Series; or

.3 Approved alternate.

2.6 Storefront frames

.1 Manufacturer's standard extruded aluminum framing members of thickness required and reinforced as required to support imposed loads.

.2 Interior Frame Type 1:

.1 Construction: Non-thermally broken.

.2 Dimensions: Nominal 44 mm (1 ¾ in.) face x 114 mm (4 ½ in.) deep back frame profile with glazing throat to accommodate 6 mm (¼ in.) glazing unit.

.3 Glazing Method: Flush glazed.

.4 Operable Units: None.

.5 Basis-of-Design:

.1 Alumicor FlushGlaze 800 Series;

.2 Kawneer Trifab 400; or

.3 Approved alternate.

2.7 Door hardware

.1 All door hardware is to be provided by Section 08 70 00 – Hardware.

2.8 Fabrication

.1 Aluminum components shall be extruded sections and shapes, unless otherwise specified or shown.

.2 Components required, for which extruded sections are not available shall be accurately formed to profiles indicated. Use minimum 14 gauge sheet aluminum unless otherwise indicated.

.3 All fastenings and connections shall be concealed unless approved by Consultant.

.4 Joints between horizontal and vertical mullions shall be accurately cut and fitted. Horizontal and vertical mullions shall be in true plane with interior and exterior faces in line.

.5 Mechanically joined sections shall have hairline joints.

.6 Reinforce members as required to withstand loads and to maintain deflection within allowable limits.

.7 Internally reinforce framing members where work of other trades is to be fastened thereto.

.8 Install air cut-offs in continuous vertical members to prevent stack effect of enclosed air columns.

.9 Framing members shall have internally formed keyed slots to receive and retain preformed gaskets, seals and thermal separators.

.10 Pressure plates shall be designed with integrally formed keyed slots to receive seals and of thickness necessary to provide permanent, uniform, sealing pressures for glazing units, without deformation.

.11 Fabricate system to accommodate and interface with work of other sections by means of rabbets, interlocks, miscellaneous angles, trim and filler sections as required.

.12 Prepare aluminum storefront framing and aluminum doors for installation of finish door hardware including but not limited to; deadlocks and other

door finish hardware as specified in Section 08 70 00 – Hardware and the Hardware Schedule.

.13 Do not expose welds. Burn, discolour, distortion, impairment, deterioration or delamination of finish surfaces will be rejected.

.14 Form covers, closures, mouldings and trim integral with or immediately adjacent to work of this Section to profiles indicated, of minimum 14 gauge sheet aluminum.

.15 Fabricate extruded or formed aluminum sills to profiles indicated to suit wall conditions and minimum 3/32 in. thick. Provide drip deflectors at sill ends and at abutting vertical surfaces. Open ends of sills shall be fitted with neatly applied closure plates. Anchors shall be designed not to work loose after installation. Unless otherwise detailed, provide “flush” slip joint at intermediate sill joints.

2.9 Finishes

.1 Three Coat Fluoropolymer Thermo-setting Enamel for exterior aluminum:

.1 All aluminum entrance and storefront framing exposed in the finished work shall have three coat fluoropolymer thermo-setting enamel conforming to AAMA 605.2-90, minimum 1.6 mils dry film thickness, ‘Duranar XL Exotic Coating’ by PPG Canada Inc‘, or 'Fluropon Classic II' by Valspar Inc., or approved alternate, in custom colour as selected later by Consultant.

.2 Pre-treat aluminum after fabrication and apply primer and finish coats in strict accordance with manufacturer’s written instructions.

.3 Protect finish with strippable protective film.

.2 One Coat finish system for interior aluminum components:

.1 All interior exposed aluminum surfaces shall have one coat thermosetting, modified-acrylic enamel primer/topcoat system, minimum 0.8 mils dry film thickness and conforming AAMA 2603.

.2 Pre-treat aluminum and apply primer and finish coats in strict accordance with manufacturer's written instructions.

.3 Protect finish with removable protective film.

.4 Acceptable coatings:

.1 Duracron by PPG Canada Inc.; or

.2 Approved alternate.

.5 Colour and sheen shall be uniform with no visible variations.

.6 Colour to be selected by Consultant not necessarily from standard range.

.3 Steel (Concealed):

.1 Hot-dip galvanized, or zinc rich paint.

.4 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

3 Execution

3.1 Examination

.1 Check structural elements and adjoining work of other sections on which work of this section is dependent, verify governing dimensions, floor elevations, floor to floor heights, minimum clearances between framing system and structure. Confirm that conditions are satisfactory before proceeding. Commencement of work of this section indicates acceptance of surfaces and conditions.

3.2 Installation

.1 General:

.1 Erect storefront framing curtain wall systems plumb, level and square, in correct relation to work of other sections, within a maximum non-cumulative deviation of 3 mm in 3,600 mm length of member, and with members accurately fitted and aligned at joints and intersections.

.2 Anchor system to building structure, adjusting as required to meet erection tolerances and secure to prevent movement other than that which is expected due to structural deflection and creep and thermal expansion and contraction.

.3 Provide all devices and components required for erection of system.

.4 Use concealed fastenings only.

.5 Touch up steel anchoring components, after installation, with zinc rich paint.

.6 Provide aluminum flashings, fillers, covers and sealants indicated and as required to render system weather tight and to meet specified performance criteria. Ensure effective seal at laps, end joints and changes of direction.

.7 Provide aluminum sills, complete with chairs, anchors, expansion plates, drip deflectors as detailed at windows. Provide sills in longest practicable lengths. Provide flush slip joints at maximum 3 m (10 ft. 0 in.) O.C.

.8 Provide continuity of thermal and air seal/vapour barriers with adjacent thermal and air seal/vapour barrier systems. Pack spaces between frames and adjacent building elements and where shown with fibrous insulation.

.9 Seal joints between storefront framing system and adjacent building elements, and between frames, sills and other materials. Caulk inside and outside, with sealant as specified herein.

.10 Install all door hardware on doors. Test all doors on completion of installation and adjust as required for smooth and efficient operation.

.11 Completed installation shall be of adequate strength to support operating entrance doors, and wind loading as specified without glass shaking or vibrating when entrance doors are in use.

.12 Leave final installation water and weathertight.

.2 Glazing:

.1 Install glass types as indicated in Section 08 80 00 – Glazing.

.2 Size glass units to accurately fit openings with appropriate clearance all around.

.3 Identify glazed openings, mark each light of glass. Indicate presence of glass.

.4 Replace all damaged or broken glass at no expense to Owner, prior to completion of work. Remove all broken glass from premises.

.5 Locate and install setting blocks and spacers according to glass manufacturer's directions. Centre and space each piece of glass on premoulded neoprene rubber spacers. Provide minimum of two spacers on each edge of each piece of glass and four where dimension exceeds 1 m (4 ft. 0 in.). Use spacers of size to accurately fit each thickness of glass.

.6 Clean glass and metal surfaces to present clean, dry, grease and oil free surfaces to receive glazing tapes, gaskets or seals.

.7 Glazing to be undertaken at temperatures recommended by manufacturer of glazing materials.

.8 Provide sealed double glazed units at all locations.

.3 Sealants:

.1 Apply sealants in strict conformance with manufacturer's written directions.

.2 Gun apply three (3) continuous beads of threshold sealant under extruded aluminum thresholds. Bead diameter shall be sufficient to ensure full width seal. Remove excess sealant by approved methods.

.3 Apply sealant under pressure with hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as designed. All joint surfaces shall be tooled to provide the contour as indicated on drawings. For application of sealant when air temperature is below 40 °F (4 °C) consult sealant manufacturer for recommendations.

.4 Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt, frost and old caulking materials. Sealant must be applied to the base surface. Previously applied paint or primer must be entirely removed.

.5 Non-porous surfaces shall be cleaned either mechanically or chemically. Protective coating on metallic surfaces shall be removed by a solvent that leaves no residue. Solvent shall be used with clean cloths or with lintless paper towels. Do not allow solvent to air dry without wiping. Wipe dry with clean, dry cloth or lintless paper towels.

.6 All joints to receive sealant shall be as indicated on shop drawings. Do not seal joints until they are in compliance with drawings, or meet with the approval of the Consultant.

.7 Joints to receive sealant shall be a minimum of 6 mm (¼ in.) wide by 6 mm (¼ in.) deep, unless otherwise approved.

.8 For joints in metal, glass and other non-porous surfaces, sealant depth shall be a minimum of half the applied sealant width, and shall in no case exceed the applied sealant width.

.9 Install backer rod or joint filler, of type and size specified, at proper depth in joint to provide sealant dimensions as detailed. Backer rod shall be of suitable size and shape, compressed 25-50 % to fit joints as required. Sealant shall not be applied without back-up material and/or bond breaker strip. When using backer rod stock, avoid lengthwise stretching and do not twist or braid it.

.10 Apply masking tape, where required, in continuous strip in alignment with joint edge.

.11 Prime surfaces where required with primer as recommended by sealant manufacturer.

.12 Sealants applied both in factory and at the job site shall be used in strict accordance with specific recommendations supplied by sealant manufacturer.

.13 All hidden joints, or joints to be concealed by metal covers, shall be cleaned, sealed and tooled, inspected and approved prior to replacing metal covers.

.14 Apply, tool and finish sealant as required. When tooling sealants, use tooling solution recommended by sealant manufacturer. Remove masking tape immediately after joints have been tooled.

.15 Clean adjacent surfaces free of sealant as work progresses. Use solvent or cleaning agent as recommended by sealant manufacturer. All finished work shall be left in a neat clean condition.

3.3 Final cleaning

.1 At completion of work of this section, remove all labels from glass and clean inner and outer faces of glass and all exposed metal surfaces at

interior and exterior. Remove all protective metal coatings, stains and foreign matter, and leave in uniform colour and in first-class condition, to Consultant's satisfaction.

.2 Replace scratched or broken glass and make good any damaged materials, all in accordance with Section 01 74 00 – Cleaning and Waste Management.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for design, supply and installation of glazed curtain wall system consisting of, but not limited to, the following:

.1 Curtain wall system.

.2 Fixed, low emissivity (Low E) sealed glass units (GL1).

.3 Connections to structural support systems, fasteners, and accessories required for a complete installation of the glazed aluminum curtain wall system.

.4 Glass infill panels (shadow boxes).

.5 Mullion extensions.

.6 Integral air barrier and vapour retarder.

.7 Gap-filling foamed-place insulation.

.8 Perimeter sealant.

.9 Manufacturer’s Site Services and Site Quality Control.

1.2 Related requirements

.1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 Reference standards

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A36/A36M, Specification for Carbon Structural Steel.

.2 ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.4 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.5 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.6 ASTM B22, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.7 ASTM E283, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.8 ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.

.9 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.

.10 ASTM E413, Classification for Rating Sound Insulation.

.11 ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

.2 American Architectural Manufacturers Association (AAMA):

.1 AAMA CW-10, Care and Handling of Architectural Aluminum From Shop to Site.

.2 AAMA CW-11, Design Wind Loads and Boundary Layer Wind Tunnel Testing.

.3 AAMA T1R-A1, Sound Control for Fenestration Products.

.4 AAMA 501, Methods of Test for Exterior Walls.

.5 AAMA 611, Voluntary Specifications for Anodized Finishes Architectural Aluminum.

.6 AAMA 612, Voluntary Specifications, Performance Requirements, and Test Procedures for Combined Coatings of Anode Oxide and Transparent Organic Coatings on Architectural Aluminum.

.7 AAMA 2603, Voluntary Specification Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

.8 AAMA 2604, Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

.3 Canadian Standards Association (CSA):

.1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members.

.3 CAN/CSA-S157/S157.1, Strength Design in Aluminum/Commentary on CAN/CSA-S157, Strength Design in Aluminum.

.4 CSA W59.2, Welded Aluminum Construction.

1.4 Administrative requirements

.1 Co-ordination: co-ordinate work of this Section with installation of air barrier placement, installing ductwork to rear of louvres, flashing placement, components or materials.

.2 Pre-Installation Meetings:

.1 Convene pre-installation meeting 2 (two) week prior to beginning work of this Section.

.2 Require attendance of the Consultant, Installer, Manufacturer, representatives of door systems to be installed in curtain wall system, and other parties directly affected by the work of this Section. Include inspection agency representative.

.3 Review:

.1 Curtain wall system drawings, specifications, and other contract documents affecting work.

.2 Submittals, completed and yet to be completed.

.3 Materials, shop and site fabrication, installation requirements, and structural silicone joints.

.4 Required inspections, operational testing, and certifying procedures.

.5 Construction schedule related to other work affecting curtain wall installation and verification of availability of materials, Installer's personnel, equipment, and facilities required to make progress and avoid delays.

.6 Preparation and installation procedures and coordination and scheduling required with related work.

.7 Weather and forecasted weather conditions and procedures for coping with unfavourable conditions.

.4 Tour, inspect, and discuss conditions, connections to building structure, and other preparatory work performed by other installers.

.5 Prepare and distribute minutes of meeting to Owner and participating parties.

1.5 Design and performance requirements

.1 Design curtain wall system, including comprehensive engineering and thermal analysis by a qualified Engineer specialized in work of this section, using structural performance requirements and design criteria indicated herein.

.2 Compartmentalization seals to be air and water tight and capable of supporting design air pressure differences.

.3 Doors in Curtain Wall System: Design curtain wall system to receive, aluminum-framed entrance doors and frames.

.4 System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with applicable code, when tested in accordance with ASTM E330.

.5 Design structural steel used for anchorage in accordance with CA/CSA-S16.1.

.6 Design curtain wall anchors to accommodate thermal, seismic, and building movements without causing detrimental effect to system components and sealants, and to have a minimum expected service life of thirty years in accordance with CSA S478.

.7 Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.

.8 Effects of Combinations of Loads: Design system to withstand the most unfavourable combinations of loads.

.9 Deflection: Design structural performance of aluminum components of curtain wall in accordance with CSA S157/S157.1.

.1 Deflection Normal to Wall Plane: Limit mullion deflection to L/175 or 19 mm whichever is less for spans less than 4,270 mm; L/240 + 6 mm for spans higher than 4,270 mm, with full recovery of glazing materials.

.2 Deflection Parallel to Glazing Plane: L/360 of clear span or 3 mm, whichever is smaller.

.10 Deflection limits for sheet metal and air vapour barriers shall be L/360 of span or maximum 6 mm whichever is less, under design loading.

.11 System Assembly: Accommodate without damage to system, components or deterioration of seals, movement within system, movement between system and perimeter framing components, dynamic loading and release of loads, deflection of structural support framing, tolerance of supporting components, column shortening, long-term creep of structural members, story drift, and deflection from uniformly distributed and concentrated live loads.

.12 Thermal Transmittance (U-factor): Fixed glazing and framing areas utilizing shall have U-factor of not more than 1.6 W/sq. m x K as determined according to NFRC 100.

.13 Air Infiltration: Limit air infiltration through assembly to 0.00015 cu m/sq m of wall area, measured at a reference differential pressure across assembly of 300 Pa or 6.24 PFF as measured in accordance with ASTM E283.

.14 Water Leakage:

.1 Design system to provide resistance to water entry as evaluated by the following test procedures:

.1 Static Water Infiltration – No leakage at 720 Pa when tested to ASTM A331 or ASTM 1105

.2 Dynamic Water Infiltration – No leakage at 720 Pa when testing to AAMA 501.1

.15 Condensation Resistance: Prevent condensation and frost on inside surfaces of system when subject to outside temperature of minus 25 ºC

and 24 kph wind speed and inside temperature of 21 ºC when interior relative humidity is 30 % in a temperature index of 60 in accordance with CSA-A440-00.

.16 Expansion / Contraction: System to provide for expansion and contraction within system components caused by a cycling temperature range of 100 ºC over a twelve (12) hour period without causing detrimental effect to system components.

.17 Surface Temperature: System to be capable of withstanding metal surface temperature range of 110 ºC without buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance. Design frames so that edges of inner pane of insulating glass units (GL1) do not fall more than 8 ºC below the temperature of the centre of the inner pane.

.18 System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

.1 Inconspicuously locate vents and drain holes to prevent staining, streaking or marking of glass or framing. Size vents to provide instantaneous pressure equalization. Provide baffles to vent openings to prevent direct rainwater entry.

.2 Incorporate vertical and horizontal compartments behind exterior caps and frame-supported structural sealant glazed joints to suit spatial distribution of wind pressures.

.3 Glazing pockets vented and drained to the exteriors.

.4 All exposed end of mullions and caps to be capped and sealed while not compromising drainage quality.

.19 Air and Vapour Seal: Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound. Position thermal insulation on exterior surface of air barrier and vapour retarder. Locate air seals to prevent contact between interior humid air and exterior cold air and structure components, and to prevent moisture accumulation on these surfaces during cold weather.

.20 Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.

.21 Provisions for Movement of System: Unless otherwise indicated, provide the following.

.1 Refer to structural engineer drawings and specification for design criteria.

.22 Provide tempered, laminated, laminated-heat strengthened and heat soaked glass and related fittings and hardware in doors, side lights, screens, storefronts, glazed curtain walls, and glazed guard rails accordance with applicable codes and as indicated or scheduled.

.1 Unless otherwise specified or indicated, provide tempered glass where sill of glass is less than 300 mm above finished floor.

.23 Sealed Insulating Glass Units (GL1): Provide units free of the following characteristics:

.1 Appearance of condensation between panes.

.2 Obstruction of vision at unit perimeter.

.3 More than 10 % measurable deterioration of thermal transmission or shading coefficient values.

.4 Chipping, cracking, or breakage of glass panes occurring due to manufacturing defects or under specified service conditions.

.5 Migration of edge spacer.

.6 Migration of low E coating into edge spacer.

.24 Joint Movement Capability between System and Adjacent Construction: Design expansion joints with movement capability as specified Structural Consultant’s specifications or as indicated, but not less than plus or minus 50 % of joint width, without detrimental effects to assembly and adjacent construction.

1.6 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details and water flow drainage diagrams.

.4 Shop Drawings:

.1 Shop drawings shall bear the professional seal and signature of a Professional Engineer licensed to design structures and registered by authority having jurisdiction in the location of the Work.

.2 Furnish complete shop and erection drawings required for the work of this Section to the Consultant for review prior to fabrication.

.3 Co-ordinate shop drawings for work of this Section with those for other trades to ensure correct interface details required to provide watertight installation.

.4 Shop drawings shall incorporate plans, elevations, sections and details for all work in this Section. The details shall show and specify all metal and glass thicknesses, types and finishes, areas to be sealed and sealant materials, gaskets, glazing methods, direction and magnitude of thermal expansion, type of construction including joinery, fasteners and welds, all anchorage assemblies and components, the fabrication and erection tolerances for the work in this Section and the adjoining related work of other Sections.

.5 Submit structural calculations certified by a Professional Engineer licensed to design structures and registered by authority having jurisdiction in the location of the Work, substantiating sizes for members and connections based on the design loads before commencing fabrication.

.5 Samples:

.1 Submit duplicate minimum 300 mm x 300 mm samples of each type of aluminum finish specified.

.2 Upon Consultant's request furnish samples of glass types, gaskets, tapes and sealants.

1.7 Submittals for information

.1 Qualifications Data: For Manufacturer and Installer. Include proof of adequate facilities and capacity to produce work.

.2 Test Reports: Submit substantiating engineering data, test results of previous tests by independent laboratory, which purport to meet performance criteria, and other supportive data. Include reports for insulating glass units (GL1) and structural silicone sealant in accordance to CGSB 12.8. Test report to be within five (5) years from current date.

.3 Submit test reports of the insulating glass units (GL1) to be supplied as prescribed in CAN/CGSB-12.8 showing successful results. Tests shall be conducted and reports prepared by an approved, independent testing laboratory. Test report to be within five (5) years from current date.

.4 Sealant Manufacturer’s Certificates: Certifying that:

.1 Sealant materials selected for use are from those specified in accordance to ASTM C794.

.2 Surface preparation and application requirements have been reviewed to suit Project requirements, and instructions given to installers.

.3 Sealants are compatible with other materials and products in curtain wall assembly and adjacent construction.

.5 Finish Coating Manufacturer’s Details: Submit name, address, phone number, and website address of coating suppliers and applicators.

.6 Installation Data: Special installation requirements.

.7 Submit Quality Control Manual outlining quality control procedures and practice encompassing all aspects of curtain wall production and installation.

.8 Submit sealant manufacturer’s sealant compatibility statement that all materials in contact with structural sealants are compatible with the sealants in accordance with ASTM C1087. Submit sealant manufacturer’s

statement and test data confirming that sealant stress is less than 138 kPa and a safety factor of 5:1.

.9 Submit glass thermal and wind load stress analysis documenting adequate glass thickness and/or heat treatment to meet stresses generated. Thermal stress analysis to consider effects of external and internal shading, conduction at glass edge, and contribution of low-e coatings.

.10 Submit finish coating manufacturer's data: Name, address, phone number, and web site address of coating suppliers and applicators.

.11 Submit results of thermal modeling of all critical and typical cross-sections to assess both overall U value and establish condensation resistance. Results to be submitted in a format acceptable to Consultant.

.12 Professional Structural Engineer's Letters of Assurance:

.1 Provide letters or completed prescribed forms signed by a professional structural engineer licensed in the Province where the Project is located, certifying that the curtain wall system has been designed, fabricated and installed in accordance with the structural performance requirements of this section and of the applicable codes, including verification that:

.1 Specified products have been used.

.2 Designs and installations as tested, have been installed on the Project.

.3 Loads and movement requirements have been achieved.

.4 Curtain wall framing designed as guards conforms to the applicable code.

.5 Summary of Design and Field review requirements.

.2 The engineer who sealed the shop drawings shall provide field review of installation and shall provide sufficient reviews in order to provide letters of professional assurance.

1.8 Closeout submittals

.1 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with Manufacturer.

.2 Maintenance Data: For glazed aluminum curtain walls and windows; include instructions for re-glazing and as follows:

.1 Instructions covering re-glazing, adjustments, recommended cleaning procedures and other relevant maintenance data.

1.9 Quality assurance

.1 Perform Work in accordance with AAMA - Aluminum Curtain Wall Design Guide Manual.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum five (5) years' documented local experience, and employing a qualified Building Envelope Consultant experienced in the Province where the Project is located.

.3 Installer Qualifications: Company specializing in performing the work of this Section with minimum five (5) years' documented experience, and approved by manufacturer.

.4 Glass and glazing work under this section shall conform to the Insulating Glass Manufacturers Alliance and to the recommendations of the glass and sealed unit manufacturers.

1.10 Storage, delivery, handling and protection

.1 Handle work of this Section in accordance with AAMA - Curtain Wall Manual CW-10.

.2 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location. Do not load any area beyond the design limits.

.3 Assembled units and their component parts shall be transported, handled and stored in a manner to preclude damage of any nature.

.4 Ship and store pre-glazed units in upright position only or use method which will positively prevent extrusion of sealants and shifting of glass within framing.

.5 Accessory materials required for erection at the site shall be delivered to the site in manufacturer's labelled containers.

.6 Remove all units or components which are cracked, bent, chipped, scratched or otherwise unsuitable for installation and replace with new.

1.11 Site conditions

.1 Provide safe and adequate equipment on the site to execute the work of this Section, including scaffolding, staging, hoisting, safety protection equipment, tools, plant and other equipment required for the completion of the work of this Section.

.2 Coordinate and verify, by measurement at the job site, all dimensions affecting the work of this Section. Submit written notifications to the Consultant any field dimensions and conditions which are at variance with those on the reviewed shop drawings. The decision regarding corrective measures shall be obtained from the Consultant prior to the fabrication of the item affected.

1.12 Warranty

.1 Provide a five (5) year warranty to correct defective Work, starting from date of Substantial Performance; include coverage for complete system against failure to meet specified requirements.

.2 Warrant insulating glass units (GL1) in accordance with Section 08 80 00 - Glazing.

.3 Provide ten (10) year manufacturer warranty for metal finishes, starting from date of Substantial Performance. Failures shall include excessive fading, non-uniformity of colour, cracking, peeling, delamination and corrosion.

.4 Warranties shall include removing and replacing covering and adjacent components and finishes. Warranty period shall recommence on remedied work.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Aluminum:

.1 Extrusions: AA6063-T5 alloy, anodizing quality, conforming to ASTM B221-12.

.2 Plate and Sheet: AA1100-H14 alloy, anodizing quality unless otherwise indicated minimum 0.125 in. thick, conforming to ASTM B209-10, with special hardness for flat aluminum spandrel panels.

.3 Exposed surfaces of aluminum shall be free of die marks, scratches, blisters, "leave-off" marks, or other blemishes, whether left unfinished or finished.

.2 Structural Steel Sections and Steel Plate:

.1 CSA-G40.20/G40.21, Grade 260W.

.3 Galvanized Steel Sheet:

.1 Commercial grade, stretcher levelled or temper rolled, with galvanized zinc G90 (Z275) coating conforming to ASTM A653/A653M.

.4 Glass: Refer to Section 08 80 00 – Glazing and as specified in this section for insulating glass units (GL1).

.1 Glass Thickness: Where glass thickness is indicated, it is a minimum. Provide glass in thicknesses as needed to conform to requirements specified.

.5 Insulation Materials:

.1 Mineral Wool Insulation for Curtain Wall: Refer to Section 07 21 00 – Thermal Insulation.

.2 Spandrel Panel Insulation Fasteners: Adhesive bonded pin and disc type insulation fasteners as per 07 21 00 – Thermal Insulation.

.6 Sealants:

.1 Perimeter Sealant and Backing Materials: As specified in Section 07 92 00 – Sealants. Colour to be selected by Consultant.

.2 Sealant Used Within System (Not Used for Glazing): Silicone sealant as recommended by curtain wall manufacturer, and with

VOC content less than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

.3 Sealing Tape for Inner Face Metal Panels of Infill Panels: Extruded polyisobutylene, ribbon-shaped, non-drying, non-skinning, non-oxidizing, reinforced, width and thickness to suit application but not less than 6 mm wide, designed to provide continuous seal.

.1 Product: ‘Tremco 440 Tape’ by Tremco, ‘Weatherban Sealer’ by 3M Canada, or approved alternate.

.4 Structural Silicone Sealant: As specified in Section 07 92 00 – Sealants.

.7 Air Vapour Barrier: As specified in Section 07 27 00 - Membrane Air Barrier.

.8 Gap-filling foam Insulation: CAN/ULC-S710.1 single-component or CAN/ULC-S711.1 two- component, low VOC, low expansion bead-applied polyurethane based insulating foam sealant providing an air-tight vapour retardant flexible seal compatible with the air vapour retarder system specified in Section 07 27 00 - Membrane Air Barrier; the Gap-filling foam insulation system as specified in Section 07 21 00 - Thermal Insulation and as recommended by Manufacturer.

.9 Zinc Rich Paint:

.1 Ready mixed, zinc rich primer conforming to CAN/CGSB-1.181, 'Sealtight Galvafroid Zinc-Rich Coating' by W.R. Meadows of Canada Limited, or 'Zinc Clad No.7 Organic Zinc Rich Primer' by Sherwin Williams Company of Canada Ltd, or approved alternate.

.10 Bituminous Paint:

.1 Conforms to CAN/CGSB-1.108, Type 2.

.11 Fasteners: '400' Series stainless steel, or '300' Series stainless steel.

.12 Flexible Flashings: Flexible EPDM rubber sheet, minimum .060 in. (60 mils) thick, by Lexcan Limited, or by Dunlop Construction Products Inc., or by Firestone Building Products Company, or approved alternate.

.13 Provide door adapters and other components as required to complete the work of this Section.

2.3 Curtain wall system

.1 Subject to conformance with requirements, provide the basis of design curtain wall assemblies manufactured by Alumicor Limited, or approved alternate systems from acceptable manufacturers listed.

.1 Curtain Wall Systems in structurally silicone glazed with perimeter cap configuration as indicated on drawings:

.1 Basis of Design System: “ThermaWall 2600 SSG”; or

.2 Approved alternate.

.2 Other acceptable manufacturers: The following manufacturers’ products meeting the Performance Requirements specified.

.1 Kawneer North America, an Alcoa company;

.2 Oldcastle Building Envelope;

.3 US Aluminum; or

.4 Approved alternate.

2.4 Aluminum entrance swing doors

.1 According to Section 08 41 13 – Aluminum Framed Entrances and Storefronts.

2.5 Fabrication – general

.1 Fit and assemble component parts in shop as far as practicable. Work that cannot be permanently shop assembled shall be fitted, assembled, marked and disassembled to assure proper fitting in field. Identify shop assembled components on shop drawings for location and erection at Site.

.2 Aluminum components shall be extruded sections and shapes, unless otherwise specified or shown.

.3 Components required, for which extruded sections are not available shall be accurately formed to profiles indicated. Use minimum 1.62 mm (14 gauge) sheet aluminum unless otherwise indicated.

.4 All fastenings and connections shall be concealed unless approved by Consultant.

.5 Joints between horizontal and vertical mullions shall be accurately cut and fitted. Horizontal and vertical mullions shall be in true plane with interior and exterior faces in line.

.6 Mechanically joined sections shall have "hairline" joints.

.7 Reinforce members as required to withstand loads and to maintain deflection within allowable limits.

.8 Internally reinforce framing members where work of other trades is to be fastened thereto.

.9 Fabricate expansion joints between mullion sections with formed extruded aluminum internal sleeve sections, secure to permit joint function and maintain true alignment of sections.

.10 Install air cut-offs in continuous vertical members to prevent stack effect of enclosed air columns.

.11 Framing members shall have internally formed keyed slots to receive and retain preformed gaskets, seals and thermal separators.

.12 Pressure plates shall be designed with integrally formed keyed slots to receive seals and of thickness necessary to provide permanent, uniform, sealing pressures for glazing units (GL1), without deformation.

.13 Provide inconspicuous, baffled weep holes to properly drain curtain wall cavities to exterior.

.14 Fabricate system to accommodate and interface with work of other Sections by means of rabbets, interlocks, miscellaneous angles, trim and filler sections as required.

.15 Factory glaze system modules as far as practicable. Effect glazing seal in accordance with wall system and glass manufacturer's recommendations and so as to meet specified design and performance requirements.

.16 Fabricate extruded or formed aluminum sills to profiles indicated to suit wall condition and minimum 2.4 mm (3/32 in.) thick. Provide drip deflectors at sill ends and at abutting vertical surfaces. Open ends of sills shall be fitted with neatly applied closure plates. Anchors shall be designed not to work loose after installation. Unless otherwise detailed provide "flush" slip joint at intermediate sill joints.

.17 Prepare aluminum curtain wall framing for installation of doors, finish door hardware including, but not limited to; deadlocks, handicap power door operators and other door finish hardware as specified within these documents.

.18 Install all door hardware on doors. Test all doors on completion of installation and adjust as required for smooth and efficient operation.

.19 Form covers, closures, mouldings and trim integral with, or immediately adjacent to work of this Section to profiles indicated on drawings, and as required for a complete installation.

2.6 Fabrication – infill panels

.1 Fabricate in accordance with reviewed shop drawings.

.2 Back painted fully tempered glass panel (SP1): Refer to Section 08 80 00 – Glazing.

.3 Back up pan:

.1 Fabricate back-up pans from formed sheet as indicated below and braced as required to resist specified forces with sealed corners:

.1 Unfinished interior:

.1 Galvanized Steel Sheet: 0.76 mm thick.

.2 Finished Interior:

.1 Prefinished Aluminum: 3 mm thick, adhered to galvanized steel sheet with painted aluminum finish.

.2 Insulation:

.1 Adhesive bond impaling pins to panels at 300 mm (12 in.) on center each way for securement of insulation.

.2 Install spandrel panel insulation in back-up pans and held in place by insulation fasteners (impale clips) to form continuous thermal barrier behind spandrel panels.

.3 Insulation Fasteners: Impaling clip of plastic or nylon with washer retainer, to be adhered to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

2.7 Insulated glass units (GL1)

.1 Fabricate sealed glass units (GL1) through the Insulating Glass Manufacturers Association of Canada Certification Program to CAN/CGSB 12.8 or ASTM E2910. Sealed units shall bear IGMAC or IGCC/IGMA Certified Products List number and be properly identified.

.2 Refer to Section 08 80 00 – Glazing for insulated glass units (GL1), and glazing used in the section.

2.8 Finishes

.1 Aluminum Finish:

.1 Two Coat Fluoropolymer Thermo-Setting Enamel:

.1 All exposed aluminum surfaces shall have two coat, thermo-setting, high performance 70 % fluoropolymer finish coating, minimum 1.2 mils dry film thickness and conforming AAMA 2605.

.2 Pre-treat aluminum and apply primer and finish coats in strict accordance with manufacturer's written instructions.

.3 Protect finish with removable protective film.

.4 Acceptable coatings:

.1 Duranar by PPG Canada Inc.;

.2 Fluropon by Valspar; or

.3 Approved alternate.

.5 Colour and sheen shall be uniform with no visible variations.

.6 to be selected by Consultant not necessarily from standard range.

.2 Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

.3 Concealed Steel Items: Galvanized in accordance with ASTM A123 to 610 g/sq.

.4 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

3 Execution

3.1 Examination

.1 Check structural elements and adjoining work of other Sections on which work of this Section is dependent, verify governing dimensions, floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frame. Confirm that conditions are satisfactory before proceeding. Commencement of work of this Section indicates acceptance of surfaces and conditions.

3.2 Erection

.1 Erect curtain wall system plumb, level and square, in correct relation to work of other Sections, within a maximum non-cumulative deviation of 1/8 in. per 12 ft. 0 in. length of member, and with members accurately fitted and aligned at joints and intersections.

.2 Anchor system to building structure, adjusting as required to meet erection tolerances and secure to prevent movement other than that which is expected due to structural deflection and creep and thermal expansion and contraction.

.3 Provide all devices and components required for erection of system.

.4 Provide flashings, fillers, covers and sealants indicated and as required to render system weathertight and to meet specified performance criteria. Ensure effective seal at laps, end joints and changes of direction.

.5 Provide continuity of thermal and air seal/vapour barriers with adjacent thermal and air seal/vapour barrier systems. Pack spaces between frames and adjacent building elements and where shown with fibrous insulation.

.6 Install glass panels and glazing materials in accordance with Section 08 80 00 – Glazing, to glazing method required to achieve performance requirements.

.7 Seal joints between wall system and adjacent building elements with sealant in strict accordance with requirements of Section 07 92 00 – Sealants.

.8 Use concealed fastenings only.

.9 Touch up steel anchoring components, after installation, with zinc rich paint.

3.3 Erection tolerances

.1 Install glazed aluminum curtain wall systems to the following maximum tolerances:

.1 Plumb: 3 mm (⅛ in.) in 3,000 mm (10 ft.) with aggregate total not exceeding 6 mm (¼ in.) in 12.2 m (40 ft.).

.2 Level: 3 mm (⅛ in.) in 6 m (20 ft.) with aggregate total not exceeding 6 mm (¼ in.) in 12.2 m (40 ft.).

.3 Alignment: Limit misalignment of two adjoining glass panes abutting in the same plane as follows:

.1 Limit offset from true alignment to 1.5 mm (1/16 in.) where surfaces meet in-line or are separated by reveal or protruding element up to 12 mm (½ in.) wide.

.2 Limit offset from true alignment to 3 mm (⅛ in.) where surfaces are separated by reveal or protruding element from 12 mm (½ in.) to 25 mm (1 in.) wide.

.3 Limit offset from true alignment to 6 mm (¼ in.) where surfaces are separated by reveal or protruding element of 25 mm (1 in.) or wider.

.4 Joint Width: Maintain sealant space between glass and adjacent construction to an average of 5/8 in., with a variation of no more than +3 mm (⅛ in.) and 6 mm (¼ in.).

.5 Location: Limit variation from plane to 3 mm (⅛ in.) in 300 mm (12 in.) with aggregate total not exceeding 12 mm (½ in.) over total length.

3.4 Manufacturer's site services

.1 Curtain wall product manufacturer to provide field surveillance of the installation of their Products.

.2 Schedule manufacturer’s review of work procedures at stages listed:

.1 Product Application: one (1) off site review.

.2 Fabrication and Handling: one (1) review at authorized installers fabrication facilities.

.3 Installation: three (3) site reviews at commencement of Work; 50 % completion of Work and upon completion of Work.

.3 Submit manufacturer's written reports to Consultant describing:

.1 The scope of work requested.

.2 Date, time and location.

.3 Procedures performed.

.4 Observed or detected non-compliances or inconsistencies with manufacturers' recommended instructions.

.5 Limitations or disclaimers regarding the procedures performed.

.6 Obtain reports within seven (7) days of review and submit immediately to Consultant.

.4 Monitor and report installation procedures and unacceptable conditions.

3.5 Site quality control

.1 Professional Structural Engineer Inspections: Engage professional structural engineer experienced in design and installation of this work and licensed in the Province where the Project is located, to perform inspections.

.1 Perform timely and regular inspections.

.2 Verify installation conforms to applicable building code.

.3 Prepare and submit inspection forms required by applicable building code.

.2 Curtain Wall Tests and Inspections:

.1 Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C1401 using Destructive Test Method A, Hand Pull Tab (Destructive), Appendix X2.

.1 Test minimum of four (4) areas on each building face.

.2 Repair installation areas damaged by testing.

.2 Structural-Sealant Glazing Inspection: After installation of metal-framed systems is complete, structural-sealant glazing shall be

inspected and evaluated according to recommendations in ASTM C1401.

.3 Remove and replace nonconforming work and retest as specified at Contractor's cost.

3.6 Final cleaning

.1 Remove protective coatings and coverings from prefinished components; clean structural components and fittings; remove excess sealants and other substances that detract from finished appearance after completion of installation.

.2 At completion of work of this Section, remove all labels from glass and clean inner and outer faces of glass and all exposed metal surfaces at interior and exterior. Replace scratched or broken glass and make good any damaged materials, all in accordance with Section 01 74 00 – Cleaning and Waste Management.

.3 Coordinate protective measures required to prevent damage or deterioration of structural glass system from subsequent construction activities.

3.7 Protection of finished work

.1 Protect finished Work from damage.

End of section

1 General

1.1 Section includes

.1 Provision of all labour, materials, equipment and incidental services necessary to supply finish hardware, including the following:

.1 Supply and delivery to the project all items of architectural finishing hardware specified herein,

.2 Supply and installation of low-energy door operators and hardware,

.3 Supply and installation of all electrical hardware items including, but not limited to; low voltage wire (FT6 plenum-rated when not in conduit), maglocks, electric strikes, electric exit devices, current transfer devices, wall switches, jamb switches, keypads, controllers, power supplies, and

.4 Completion of all low voltage terminations by the hardware supplier

1.2 Related requirements

.1 Section 08 11 13 – Steel Doors and Frames

.2 Section 08 14 00 – Wood Doors

.3 Section 08 41 13 – Aluminum Framed Entrances and Storefronts

.4 Section 08 71 00 – Hardware Schedule.

1.3 Reference standards

.1 Standards:

.1 ANSI-A250.4 - Steel Doors and Frames Physical Endurance

.2 ANSI A156.1 - Butts and Hinges

.3 ANSI A156.3 - Exit Devices

.4 ANSI A156.4 - Door Controls - Door Closers

.5 ANSI A156.5 - Cylinders and Input Devices for Locks

.6 ANSI A156.5 - Auxiliary Locks and Associated Products

.7 ANSI A156.6 - Architectural Door Trim

.8 ANSI A156.7 - Template Hinge Dimensions

.9 ANSI A156.8 - Door Controls - Overhead Holders

.10 ANSI A156-10 - Power Operated Pedestrian Doors

.11 ANSI A156.13 - Mortise Locks and Latches

.12 ANSI A156.14 - Sliding and Folding Door Hardware

.13 ANSI A156.15 - Closer Holder Release Devices

.14 ANSI A156.16 - Auxiliary Hardware

.15 ANSI A156.18 - Material and Finishes

.16 ANSI A156.19 - Power Assist and Low Energy Power Operated Doors

.17 ANSI A156.21 - Thresholds

.18 ANSI A156.22 - Door Gasketing and Edge Sealing Systems

.19 ANSI A156.25 - Electrified Locking Devices

.20 ANSI A156.26 - Continuous Hinges

.21 ANSI A156.30 - High Security Cylinders

.22 ANSI A156.31 - Electric Strikes and Frame Mounted Actuators

.23 ANSI A250.4 - Steel Doors and Frames Physical Endurance

.24 NFPA 80 - Standard for Fire Doors and Other Opening Protectives

.2 Codes:

.1 NFPA 101 - Life Safety Code

.2 OBC 2012 - Ontario Building Code

.3 ANSI A117.1 - Accessible and Usable Buildings and Facilities

1.4 Definitions

.1 Architectural Hardware Consultant (AHC): person or persons skilled in selecting, coordinating and specifying architectural hardware, and certified by the Door and Hardware Institute.

.2 Hardware Supplier: company or group of companies whose purpose is the manufacture and supply of architectural finish hardware.

.3 Hardware Distributor: company whose purpose is the distribution of architectural finish hardware.

1.5 Quality assurance

.1 Products

.1 Products specified herein are minimum standard. Approved substitutions are listed. Products proposed as substitutions must be accepted by addenda prior to Bid Closing.

.2 Hardware for doors in fire separations and exit doors must be certified by a Canadian Certification Organization accredited by Standards Council of Canada. Supply only ULC and/or CSA listed electrical components.

.3 Hardware Suppliers

.1 Hardware Suppliers must have in their employ a certified Architectural Hardware Consultant (AHC) certified by the Door and Hardware Institute.

.2 The Hardware Supplier will provide following services to the Contract:

.1 preparation of the hardware schedule issued for tender,

.2 review of all shop drawings,

.3 provision of requested samples,

.4 review of hardware substitution submittals, and

.5 provision of all inspections and reports as specified herein.

.4 Hardware Distributors

.1 The Distributor must have a minimum of five (5) years documented experience in the supply of Finish Hardware for similar projects.

.2 Hardware Distributors must have in their employ a certified Architectural Hardware Consultant (AHC) certified by the Door and Hardware Institute.

.3 The Hardware Distributor will assume responsibility that the Products supplied under this section meet or exceed the minimum requirements of the specifications, the hardware schedule, and all authorities having jurisdiction.

.5 Installers

.1 Hardware Installers must have a minimum of five (5) years' experience in installation of hardware. The Contractor shall provide verification of installer's qualification to the Consultant for approval. Installers to attend all review meetings with the Hardware Supplier and Distributor.

.6 Pre-installation Meeting

.1 Convene a pre-installation meeting for the work specified in this section. Attendees must include, as a minimum, representatives of the following:

.1 Contractor (Site Superintendent & Project Manager)

.2 Installation Subcontractor (Site Foreman & Project Manager)

.3 Hardware Supplier (AHC)

.4 Hardware Distributor (AHC and Installer)

.5 Related Subcontractors (i.e. Electrical, Security Systems)

.6 Consultant

1.6 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Updated Finish Hardware Schedule

.1 Prepare and submit six (6) complete detailed hardware schedules prepared in 216 mm x 279 mm DHI format.

.4 Product Data

.1 Provide in a three ring binder six (6) copies of product data sheets with the hardware schedule showing all items of hardware to be used on the project.

.5 Samples

.1 When requested in writing, provide one sample of each hardware item requested complete with fasteners to the office of the Consultant. Samples to be clearly labeled with their hardware schedule designation and manufacturers' name and model number. Samples may be incorporated into the Work.

.6 Templates

.1 Provide other sections with two (2) complete sets of hardware templates for related fabricating and installation.

.7 Keying Schedule

.1 Provide three (3) copies of keying schedule for review. Include all special keying notes and stamping instructions. Locks and cylinders are not to be ordered until the key schedule has been approved by the Owner.

.8 Wiring Diagrams

.1 Provide a written description of the functional use of all electrical hardware. Include door and frame elevations showing the location of each item of electrical hardware to be installed, including a diagram showing number and size of all conductors. Include drawings showing all terminal connections. Where electrical hardware is to be supplied and installed provide the Contractor with riser diagrams listing the correct wire runs and back box sizes as well as 115V AC requirements.

.9 Operations and Maintenance Data

.1 Prior to Substantial Performance, provide two (2) copies of the following information for inclusion in Operation And Maintenance Manuals:

.1 Maintenance instructions for each hardware item,

.2 Catalogue cut sheets and Product Specifications or each product,

.3 Parts list for each product,

.4 Copy of final “as-built” hardware schedule, and

.5 Copy of final keying schedule.

.10 Maintenance Materials

.1 Provide the following maintenance materials:

.1 Five (5) of each installation tool used for locks/passage/privacy, all type of door closers, and all exit devices.

1.7 Delivery, storage, and handling

.1 Deliver each hardware item in its original package complete with all fasteners, keys, templates, and installation instructions required for installation.

.2 Package hardware separately for each door or unit and state clearly on each package the number and description of the door or unit for which the hardware therein is intended. Group items accordingly.

.3 Clearly mark each container with the door opening number and the hardware schedule item or heading number.

.4 Store hardware in a locked room or other secure area, accessible by only the Contractor. Storage area must contain adequate storage provision to hold all hardware off the floor (temporary shelving or wood pallets). Ensure area is kept dry and clean.

.5 When requested, package items of hardware separately for delivery to other fabricators for their installation.

.6 Deliver and assist in unloading and sorting of hardware. All hardware must be checked in on site by the Contractor's Site Supervisor.

1.8 Coordination with other trades

.1 Supply finish hardware to those who are to install it, complete with templates and other complete installation instructions in sufficient time to avoid delaying the progress of the work.

.2 Supply complete templates and instructions to all door and frame manufacturers for factory machining of products to receive Hardware.

1.9 Inspection

.1 Hardware Distributor must perform the following inspections:

.1 Check all hardware when it has been installed and notify the Consultant of improper installation, defective materials, or products installed that were not specified. Replace defective hardware promptly.

.2 Check all door closers after they have been installed to make sure that all adjustments such as back-checking degree have been

properly made. Notify the Consultant of any closers which have not been properly adjusted.

1.10 Maintenance

.1 Maintenance Service

.1 Following occupancy of the building by the Owner, arrange with the Owner's maintenance staff for instruction of proper use, servicing, adjusting and lubrication of all finish hardware. Submit to the Consultant a list of attendees and meeting date.

1.11 Extended warranties

.1 Provide the following manufacturer's warranties beyond the date of expiration of the Contract warranty:

.1 Hinges - Lifetime

.2 Electrified Hinges – One (1) year

.3 Mortise locksets - Seven (7) years

.4 Electrified Locksets – Two (2) years

.5 Exit Devices - Five (5) years

.6 Door closers - Ten (10) years

.7 Electric Strikes – Five (5) years

2 Products

2.1 Acceptable manufacturers

.1 Subject to conformance to requirements provide hardware manufactured by the following:

.1 Dorma Group of Companies;

.2 ASSA-ABLOY Group of Companies;

.3 Allegion Group of companies; or

.4 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Fabricate all hardware to template. Provide templates and template hardware together with the instructions necessary for door and frame preparation.

.2 Supply all hardware with necessary screws, bolts or other fastening devices to anchor hardware in position neatly and properly in accordance with best practices.

.3 Only products listed in the hardware schedule or the approved alternates noted in the following list are to be used on this project.

.4 Use one manufacturer's products only for all similar items.

.5 All exterior doors shall be fitted with complete perimeter weatherstripping and threshold where not provided by door or frame manufacturer.

.6 No substitutions are allowed for the following products, due to integration with existing hardware:

.1 Locksets, Latchsets, and Privacy Sets.

.2 Panic Sets

.3 Door Closers.

2.4 Fastenings

.1 Supply all required bolts, screws, expansion shields, anchors, and other related accessories for satisfactory attaching or installing of all finish hardware.

.2 Exposed fasteners shall match finish of, and be of compatible material with hardware.

.3 Where push/pull hardware is scheduled, door pull must be through-fastened and have fasteners concealed by push plate on opposite side.

2.5 Hinges

.1 Butt Hinges: ANSI/BHMA-A156.1, Grade 1.

.1 Supply hinges with non-removable pin (NRP) option on all doors where the hinge barrel is exposed on the secured exterior side of the door.

.2 Use two hinges on doors up to 1,525 mm and an additional hinge for each additional 760 mm or fraction thereof.

.3 Doors 900 mm wide and less; 114 mm high hinges; doors greater than 914 mm wide; 127 mm high hinges, all standard weight.

.4 Supply standard weight and heavy weight concealed bearing hinges on all doors equipped with door closers; ferrous (steel) material for all interior and/or fire-rated doors and stainless steel for exterior doors as listed in the hardware groups.

2.6 Surface/flush bolts

.1 Surface/Flush Bolts: ANSI/BHMA-A156.16, Grade 1.

.1 Surface Bolts

.1 Surface bolts to have 25 mm throw with vandal-resistant concealed mounting. Units to be constructed of heavy duty steel and be ULC listed up to three (3) hours when used on the inactive door of a pair up to 2,440 mm in height.

.2 Manual Flush Bolts-Metal Doors

.1 Manual flush bolt for metal doors to be ULC listed for three (3) hour fire doors with 13 mm diameter bolt tip, 19 mm throw. Rod length to be 305 mm. Supply dustproof strikes with all flushbolts.

.3 Manual Flush Bolt-Wood Doors

.1 Manual flush bolt for wood doors to be ULC listed for ninety (90) min fire doors with 19 mm throw with a 22 mm vertical adjustment. Supply dustproof strikes with all flushbolts.

.4 Automatic Flush Bolts-Metal Doors

.1 Automatic flush bolts for metal doors, fully automatic, ULC listed for three (3) hour fire doors, low actuation forces, top bolt has spring tension, non-handed with 19 mm throw with a 22 mm vertical adjustment. Optional rod length for non-rated openings. Auxiliary fire latch that eliminates the bottom bolt

for ULC listed doors. Supply dustproof strikes with all flushbolts.

.5 Automatic Flush Bolts- Wood Doors

.1 Automatic flush bolts for wood doors to be fully automatic ULC listed for ninety (90) min fire doors, low actuation forces, top bolt has spring tension, non-handed with 19mm throw with a 22 mm vertical adjustment. Auxiliary fire latch that eliminates the bottom bolt for ULC listed doors (twenty (20) min only). Supply dustproof strikes with all flushbolts.

2.7 Locksets, latchsets, deadlocks

.1 Grade 1 Deadbolt

.1 ANSI/BHMA-A156.5, Grade 1 deadbolt supplied with solid brass or bronze trim rings and 25 mm throw high-strength, steel alloy deadbolt with hardened steel roller resistant to sawing and kick-in attacks. Metal shield protects bolt from attack through the door as well as hardened steel balls that protect mounting screws from drill attack. Exclusive wood frame reinforcer protects wood jamb against kick-in attacks.

.2 Grade 1 Cylindrical

.1 ANSI/BHMA-A156.2, Grade 1 extra heavy duty residential, commercial, institutional and industrial applications. Latch bolts to be steel with minimum 13 mm throw deadlocking on keyed and exterior functions. 19 mm throw anti-friction latchbolt on pairs of fire doors. Provide manufacturer’s standard wrought box strike for each latch or lock, with curved lip extended to protect frame. Lock case to be steel. Locks to incorporate one piece spring cage and spindle. Precision solid brass 6-pin cylinder with nickel silver keys. All levers to be solid with no plastic inserts. Locks and latchsets tested to exceed 3,000,000 cycles.

.3 Grade 1 Mortise

.1 ANSI/BHMA-A156.13, Grade 1 Operational, Grade 1 Security, mortise lock for commercial and institutional buildings. Lock cases to have a high strength steel alloy cylinder retainer with a captured ¼-20 set screw. Lock case to be field reversible without chassis

disassembly. Supply locksets with lock cases manufactured from 2.7 mm steel with internal components of steel with zinc-dichromate plating for corrosion resistance. Case cover to be secured with four screws for increased rigidity. Locks are to feature a full 19mm throw two-piece stainless steel mechanical anti-friction latchbolt with 25 mm throw deadbolt constructed of sintered stainless steel. Deadbolt to remain a minimum of 16 mm within lock case when fully extended. All mortise locks are to feature external spring cages. Stop works functions to be by turn unit. Lock cases with stop works on edge of lock case will not be accepted. Spindles to be such that if forced it will twist first, then break (approx. 81.3 N/m of torque).

.4 All Grade 1 and Grade 2 cylindrical lever locksets shall have a free wheeling or clutch mechanism so the lever moves when in the locked position without retracting the latch bolt.

2.8 Exit devices

.1 Narrow Style: ANSI/BHMA-A156.3, Grade 1 ULC listed for panic hardware and fire exit hardware. Supply exit devices with smooth mechanism case and “the quiet one” fluid dampener to eliminate noise associated with exit device operations. Non-handed device with touchpad assemblies with no exposed fasteners and cast end caps, reinforced aluminum with stainless steel touchpad and raised edge to minimize pinching. Fits door stiles as narrow as 45 mm.

.2 Heavy Duty: ANSI/BHMA-A156.3, Grade 1 ULC listed for panic hardware and fire exit hardware. Supply exit devices and fire exit devices featuring coil compression springs on all device mechanism subassemblies and dead latching mechanisms for all active latchbolts. Supply exit devices with smooth mechanism case and “the quiet one” fluid dampener to eliminate noise associated with exit device operations. Non-handed device with touchpad assemblies with no exposed fasteners and cast end caps, reinforced aluminum with stainless steel touchpad and raised edge to minimize pinching. Roller strikes to be standard on all rim and surface vertical rod devices. Doors greater than 914 mm wide supply long bar exit devices, doors 2,134 mm high and greater supply extension rods. 1,000,000 cycle testing independently certified by ETL.

.3 Device Trim

.1 Supply device trim featuring recessed cylinder mounting and coil compression spring design with shear pin protection for all lever designs. Similar lever designs for exits as specified for locksets.

.4 Mullions Non-Rated

.1 Aluminum mullions complete with mullion stabilizers prepared with strikes for use with all rim devices to provide single door performance and security on double door applications.

.2 Steel mullion prepared for two strikes for use with all rim devices and key removable kit to provide quick removal to provide single door performance and security on double door applications.

.5 Mullions Rated

.1 Fire rated ULC approved mullion for up to three hour openings up to 2.4 m x 2.4 m using rim devices prepared for strikes. Supply with key removable kit to provide quick removal to provide single door performance and security on double door applications.

.6 Exit devices installed on exterior doors must have dead latching bolts to ensure tamper proof security.

2.9 Door closers

.1 Door closers to be Grade 1 ANSI/BMHA A156, and have the following features (see separate closer sections below for further information):

.1 Fully hydraulic, rack and pinion action with high strength cast iron cylinders and one (1) piece forged steel pistons.

.2 Hydraulic fluid of a type requires no seasonal adjustments, and has constant temperature control from 49 °C to – 35 °C.

.3 Hydraulic regulation controlled by tamper-proof, non-critical screw valves, adjustable with a hex wrench.

.4 Separate adjustments for backcheck, general speed and latch speed.

.5 Include high efficiency, low friction pinion bearings.

.6 Size one (1) manual door closers to provide less than 22N opening force on a 914 mm door leaf.

.7 Closers with painted finishes shall exceed a minimum 100-hour salt spray test, as described in ANSI/BHMA-A156 and ASTM B117.

.8 Closers detailed with plated finishes shall include plated covers (or finish plates), arms and visible fasteners.

.9 Provided with all mounting plates required to mount on any special door and frame conditions.

.2 Medium Duty Mechanical (Interior/Exterior)

.1 ANSI/BHMA-A156.4, non-sized (1-6) and non-handed cylinder body to have 32 mm piston diameter with 16mm single heat-treated shaft. Track closer cylinder body non-sized (2-4) or (1-2). Closers to have stamped main arm and forearm (forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

.3 Medium Duty Mechanical (Interior)

.1 ANSI/BHMA-A156.4, non-sized (1-4) and non-handed cylinder body. Track closer cylinder body non-sized (1-3). Closers to have stamped main arm and forearm (forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck. Closer to have standard metal cover not to exceed 45 mm from face of the door.

.4 Heavy Duty Mechanical (Pull Side Mount)

.1 ANSI/BHMA-A156.4, non-sized (1-5) and handed cylinder body to have 38mm piston diameter with 17.5mm double heat-treated shaft and certified to exceed ten million (10,000,000) full load operating cycles by a recognized independent testing laboratory. Track closers sized 1, 3 or 4. Closers to have forged steel main arm. Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have

single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

.5 Heavy Duty Mechanical (Top Jamb Mount)

.1 ANSI/BHMA-A156.4, non-sized (1-5) and handed cylinder body to have 38 mm piston diameter with 17.5 mm double heat-treated shaft and certified to exceed ten million (10,000,000) full load operating cycles by a recognized independent testing laboratory. Track closers sized 1, 3 or 4. Closers to have forged steel main arm. Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

.6 Medium Duty Mechanical (Interior-Pull Side Mount)

.1 ANSI/BHMA-A156.4, sized (1, 2, 3 or 4) and handed cylinder body to have 32 mm piston diameter with 16mm single heat-treated shaft. Closers to have forged steel main arms. Optional arms to be interchangeable within the series of closers. Standard plastic cover not to exceed 41 mm from face of door.

.7 Heavy Duty Mechanical (Multiple Applications)

.1 ANSI/BHMA-A156.4, non-sized (1-6) and non-handed cylinder body to have 38 mm piston diameter with 17.5mm double heat-treated shaft and certified to exceed ten million (10,000,000) full load operating cycles by a recognized independent testing laboratory with power-adjust speed dial to show spring size power. Track closers non-sized 1-4. Closers to have stamped main arm and forearm (forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

.8 Heavy Duty Mechanical (Parallel Arm Mount)

.1 ANSI/BHMA-A156.4, non-sized (1-5) and handed cylinder body to have 38 mm piston diameter with 17.5 mm double heat-treated shaft and certified to exceed ten million (10,000,000) full load

operating cycles by a recognized independent testing laboratory. Track closers sized 1, 3, or 4. Closers to have forged steel main arm and forearms. Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

.9 Medium Duty Mechanical (Interior-Push Side Mount)

.1 ANSI/BHMA-A156.4, sized (1, 2, 3 or 4) and handed cylinder body to have 32mm piston diameter with 16mm single heat-treated shaft. Closers to have forged steel main arm and forearms. Optional arms to be interchangeable within the series of closers. Standard plastic cover not to exceed 41 mm from face of door.

.10 Heavy Duty Single Point Hold-Open (Pull and Push Side Mount):

.1 ANSI/BHMA-A156.4, non-sized (1-4) and non-handed cylinder body to have 38mm piston diameter with 17.5 mm double heat-treated shaft with adjustable single-point hold open function controlled by solenoid assembly located in a head frame mounted track. Track arm to have single lever arm with low friction track and roller assembly. Unit to have a momentary on/off switch board assembly for testing door release and also provides over-voltage protection.

.11 Heavy Duty Multi-Point Hold-Open (Pull Side Mount):

.1 ANSI/BHMA-A156.4. Provide closer/holder designed to hold open the door in the open position under normal usage and to release and automatically close the door under fire conditions. Closer will include an integral Electro-magnetic holder mechanism designed for use with ULC listed fire detectors, provided with normally closed switches. Sized (3 or 4) and handed cylinder body to have 38 mm piston diameter with 17.5 mm double heat-treated shaft with multi-point hold open function controlled by solenoid in the cylinder assembly. Track arm to have single lever arm with low friction track and roller assembly with swing free function with no-drift feature. Unit to have a momentary on/off switch board assembly for testing door release and also provides over-voltage protection. Where

detailed multi-point closer/holders shall incorporate a hold open bypass feature from 0 degrees up to either 80 degrees or 140 degrees.

.12 Heavy Duty Multi-Point (Push Side Mount):

.1 ANSI/BHMA-A156.4. Provide closer/holder designed to hold open the door in the open position under normal usage and to release and automatically close the door under fire conditions. Closer will include an integral Electro-magnetic holder mechanism designed for use with ULC listed fire detectors, provided with normally closed switches. Sized (3 or 4) and handed cylinder body to have 38 mm piston diameter with 17.5 mm double heat-treated shaft with multi-point hold open function controlled by solenoid in the cylinder assembly. Unit to be supplied with forged steel main arm. Unit to have a momentary on/off switch board assembly for testing door release and also provides over-voltage protection. Where detailed multi-point closer/holders shall incorporate a hold open bypass feature from 0 degrees up to either 80 degrees or 140 degrees.

2.10 Door operators

.1 Heavy Duty Electric Operator (Push Side Mount)

.1 ANSI/BHMA-A156.19, non-sized (2-5) and non-handed cylinder body to have 38mm piston diameter with 17.5 mm double heat-treated shaft. With forged steel main arm. Power operator to include:

.1 Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical code.

.2 Second Chance Function: program within the on-board computer monitoring resistance during opening cycle. If resistance is present operator pauses for a few seconds, then attempts to open door again. If resistance does not exist door will open normally. However, if resistance still exists, door will pause and the unit will time out and door will close.

.3 Breakaway Drive System: System within the motor/clutch assembly. If the door is forced closed while in the opening cycle, the clutch slips preventing damage to the operator, door and frame.

.4 Soft Start Motor Control: required for controlled start once actuator is depressed to extend the service life of all drives components.

.5 Built in Power Supply to deliver 12 V and 24 V outputs up to a maximum of 1.0 amp.

.6 Certified by ULC for use on labeled doors.

.7 Independent adjustments for all electrically controlled functions within controller module.

.2 Heavy Duty Electric Operator (Pull Side Mount):

.1 ANSI/BHMA-A156.19, non-sized (1-4) and non-handed cylinder body to have 38 mm piston diameter with 17.5 mm double heat-treated shaft. Track arm to have single lever arm with low friction track and roller assembly. Power operator to include:

.1 Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical code.

.2 Second Chance Function: program within the on-board computer monitoring resistance during opening cycle. If resistance is present operator pauses for a few seconds, then attempts to open door again. If resistance does not exist door will open normally. However, if resistance still exists, door will pause and the unit will time out and door will close.

.3 Breakaway Drive System: System within the motor/clutch assembly. If the door is forced closed while in the opening cycle, the clutch slips preventing damage to the operator, door and frame.

.4 Soft Start Motor Control: required for controlled start once actuator is depressed to extend the service life of all drives components.

.5 Built in Power Supply to deliver 12 V and 24V outputs up to a maximum of 1.0 amp.

.6 Certified by ULC for use on labeled doors.

.7 Independent adjustments for all electrically controlled functions within controller module.

.3 Actuators

.1 Wall Type

.1 Wall plate switch to be hard-wired either 12 V DC or 24 V DC actuator with round, stainless steel touch plate in either 114 mm or 152 mm diameters. Engraved blue filled handicap symbol conforms to most accessibility codes. Units to include heavy grade components for vandal resistant mounting and weather resistant switch standard.

.2 Jamb Type

.1 Jamb switch to be hard-wired either 12 VDC or 24 VDC actuator with rectangular stainless steel touch plate, 38 mm wide x 114 mm high. Engraved blue filled handicap symbol conforms to most accessibility codes. Designed to mount in a frame cutout projecting approximately 13 mm from the frame. Units to include heavy grade components for vandal resistant mounting and weather resistant switch standard.

.3 Full Height:

.1 Hard wired hard-wired either 12 VDC or 24 VDC actuator with full height stainless steel touch plate, 150 mm wide x 914 mm high. Engraved blue filled handicap symbol conforms to most accessibility codes. Add ‘PUSH TO OPEN’ lettering for enhanced identification. Designed to wall, or provide post. Low profile projecting maximum 13 mm from the frame. Units to include heavy grade components for vandal resistant mounting and weather resistant switch standard.

.4 Low energy door operators will be supplied and installed by factory trained installers. Hardware supplier will coordinate the installation of the door operators and include the cost of labour for this work.

2.11 Pulls and plates

.1 Supply door trim as listed in hardware schedule. Supply pulls with back to back (BTB) or through bolt mounting as required. When push plates are listed with door pulls, install the push plate to conceal the through bolt.

.2 All kickplates, push plates, and bumper plates must have all sides beveled and corners rounded to ensure no sharp edges. Supply plates with counter sunk screw holes. Supply double-sided tape for adhesive-mount.

.3 Kick plates will be minimum 0.127 mm thick unless listed otherwise; size to be door width less 35 mm for single door, and less 25 mm for pairs of doors. Heights as scheduled.

2.12 Door stops and holders

.1 Floor Stops (Doors without Threshold)

.1 ANSI/BHMA-A156.6. Floor stops to be 25 mm overall height with 4.8 mm base height for use on doors without thresholds. Heavy-duty cast dome stop constructed of brass/bronze with gray, non-marring rubber bumper.

.2 Floor Stops (Doors with threshold or undercut doors)

.1 ANSI/BHMA-A156.6. Floor stops to be 25 mm overall height with 14.3 mm base height for use on doors with thresholds or undercut doors. Heavy-duty cast dome stop constructed of brass/bronze with gray, non-marring rubber bumper.

.3 Wall Stops (No Button on Locking Hardware)

.1 ANSI/BHMA-A156.6. Wall stops to be constructed of heavy-duty brass base with special retainer cup that makes the rubber stop tamper resistant. Convex design of rubber bumper.

.4 Wall Stops (Projecting Button on Locking Hardware)

.1 ANSI/BHMA-A156.6. Wall stops to be constructed of heavy-duty brass base with special retainer cup that makes the rubber stop tamper resistant. Concave rubber bumper to avoid damage to locks with projecting buttons.

.5 Supply wall stops where wall conditions are sufficient to support impact loads, such as stud partitions with wood blocking, masonry, or concrete.

Supply floor stops with sufficient height to suite the floor condition or undercut of doors.

.6 Overhead stops and mechanical holders shall be surface mounted unless a conflict exists with door closers or other hardware. Provide door stays with friction action in locations that do not have door closers. Install all overhead stops and holders for 90 ° stop unless otherwise specified.

.7 Electronic door holders will be supplied tri-voltage and be connected to the fire alarm system by Division 28 to release the door when signaled.

2.13 Door seals

.1 Supply perimeter seals to fully cover all gaps between door, frame, and floor condition to seal against weather, sound, or smoke as required and scheduled.

.2 Frame gaskets shall be closed cell neoprene. Extruded housing must have a rib to prevent distortion during installation. Aluminum frames will be provided with weather stripping inserts by the frame supplier.

.3 Door bottoms will be heavy-duty and have an adjustment screw to ensure proper contact with flooring. Supply correct drop insert for carpet where required.

2.14 Thresholds

.1 Supply extruded aluminum thresholds to ensure the sweep or door bottom makes full contact. Supply thermally broken thresholds for all exterior door openings.

.2 Threshold height shall not exceed 13 mm for barrier-free path of travel.

2.15 Emergency call system

.1 Provide emergency call system in universal washrooms in accordance with applicable code requirements and authority having jurisdiction.

.2 Emergency button: Consisting of audio and visual signal devices activated inside washroom.

.3 Provide sign reading “IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL

ACTIVATE" in letters at least 25 mm high with a 5 mm stroke and that is posted above the emergency button.

.4 Coordinate electrical power supply with Division 26.

2.16 Electronic hardware

.1 Keyswitch

.1 Keyswitch housing to be cast zinc to protect against vandalism, housing to provide a concealed rear mounting attachment which cannot be compromised when the cylinder is attached with a set screw. Standard stainless steel cover plate.

.2 Electric Strikes

.1 ANSI/BHMA-A156.31, Grade 1. Electric strikes to be ULC listed burglary-resistant and electric strike for fire doors and frames; "A" label for single doors and "B" label for double doors. Electric strikes to be stainless steel construction, non-handed available in 12 V or 24 V AC or DC with continuous duty solenoid and accept 19 mm throw latchbolts. Strike box to be adjustable to compensate for any misalignment of the door or frame with two (2) piece plug connector for ease of installation.

.3 Magnetic Locks

.1 ANSI/BHMA-A156.23, Grade 1. Electromagnetic locks to be field selectable dual voltage 12/24VDC with a minimum holding force of 7,339N, residual magnetism within one second of 17.8N maximum and inductive kickback not to exceed 53 volts peak. Electromagnetic locks to be powered by filtered and regulated power supply. Electromagnetic locks used on labeled fire door assemblies shall be ULC listed as auxiliary locks, rated for A-label openings. Housings shall not project more than 45 mm into the door opening. Electromagnetic locks to be furnished with an adjustable mounting bracket for accurate installation and furnished with an integral circuit board with terminal strip for accurate wiring.

.4 Power Supplies

.1 Power supplies to be Underwriter Laboratories (UL) listed for general-purpose use tested to meet UL1012 specifications. Power

supplies to have 12/24 V DC field selectable output voltage with output current of 3 amps at 12V DC and 2 amps at 24 V DC with supply output voltage filtered and regulated. The power supply to be inherently modular by design for ease of installation and to provide flexibility for future system modifications when necessary.

.5 Include power supplies that are compatible with magnetic lock and have a NFPA-101 fire alarm release. Reset key switch will be centrally located and will re-arm all the magnetic locks in the building.

.6 Access control will be frame-mounted stand-alone keypad complete with adjustable time delay. Units will have all functions keypad programmable, 12 or 24 volt AC/DC with a code length of 3-6 digits.

.7 Electronic hardware will be supplied and installed by this section, including all low voltage device wiring.

2.17 Finishes

.1 Finishes are specified as follows:

.1 As indicated in Section 08 71 00 - Hardware Schedule.

2.18 Keying

.1 General

.1 Architectural Hardware Consultant (AHC) will meet with the Owner to obtain and finalize all keying requirements, and will subsequently issue copies of the keying schedule for review.

.2 Provide temporary construction keying system during construction period. Permanent keys will be furnished to the Owner prior to occupancy. The Owner or Owner's Agent will void the operation of the construction keys.

.3 Key Material: Provide manufacturer's standard embossed keys of nickel silver to ensure durability.

.4 Key Quantity: Furnish keys in the following quantities:

.1	Temporary construction keys:	ten (10) each.
.2	Grand Master keys per grand master group:	six (6) each.
.3	Master keys per master group:	six (6) each.

.4 Change keys per cylinder or keyed alike group: four (4) each.

.5 Five (5) extractor tools each.

.5 Deliver all permanent key blanks and security keys direct to Owner from factory by secure courier, return receipt requested. Failure to properly comply with these requirements may cause to require replacement of all or any part of the cylinders and keys involved as deemed necessary at no additional cost to the Owner.

.6 Furnish one key control system complete with indexed door numbers, key codes, bittings, building numbers, room numbers, lock function, design, and finish. In addition, include model numbers, handing, design, and functions of exit devices and door closers. Transmit to the Owner by secure carrier, return receipt requested.

.7 Provide complete cross-index system, place keys on markers and hooks in the cabinet as determined by the final key schedule. Provide one each key cabinet and hinged panel type cabinet for wall mounting as noted in detailed hardware schedule.

.2 Standard Keying With Exterior High-Security Cylinders

.1 Interior locks and cylinders shall be furnished in a new masterkey system.

.2 Exterior locks and cylinders to be high-security removable core cylinders with level-three side-bit milling to allow integration with existing standard key systems.

.3 Permanent cylinders to be factory-keyed, combinated in sets or subsets, master keyed or great grand master keyed, as directed by Owner. Permanent keys and cylinders shall be marked with the keyset symbol on all keyblanks for identification. Visual key control marks or codes will not include the actual key cuts.

3 Execution

3.1 Examination

.1 Ensure that doors and frames are properly prepared and reinforced to receive finish hardware prior to installation.

.2 Ensure that door frames and finished floor are sufficiently plumb and level to permit proper engagement and operation of hardware.

.3 Submit to Consultant in writing a list of deficiencies determined as part of inspection required in 3.3.1 and 3.3.2, prior to installation of finished hardware.

3.2 Installation

.1 Install hardware to ANSI/DHI-A115.1G.

.2 Install hardware at mounting heights as specified in the manufacturer's templates or specific references in approved hardware schedule or approved elevation drawings. Where mounting height is not otherwise specified herein, install hardware at the following mounting heights:

.1 Locksets: 1,015 mm.

.2 Exit device: 1,015 mm.

.3 Push/Pull: 1,065 mm.

.4 Deadlock: 1,200 mm.

.3 Install hardware using only manufacturer supplied and approved fasteners in strict adherence with manufacturers published installation instructions.

.4 Ensure that all locksets / latchsets / deadlocks are of the correct hand before installation to ensure that the cylinder is in the correct position. Handing is part of installation procedure.

.5 Ensure that all exit devices are of the correct hand and adjust device cam for proper outside trim function prior to installation. Handing is part of installation procedure.

.6 Follow all manufactures installation instructions. Adjustment is inclusive of spring power, closing speed, latching speed and back-check at the time of installation.

.7 Delayed action door closers are to be adjusted to forty (40) second delay for handicapped accessibility and movement of materials. Time period to be approved by Owner.

.8 Install head seal prior to installation of parallel arm mounted door closers and push side mounted door stops/holders.

.9 Counter sink through bolt of door pull under push plate during installation.

.10 Mount all closers, automatic operators and hold-open devices with through bolts, as indicated in the hardware schedule.

.11 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.12 Remove construction locks when directed by Consultant; install permanent cores and check operation of all locks.

.13 Other trades installing hardware must follow all manufacturer's instructions including door closer adjustment, handing of locksets as required, and degree of door swing.

.14 Hardware Distributor will include all labour to terminate secondary low voltage wire runs at all door control devices supplied by this section, including but not limited to; door operators, magnetic locks, push button code entry units (keypads), request to exit switches, electric strikes and any associated electrical equipment. Ensure system is tested and complete for Owner's use. Provide staff training for push button code system (keypads) including all programming function and maintenance.

.15 Hardware Distributor will instruct the installer as to how various newer or unusual items that are required to be installed for proper performance.

3.3 Field quality control

.1 Hardware distributer to perform bi-monthly on-site inspections during hardware installation and provide inspection reports listing progress of work, unacceptable work and corrective measures. Repair or replace as directed by the Consultant.

.2 Upon completion of hardware installation, arrange with the Owner and Consultant demonstration and training in the proper operation, adjustment, and maintenance of all finish hardware supplied under this Contract.

.3 Before completion of the Work but after finish hardware installation has been completed, submit a certificate to the Consultant stating:

.1 Final inspection has been completed by Hardware Supplier and Hardware Distributor ensuring that all hardware has been checked for installation and operation; and

.2 Operation and maintenance of all hardware has been fully demonstrated to the satisfaction of the Owner, and verified by Consultant.

3.4 Adjusting and cleaning

.1 Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.

.2 All hardware to be left clean and free of disfigurements.

.3 Check all locked doors against approved keying schedule.

3.5 Protection

.1 Protect hardware from damage during construction period by removing and reinstalling or where necessary, using temporary hardware to maintain finish in new condition and maintain manufacturer's warranty.

3.6 Hardware schedule

.1 Refer to Section 08 71 00 Hardware Schedule.

End of section

DOOR HARDWARE
08 71 00

PROJECT:

New Paramedics Station - Seaton
Concession Road 5
Pickering, Ontario

ARCHITECT:

AECOM
50 Sportsworld Crossing Road, Suite 290
Kitchener, Ontario, Canada

Prepared By: Paul Kasak
Date: March 30, 2021
Revised: **August 26, 2021**

Architectural Hardware Finishes

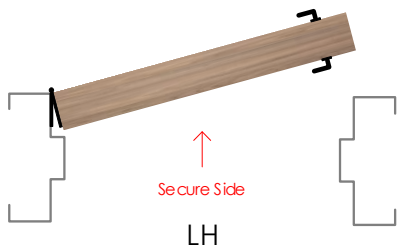
Steel	Stainless Steel	Brass/Bronze	Aluminum	Painted/Powder Coat	US/CAN#
Clear Anodized / Painted Aluminum					
			628	689	US28
Satin Nickel					
646		619	670		US15
Polished Nickel					
645		618	669		US14
Satin Stainless Steel					
	630				US32D
Polished Stainless Steel					
	629				US32
Satin Chrome					
652		626	702		US26D
Polished Chrome					
651		625	672		US26
Satin Brass					
633		606	667	678	US4
Polished Brass					
632		605	666	677	US5
Satin Bronze					
639		612	668	680	US10
Oil Rubbed Bronze					
640		613	703	695	US10B
Flat Black / Anodized Black					
631		622	671	693	US19

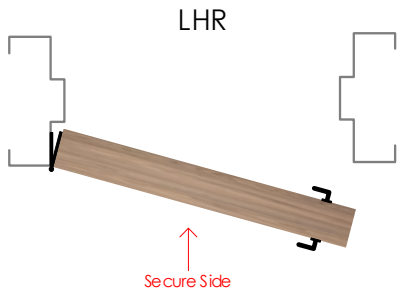
Door Handing's

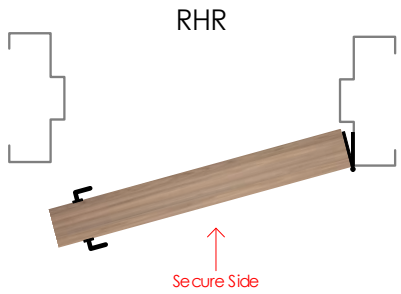
Abbreviations

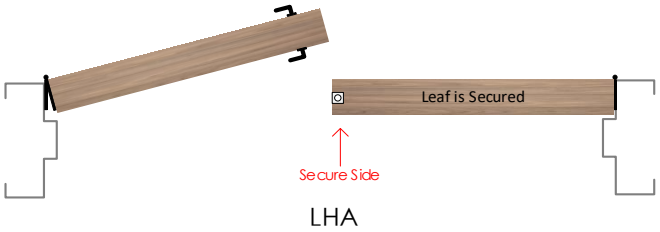
RH = Right Hand	RHA = Right Hand Active	SS = Single Slider
LH = Left Hand	LHA = Left Hand Active	BP = Bi-Parting Slider
RHR = Right Hand Reverse	RHA/LHA = Right & Left Hands Active	BF = Bi-Folding Slider
LHR = Left Hand Reverse	RHRA/LHRA = Right & Left Hand Reverse Active	TS = Telescopic Slider
RHRA = Right Hand Reverse Active	DA = Double Acting	PKT = Pocket Slider
LHRA = Left Hand Reverse Active	DE = Double Egress	

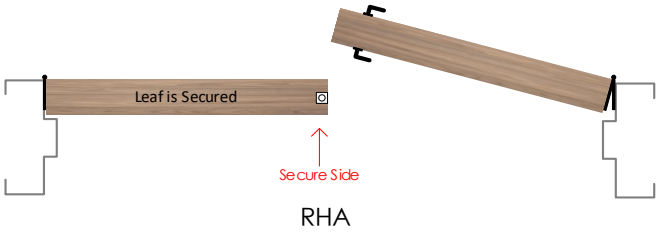
NOTE: The handing of a swing door is determined by placing yourself on the secured or keyed side of the door.



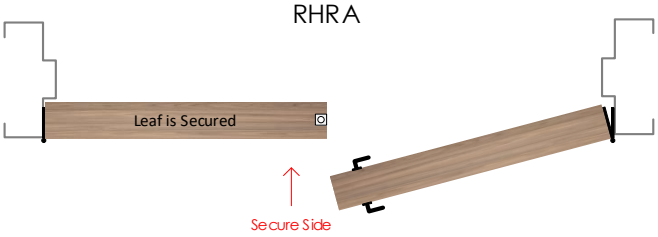




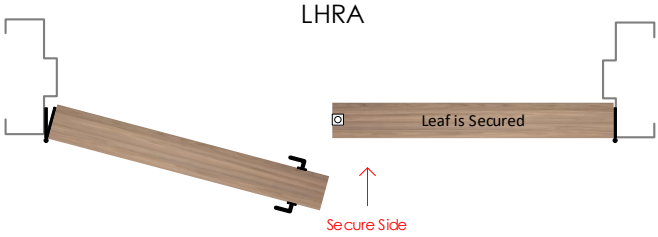




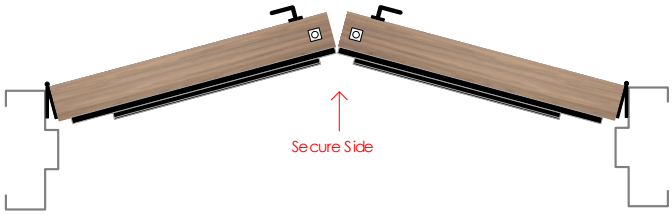
RHRA



LHRA

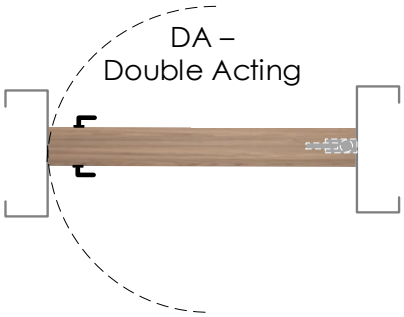


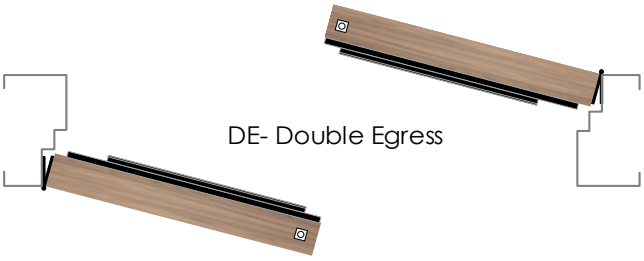
LHRA/RHRA



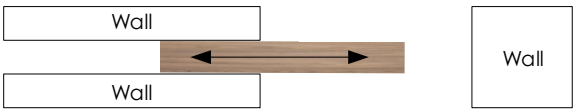
LHA/RHA

DA –
Double Acting





DE- Double Egress



PKT- Pocket Door

SS- Single Sliding Door

BP- Bi Parting Sliding Door

BPS- Bi Passing Sliding Door

Products & Alternatives

NOTE: Only those products / brands listed here are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If using an alternate product to form a price it is the bidder's responsibility to ensure that product is identical in every way to the specified item. If no alternates are listed, no alternate products are acceptable.

Product Type	Product#	Manufacturer	Alternate Manufacturer 1	Alternate Manufacturer 2
Butt Hinge	CB81, 114 x 102 NRP	PBB	McKinney	Ives
Continuous Hinge	A110HD	ABH	Pemko	Ives
Mortise Lockset	M9000	Dormakaba	Sargent	Schlage
Exit Device	9700	Dormakaba	Sargent	Von Duprin
Closer	8900	Dormakaba	Norton	LCN
Closer	TS93	Dormakaba	Norton	LCN
Overhead Stop	1000	ABH	Rixson	Glynn Johnson
Door Stop	CBH 87	CBH	Rockwood	Gallery
Pull Handle	CBH 6039	CBH	Rockwood	Gallery
Pull Handle Set	CBH 6041	CBH	Rockwood	Gallery
Kick Plate	CBH 903	CBH	Rockwood	Gallery
Weather Strip	20-S	KN Crowder	Pemko	National Guard
Smoke/Sound Seal	W-63	KN Crowder	Pemko	National Guard
Auto Door Bottom	CT-54	KN Crowder	Pemko	National Guard
Threshold	CT-46	KN Crowder	Pemko	National Guard
Auto Operator	ED100/250	Dormakaba	Besam	Omega
Wave Button	910TC-SS	Dormakaba	BEA	
Wave to Lock Kit	CX-WC16	Camden	BEA	
Emergency Call Kit	WEC10K2	Camden	BEA	
Motion Sensor	915AFI	Dormakaba	Securitron	
Electric Strike	F0162	Dormakaba	HES	
Electric Strike	F2164	Dormakaba	HES	
Sliding Door Hardware	CFT-201-CC	KN Crowder		

Symbols

- Door has a fire rating and all associated hardware must have a fire label to suit. Must comply with local requirements.

- Door is automatic and is equipped with an auto operator. Door must meet local barrier free codes

- Door has an electrical requirement and requires power to be brought to the appropriate location above the door or to the latch, for either security or barrier free applications. Refer to security & electrical drawings for further information.

- Door requires security card access. Refer to security / electrical drawings for further information.

Abbreviations

Door:

HMD = Hollow Metal Door
IHMD = Insulated Hollow Metal Door
ALD = Aluminum Door
SCWD = Solid Core Wood Door
HCWD = Hollow Core Wood Door
FGD = Frameless Glass Door
FRP = Fiberglass Reinforced Plastic Door

Frame:

HMF = Hollow Metal Frame
ALF = Aluminum Frame
Cased Open HMF = Cased Open Hollow Metal Frame
WDF = Wood Frame
Cased Open WDF = Cased Open Wood Frame
Cased Open Drywall = Cased Open Drywall

Fire Ratings:

0 HR – Zero Hour Fire Rating / Smoke Barrier
20 MIN – 20 Minute Fire Rating
¾ HR – 45 Minute Fire rating
1 ½ HR – 90 Minute Fire Rating
2 HR – 120 Minute Fire Rating
3 HR – 180 Minute Fire Rating

Disclaimer

Installation Instructions:
Installation instructions have been provided for convenience only. Although we do our best to ensure these documents are accurate and up to date, it is ultimately the responsibility of the installer to ensure they are using the correct instructions for the product they are installing. Use of the installation instructions provided is done so at one's own risk and Spyder SC takes no responsibility to their accuracy.
Weblinks:
Weblinks do change from time to time as manufacturers move around their websites, please inform us if you have a none functioning weblink.

HARDWARE SCHEDULE

Heading# 1

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2368 x 57	**STC Rating**	None
Door Material:	IALD	**Frame Material:**	ALF	**Fire Rating**	None

1 Total Openings

1 **Door#** D002 **Location:** Corridor 102 From Vestibule 101 **Handing:** LHR

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
1	Continuous Hinge	A110HD x 2337	628 / US28 / Clear Anodized	ABH	X	X		☐
1	Exit Device / Passage Trim	9700-Zx23-L118-GK9200	630 / US32D / Satin Stainless Steel	Dormakaba	X	X	X	☐
1	Overhead Stop	1023SL	630 / US32D / Satin Stainless Steel	ABH	X	X		☐
1	Electric Strike	F0162	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Weather Strip	By Aluminum Door Supplier						☐
1	Door Sweep	By Aluminum Door Supplier						☐
1	Threshold	By Aluminum Door Supplier						☐
By Automatics Supplier								
1	Auto Operator	ED250 x SA x PUSH x 1041mm header	628 / US28 / Clear Anodized	Dormakaba	X	X		☐
2	Wave Button	910TC-SS	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.

End of Heading

Heading# 2

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D003 **Location:** Corridor 102 To Report Writing 103 **Handing:** LH

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Passage Latch Set	M9010-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐

End of Heading

Heading# 3

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D004 **Location:** Corridor 102 To IT 125 **Handing:** LH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Closer	TS9315-T-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
1	Auto Door Bottom	CT-53S x 965	719 Milled Aluminum	KN Crowder	X			☐
By Security Supplier								
1	Card Reader	To Suit Building System	Black					☐
1	Motion Sensor	915AFI	Black	Dormakaba	X			☐
1	Access Controller	To Suit Building System						☐
1	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 4

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2540 x 57	**STC Rating**	None
Door Material:	IALD	**Frame Material:**	ALF	**Fire Rating**	None

2 Total Openings

1	**Door#**	D006	**Location:**	Kitchen 104	From	Courtyard 106	**Handing:**	LHR
1	**Door#**	D007	**Location:**	Corridor 102	From	Courtyard 106	**Handing:**	RHR

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
2	Continuous Hinge	A110HD x 2515	628 / US28 / Clear Anodized	ABH	X	X		☐
2	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
2	Closer	8916-SDS-FC x DP89	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
2	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
2	Weather Strip	By Aluminum Door Supplier						☐
2	Door Sweep	By Aluminum Door Supplier						☐
2	Threshold	By Aluminum Door Supplier						☐
By Security Supplier								
2	Card Reader	To Suit Building System	Black					☐
2	Motion Sensor	915AFI	Black	Dormakaba	X			☐
2	Fire Pull Station	To Suit Local Jurisdiction						☐
2	Access Controller	To Suit Building System						☐
2	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
2	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

Note:

- Pull station to be relayed to security system as well as to electric strike. Pull station to exit courtyard in emergency.

End of Heading

Fire Rated

Heading# 5

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	3/4 HR

4 Total Openings

									Web Link	Install Instructions	Site Verified
1	**Door#**	D008	**Location:**	Corridor 107	To	Classroom 112	**Handing:**	LH			
1	**Door#**	D009	**Location:**	Corridor 107	To	Classroom 112	**Handing:**	RH			
1	**Door#**	D010	**Location:**	Corridor 107	To	Classroom 113	**Handing:**	RH			
1	**Door#**	D011	**Location:**	Corridor 107	To	Classroom 113	**Handing:**	LH			

By Hardware Supplier

12	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
4	Passage Latch Set	M9010-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
4	Closer	TS9315-T-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
4	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
4	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
4	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
4	Auto Door Bottom	335S x 965	719 Milled Aluminum	National Guard	X			☐

End of Heading

Heading# 6

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

2 Total Openings

									Web Link	Install Instructions	Site Verified
1	**Door#**	D012	**Location:**	Corridor 107	To	Storage 116	**Handing:**	LH			
1	**Door#**	D017	**Location:**	Open Office 108	To	Storage 110	**Handing:**	RH			

By Hardware Supplier								
6	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
2	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
2	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
By Region Of Durham								
2	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Electrical Automatic

Heading# 7

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D013 **Location:** Corridor 107 To Universal W/S 119 **Handing:** RH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
1	Auto Door Bottom	335S x 965	719 Milled Aluminum	National Guard	X			☐
By Automatics Supplier								
1	Auto Operator	ED100 x SA x PULL x 1041mm header	628 / US28 / Clear Anodized	Dormakaba	X	X		☐
1	Wave to Lock Kit	CX-WC16	630 / US32D / Satin Stainless Steel	Camden	X			☐
1	Emergency Call Kit	WEC10K2		Camden	X			☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.

End of Heading

Electrical Card Access Automatic

Heading# 8

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2570 x 45	**STC Rating**	None
Door Material:	ALD	**Frame Material:**	ALF	**Fire Rating**	None

1 Total Openings

1 **Door#** D014 **Location:** Corridor 107 To Vestibule 122 **Handing:** LH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
1	Continuous Hinge	A110HD x 2544	628 / US28 / Clear Anodized	ABH	X	X		☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Closer	TS9315-PTH-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5700	Black	KN Crowder	X			☐
By Automatics Supplier								
1	Auto Operator	ED100 x SA x PUSH x 1041mm header	628 / US28 / Clear Anodized	Dormakaba	X	X		☐
2	Wave Button	910TC-SS	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
By Security Supplier								
1	Card Reader	To Suit Building System	Black					☐
1	Motion Sensor	915AFI	Black	Dormakaba	X			☐
1	Access Controller	To Suit Building System						☐
1	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Electrical Card Access

Heading# 9

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2368 x 57	**STC Rating**	None
Door Material:	IALD	**Frame Material:**	ALF	**Fire Rating**	None

2 Total Openings

1	**Door#**	D019	**Location:**	Open Office 108	From	Exterior	**Handing:**	LHR
1	**Door#**	D060	**Location:**	Corridor	From	Exterior	**Handing:**	RHR

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
2	Continuous Hinge	A110HD x 2337	628 / US28 / Clear Anodized	ABH	X	X		☐
2	Exit Device / Night Latch Trim	CD9700-Z003T-L118-GK9200	630 / US32D / Satin Stainless Steel	Dormakaba	X	X	X	☐
2	Pull Handle	CBH 6039 x 914 OA x 32 DIA x mtg#6	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Closer	8916-SDS-FC x DP89	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
2	Electric Strike	F0162	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
2	Mortise Cylinder	97D02T	626 / US26D / Satin Chrome	Dormakaba	X			☐
2	Weather Strip	By Aluminum Door Supplier						☐
2	Door Sweep	By Aluminum Door Supplier						☐
2	Threshold	By Aluminum Door Supplier						☐
By Security Supplier								
2	Card Reader	To Suit Building System	Black					☐
2	Motion Sensor	915AFI	Black	Dormakaba	X			☐
2	Access Controller	To Suit Building System						☐
2	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
4	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 10

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D020 **Location:** Classroom 113 To SIM Lab **Handing:** RH

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Passage Latch Set	M9010-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Overhead Stop	1023SL	630 / US32D / Satin Stainless Steel	ABH	X	X		☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐

End of Heading

Heading# 11

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D021 **Location:** Classroom 113 To Storage 115 **Handing:** RH

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Overhead Stop	1023SL	630 / US32D / Satin Stainless Steel	ABH	X	X		☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Electrical Card Access

Heading# 12

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	IHMD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D022 **Location:** SIM Lab 114 From Exterior **Handing:** LHR

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
1	Continuous Hinge	A110HD x 2109	628 / US28 / Clear Anodized	ABH	X	X		☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Closer	TS9315-SPT-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Weatherstrip	20-S x 5265	628 / US28 / Clear Anodized	KN Crowder	X			☐
1	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
1	Threshold	CT-46 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Security Supplier								
1	Card Reader	To Suit Building System	Black					☐
1	Motion Sensor	915AFI	Black	Dormakaba	X			☐
1	Access Controller	To Suit Building System						☐
1	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 13

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D023 **Location:** Gender Neutral W/R 117 From Corridor **Handing:** RHR

By Hardware Supplier

					Web Link	Install Instructions	Site Verified	
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Pull Handle Set	CBH 6041 x 914 OA x 32 DIA x mtg#3 x BTB	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Closer	TS9315-PT-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5700	Black	KN Crowder	X			☐
1	Auto Door Bottom	335S x 965	719 Milled Aluminum	National Guard	X			☐

End of Heading

Fire Rated

Heading# 14

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	3/4 HR

2 Total Openings

1	**Door#**	D031	**Location:**	Gender Neutral W/R 117	To	Janitor Room 120	**Handing:**	RH
1	**Door#**	D064	**Location:**	Oxygen/Linen 134	To	Oxygen/Linen 102b	**Handing:**	LH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
6	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
2	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
2	Closer	TS9315-T-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
2	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
2	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Region Of Durham								
2	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 15

Opening Information					
Opening Type:	Pair	**Opening Size:**	2-900 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D032 **Location:** Storage 118 From Corridor 107 **Handing:** LHRA/RHRA

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
6	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
2	Flush Bolt	GSH 401UL	626 / US26D / Satin Chrome	Gallery	X			☐
2	Dummy Lever	M9001-L118-A	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Roller Latch	404H	630 / US32D / Satin Stainless Steel	Gallery	X			☐
2	Closer	TS9315-PTH-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Smoke / Sound Seal	W-63 x 6100	Black	KN Crowder	X			☐

End of Heading

Heading# 16

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	3/4 HR

1 Total Openings

1 **Door#** D033 **Location:** Vestibule 122 To Electrical 123 **Handing:** LH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Closer	TS9315-T-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
1	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Security Supplier								
1	Card Reader	To Suit Building System	Black					☐
1	Motion Sensor	915AFI	Black	Dormakaba	X			☐
1	Access Controller	To Suit Building System						☐
1	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 17

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	3/4 HR

1 Total Openings

1 **Door#** D034 **Location:** Electrical 123 To Mechanical 124 **Handing:** RH

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Closer	TS9315-T-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
1	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Electrical Card Access

Heading# 18

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D037 **Location:** Medical Storage 127 To Secured 126 **Handing:** LH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Closer	TS9315-SPT-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
By Security Supplier								
1	Card Reader	To Suit Building System	Black					☐
1	Motion Sensor	915AFI	Black	Dormakaba	X			☐
1	Access Controller	To Suit Building System						☐
1	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 19

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

2 Total Openings

									Web Link	Install Instructions	Site Verified
1	**Door#**	D038	**Location:**	Corridor 102a	To	Corridor 102	**Handing:**	LH			
1	**Door#**	D046	**Location:**	Decon 130	To	Gender Neutral W/R 128	**Handing:**	RH			

By Hardware Supplier

6	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
2	Pull Handle Set	CBH 6041 x 914 OA x 32 DIA x mtg#3 x BTB	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Closer	TS9315-PT-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
2	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐

End of Heading

Fire Rated

Heading# 20

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	1 HR

2 Total Openings

									Web Link	Install Instructions	Site Verified
1	**Door#**	D047	**Location:**	Vehicle Bay 131	From	Corridor 102	**Handing:**	LHR			
1	**Door#**	D049	**Location:**	Vehicle Bay 131	From	Corridor 102a	**Handing:**	RHR			

By Hardware Supplier

6	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
2	Exit Device / Passage Trim	9700-Zx23-L118	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
2	Closer	TS9315-T-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
2	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
2	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐

End of Heading

Heading# 21

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	1 HR

1 Total Openings

1 **Door#** D048 **Location:** Vehicle Bay 131 To Med. Storage 127 **Handing:** LH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Storeroom Lockset	M9080T-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Closer	TS9315-SPT-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
1	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Security Supplier								
1	Card Reader	To Suit Building System	Black					☐
1	Motion Sensor	915AFI	Black	Dormakaba	X			☐
1	Access Controller	To Suit Building System						☐
1	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 22

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	1 HR

1 Total Openings

1 **Door#** D050 **Location:** Vehicle Bay 131 To Decon 130 **Handing:** LH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Passage Latch Set	M9010-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Electric Strike	F2164	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
1	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Automatics Supplier								
1	Auto Operator	ED100 x SA x PULL x 1041mm header	628 / US28 / Clear Anodized	Dormakaba	X	X		☐
2	Motion Sensor	915AFI	Black	Dormakaba	X			☐

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.

End of Heading

Heading# 23

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	HMF	**Fire Rating**	None

14 Total Openings

1	**Door#**	D024	**Location:**	Neutral Gender W/R	From	Neutral Gender W/R 117	**Handing:**	LHR			
1	**Door#**	D025	**Location:**	Neutral Gender W/R 117	To	Neutral Gender W/R	**Handing:**	LH			
1	**Door#**	D026	**Location:**	Neutral Gender W/R 117	To	Neutral Gender W/R	**Handing:**	LH			
1	**Door#**	D027	**Location:**	Neutral Gender W/R 117	To	Neutral Gender W/R	**Handing:**	LH			
1	**Door#**	D028	**Location:**	Neutral Gender W/R 117	To	Neutral Gender W/R	**Handing:**	RH			
1	**Door#**	D029	**Location:**	Neutral Gender W/R 117	To	Neutral Gender W/R	**Handing:**	RH			
1	**Door#**	D030	**Location:**	Neutral Gender W/R 117	To	Neutral Gender W/R	**Handing:**	RH			
1	**Door#**	D039	**Location:**	Neutral Gender W/R	From	Neutral Gender W/R 128	**Handing:**	RHR			
1	**Door#**	D040	**Location:**	Neutral Gender W/R 128	To	Neutral Gender W/R	**Handing:**	RH			
1	**Door#**	D041	**Location:**	Neutral Gender W/R	From	Neutral Gender W/R 128	**Handing:**	LHR			
1	**Door#**	D042	**Location:**	Neutral Gender W/R 128	To	Neutral Gender W/R	**Handing:**	LH			
1	**Door#**	D043	**Location:**	Neutral Gender W/R 128	To	Neutral Gender W/R	**Handing:**	RH			
1	**Door#**	D044	**Location:**	Neutral Gender W/R 128	To	Neutral Gender W/R	**Handing:**	RH			
1	**Door#**	D045	**Location:**	Neutral Gender W/R 128	To	Neutral Gender W/R	**Handing:**	RH			

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
42	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
14	Privacy Lockset / Indicator	M9046-L118-A	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
14	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
14	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
14	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
14	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐

End of Heading

Heading# 24

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 57	**STC Rating**	None
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D051 **Location:** Vehicle Bay 131 From Oxygen/Linen 134 **Handing:** LHR

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Butt Hinge	CB81, 114 x 102, NRP	646 / US15 / Satin Nickel	PBB	X			☐
1	Exit Device / Night Latch Trim	CD9700-Z003T-L118	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Pull Handle	CBH 6039 x 914 OA x 32 DIA x mtg#6	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Closer	TS9315-T-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
1	Mortise Cylinder	97D02T	626 / US26D / Satin Chrome	Dormakaba	X			☐
1	Floor Stop	CBH 87	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Kick Plate	CBH 903, 203 x 927 x TAPE	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Smoke / Sound Seal	W-63 x 5265	Black	KN Crowder	X			☐
1	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Region Of Durham								
2	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 25

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2150 x 45	**STC Rating**	None
Door Material:	IHMD	**Frame Material:**	HMF	**Fire Rating**	None

3 Total Openings

1	**Door#**	D035	**Location:**	Electrical 123	From	Exterior	**Handing:**	RHR
1	**Door#**	D055	**Location:**	Oxygen/Linen 134	From	Exterior	**Handing:**	LHR
1	**Door#**	D062	**Location:**	Wash Area 133	From	Exterior	**Handing:**	RHR

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
3	Continuous Hinge	A110HD x 2109	628 / US28 / Clear Anodized	ABH	X	X		☐
3	Exit Device / Night Latch Trim	CD9700-Z003T-L118	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
3	Pull Handle	CBH 6039 x 914 OA x 32 DIA x mtg#6	630 / US32D / Satin Stainless Steel	CBH	X			☐
3	Closer	TS9315-SPT-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
3	Mortise Cylinder	97D02T	626 / US26D / Satin Chrome	Dormakaba	X			☐
3	Electric Strike	F0162	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
3	Weatherstrip	20-S x 5265	628 / US28 / Clear Anodized	KN Crowder	X			☐
3	Auto Door Bottom	CT-54 x 965	719 Milled Aluminum	KN Crowder	X			☐
3	Threshold	CT-46 x 965	719 Milled Aluminum	KN Crowder	X			☐
By Security Supplier								
3	Card Reader	To Suit Building System	Black					☐
3	Motion Sensor	915AFI	Black	Dormakaba	X			☐
3	Access Controller	To Suit Building System						☐
3	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
6	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Heading# 26

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2368 x 57	**STC Rating**	None
Door Material:	IALD	**Frame Material:**	ALF	**Fire Rating**	None

2 Total Openings

1	**Door#**	D001	**Location:**	Vestibule 101	From	Exterior	**Handing:**	LHR
1	**Door#**	D059	**Location:**	Vestibule 122	From	Exterior	**Handing:**	RHR

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
2	Continuous Hinge	A110HD x 2337	628 / US28 / Clear Anodized	ABH	X	X		☐
2	Exit Device / Night Latch Trim	CD9700-Z003T-L118-GK9200	630 / US32D / Satin Stainless Steel	Dormakaba	X	X	X	☐
2	Pull Handle	CBH 6039 x 914 OA x 32 DIA x mtg#6	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Mortise Cylinder	97D02T	626 / US26D / Satin Chrome	Dormakaba	X			☐
2	Electric Strike	F0162	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
2	Weather Strip	By Aluminum Door Supplier						☐
2	Door Sweep	By Aluminum Door Supplier						☐
2	Threshold	By Aluminum Door Supplier						☐
By Automatics Supplier								
2	Auto Operator	ED250 x SA x PUSH x 1041mm header	628 / US28 / Clear Anodized	Dormakaba	X	X		☐
4	Wave Button	910TC-SS	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
By Security Supplier								
2	Card Reader	To Suit Building System	Black					☐
2	Motion Sensor	915AFI	Black	Dormakaba	X			☐
2	Access Controller	To Suit Building System						☐
2	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
4	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.

End of Heading

Heading# 27

Opening Information					
Opening Type:	Pair	**Opening Size:**	2-900 x 2150 x 45	**STC Rating**	None
Door Material:	IHMD	**Frame Material:**	HMF	**Fire Rating**	None

1 Total Openings

1 **Door#** D036 **Location:** Mechanical 124 From Exterior **Handing:** RHRA

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
2	Continuous Hinge	A110HD x 2109	628 / US28 / Clear Anodized	ABH	X	X		☐
1	Exit Device / Night Latch Trim	CD9700-Z003T-L118	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Exit Device	CD9700EO	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Pull Handle	CBH 6039 x 914 OA x 32 DIA x mtg#6	630 / US32D / Satin Stainless Steel	CBH	X			☐
2	Closer	TS9315-SPT-SN4	689 / US28 / Painted Aluminum	Dormakaba	X	X		☐
2	Mortise Cylinder	97D02T	626 / US26D / Satin Chrome	Dormakaba	X			☐
1	Mortise Cylinder	97D01T	626 / US26D / Satin Chrome	Dormakaba	X			☐
1	Electric Strike	F0162	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐
1	Removable Mullion	1340KR-EL	600 / USP / Primed	Dormakaba	X	X		☐
1	Weatherstrip	20-S x 6100	628 / US28 / Clear Anodized	KN Crowder	X			☐
2	Auto Door Bottom	CT-54 x 900	719 Milled Aluminum	KN Crowder	X			☐
1	Threshold	CT-46 x 1800	719 Milled Aluminum	KN Crowder	X			☐
By Security Supplier								
1	Card Reader	To Suit Building System	Black					☐
1	Motion Sensor	915AFI	Black	Dormakaba	X			☐
1	Access Controller	To Suit Building System						☐
1	Power Supply	To Suit Building System – Locate in nearest IT closet						☐
By Region Of Durham								
1	Permanent Core	77D100	626 / US26D / Satin Chrome	Dormakaba	X			☐

End of Heading

Electrical Automatic

Heading# 28

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2568 x 45	**STC Rating**	None
Door Material:	ALD	**Frame Material:**	ALF	**Fire Rating**	None

1 Total Openings

1 **Door#** D063 **Location:** Corridor 107 To Open Office 108 **Handing:** RH

					Web Link	Install Instructions	Site Verified	
By Hardware Supplier								
1	Continuous Hinge	A110HD x 2542	628 / US28 / Clear Anodized	ABH	X	X		☐
1	Pull Handle Set	CBH 6041 x 914 OA x 32 DIA x mtg#3 x BTB	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Overhead Stop	1023SL	630 / US32D / Satin Stainless Steel	ABH	X	X		☐
1	Weather Strip	By Aluminum Door Supplier						☐
By Automatics Supplier								
1	Auto Operator	ED100 x SA x PULL x 1041mm header	628 / US28 / Clear Anodized	Dormakaba	X	X		☐
2	Wave Button	910TC-SS	630 / US32D / Satin Stainless Steel	Dormakaba	X	X		☐

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.

End of Heading

Heading# 29

Opening Information					
Opening Type:	Single	**Opening Size:**	965 x 2568 x 45	**STC Rating**	None
Door Material:	ALD	**Frame Material:**	ALF	**Fire Rating**	None

1 Total Openings

1 **Door#** D061 **Location:** Corridor 102 From Vestibule 122 **Handing:** RHR

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
1	Continuous Hinge	A110HD x 2542	628 / US28 / Clear Anodized	ABH	X	X		☐
1	Pull Handle Set	CBH 6041 x 914 OA x 32 DIA x mtg#3 x BTB	630 / US32D / Satin Stainless Steel	CBH	X			☐
1	Overhead Stop	1023SL	630 / US32D / Satin Stainless Steel	ABH	X	X		☐
1	Weather Strip	By Aluminum Door Supplier						☐

End of Heading

Heading# 30

Opening Information					
Opening Type:	Pair	**Opening Size:**	2-915 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	CASED OPEN DRYWALL	**Fire Rating**	None

2 Total Openings

										Web Link	Install Instructions	Site Verified
1	**Door#**	D005	**Location:**	Closet	From	Corridor 102	**Handing:**	BI-PART				
1	**Door#**	D015b	**Location:**	Closet	From	Corridor 107	**Handing:**	BI-PART				

By Hardware Supplier								
4	Track	CFT-200-BP x 3660	622 / US19 / Flat Black	KN Crowder	X			☐
8	Hangers	CFT-201-CC2-BP	622 / US19 / Flat Black	KN Crowder	X			☐
4	Floor Guide	C-913		KN Crowder				☐
4	Spacer	CRFT-WBS		KN Crowder				☐
4	Guide Channel	C-914 x 915	628 / US28 / Clear Anodized	KN Crowder				☐
4	Door Pull	C-90BH	622 / US19 / Flat Black	KN Crowder	X			☐

End of Heading

Heading# 31

Opening Information					
Opening Type:	Single	**Opening Size:**	915 x 2150 x 45	**STC Rating**	None
Door Material:	SCWD	**Frame Material:**	CASED OPEN DRYWALL	**Fire Rating**	None

1 Total Openings

1 **Door#** D015a **Location:** Closet From Corridor 107 **Handing:** SS

By Hardware Supplier					Web Link	Install Instructions	Site Verified	
1	Track	CFT-200-BP x 1830	622 / US19 / Flat Black	KN Crowder	X			☐
2	Hangers	CFT-201-CC2-BP	622 / US19 / Flat Black	KN Crowder	X			☐
1	Floor Guide	C-913		KN Crowder				☐
1	Spacer	CRFT-WBS		KN Crowder				☐
1	Guide Channel	C-914 x 915	628 / US28 / Clear Anodized	KN Crowder				☐
1	Door Pull	C-90BH	622 / US19 / Flat Black	KN Crowder	X			☐

End of Heading

END OF SCHEDULE

1 General

1.1 Section includes

.1 Section includes supply and installation of glass and glazing for sections referencing this section for products and installation of:

.1 Glazing materials.

.2 Sealed insulating glass units (GL1).

.3 Fire rated glass (FRG)

.4 Glass films (FILM).

.5 Vision Strips (VS).

.6 Back Painted Glass (SP1).

1.2 Related requirements

.1 Section 06 10 00 – Rough Carpentry

.2 Section 07 92 00 – Sealants

.3 Section 08 11 13 – Steel Doors and Frames

.4 Section 08 41 13 – Aluminum Framed Entrances and Storefronts

.5 Section 08 44 13 – Glazed Aluminum Curtain Wall

1.3 Performance requirements

.1 Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with the Ontario Building Code and to withstand design pressures specified in applicable sections.

.2 Where glass extends from 1,070 mm to floor, design lateral loads, in addition to other load requirements, in accordance with applicable codes.

.3 Unless otherwise specified, limit glass deflection to L/175 or flexure limit of glass with full recovery of glazing materials, whichever is less.

.4 Provide tempered, laminated, laminated-heat strengthened and heat soaked glass and related fittings and hardware in doors, side lites, screens, storefronts, glazed curtain walls, and glazed guard rails accordance with applicable codes and as indicated or scheduled.

.5 Unless otherwise specified or indicated, provide tempered glass where sill of glass is less than 300 mm above finished floor.

.6 Unless otherwise specified or indicated, provide laminated-heat strengthened and heat soaked glass where glass is a guard.

.7 Sealed Insulating Glass Units: Provide units free of the following characteristics:

.8 Appearance of condensation between panes.

.9 Obstruction of vision at unit perimeter.

.10 More than 10 % measurable deterioration of thermal transmission or shading coefficient values.

.11 Chipping, cracking, or breakage of glass panes occurring due to manufacturing defects or under specified service conditions.

.12 Migration of edge spacer.

1.4 Administrative requirements

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this Section.

.2 Coordination of the Location of Tempering and Laminated Glass Stamps/Logos: Contractor is required to discuss and coordinate the location of the Tempering and Laminating stamps/ logos with the Consultant at the time of shop drawing submission. This is to be reviewed and approved prior to the ordering of any glass.

1.5 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

.4 Product Data on Glazing Sealant: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colours.

.5 Shop Drawings: For glass indicated to comply with performance requirements.

.1 Clearly indicate glass types, configurations, thicknesses, translucent finishes, treatments, coatings, gaskets, hardware and accessories.

.2 Indicate forces applied to connections at structure and analysis data.

.3 Apply signature and seal by a qualified professional structural engineer licensed in the Province where the Project is located.

.6 Samples:

.1 Submit two 300 x 300 mm samples for each type of glass specified.

.2 Samples for Colour Selection:

.1 Allow for a minimum of three iterations of samples for each type of custom coloured glass to the approval of Consultant.

.3 Samples for Verification: Submit one (1) sample 300 x 300 mm in size, exampling each type of glass following Consultant review.

.4 Glazing Accessory Samples: Submit samples of each type of glazing accessory. For structural glazing sealants, install 300 mm length of sealant between two (2) edges of representative glass samples.

.7 Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated or scheduled.

1.6 Submittals for information

.1 Manufacturer's Certificate: Certify that glass products conform to requirements.

.2 Qualifications Data: For installer. Include proof of adequate facilities and capacity to produce work.

.3 Professional Structural Engineer's Letters of Assurance:

.1 Provide letters or completed prescribed forms, signed by the professional structural engineer used to perform inspections and design glass, stating that the glass indicated conforms to performance requirements and design criteria, and has been fabricated and installed in accordance with applicable code requirements.

1.7 Quality assurance

.1 Perform Work in accordance with Ontario Glass and Metal Association (OGMA) Ontario Glazing Systems Specification Manual, supplemented by GANA (Glass Association of North America) Glazing Manual, and GANA Laminated Glazing Reference Manual, for design and fabrication of glazing and installation methods.

.2 Perform Work in accordance with Insulating Glass Manufacturer's Association of Canada (IGMAC) Glazing Guidelines for Sealed Insulating Glass Units, including requirements for guaranteed service life for manufacture and installation of sealed insulating glass units.

.3 Certify units to Insulating Glass Manufacturers Alliance (IGMA) program to ASTM E2190.

.4 Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: An insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

.5 Installer Qualifications: Company specializing in performing the work of this Section with minimum five (5) years' continuous documented experience on projects of similar scope and size, approved by the manufacturer.

.6 Labelling:

.1 Label glass, with manufacturer's labels identifying glass type and thickness.

.2 Safety Glazing: Permanently mark glazing with certification label of the manufacturer. Label shall indicate manufacturer's name, type

of glass, thickness, and the safety glazing standard with which glass complies.

.3 Insulating Glass Units: Permanently mark spacers, or at least one component lite, of units with appropriate certification label of IGMAC.

1.8 Delivery, storage and handling

.1 Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

.2 Minimize storage time of materials at site.

.3 Minimize handling. Install glass as soon as possible after delivery.

.4 Store glass at a constant temperature, vertically, blocked off the floor and in a designated clean, dry and dust-free and corrosive contaminant-free interior storage area with adequate air circulation.

.5 Protect glass from contact with contaminants.

1.9 Warranty

.1 Provide a ten (10) year manufacturer’s insulated glass unit warranty, starting from date of Substantial Performance, to include coverage for:

.1 Sealed glass units from seal failure, interpane dusting or misting of any nature, and replacement of same.

.2 Delamination of laminated glass and replacement of same.

.3 Colour fading of interlayer and replacement of whole glass units.

.2 Installation of plastic films on glass shall not diminish coverage of warranties for glass.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials – general

.1 Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses and heat treatment as needed to conform to requirements specified.

.1 Minimum Glass Thickness for Exterior Lites: As indicated by Design.

.2 Minimum Glass Thickness for Interior Lites: 6 mm.

2.3 Glass materials

.1 Clear Annealed Float Glass: CAN/CGSB 12.3 glazing quality or ASTM C1036 Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

.2 Heat Strengthened Float Glass (HS): CAN/CGSB 12.9, Type 2 Heat Strengthened, Class A or ASTM C1048; Type I; Kind HS (heat strengthened); Quality-Q3; Class I (clear) unless otherwise indicated; of condition indicated.

.3 Fully Tempered Float Glass (TPG): CAN/CGSB 12.1, Type 2- Fully Tempered, Class B or ASTM C1048; Type I; Quality-Q3; Kind FT (fully tempered); Class I (clear) unless otherwise indicated; of condition indicated.

.1 Heat soak tempered float glass to BS EN 14179-1 for exterior insulated glass units.

.4 Fire rated glass (FRG):

.1 8 mm thick, laminated ceramic fire-rated glass. Glass shall be ULC-listed to conform with CAN-ULC S104 & 106. Glass shall be impact-safety tested to CAN/CGSB 12.1. Include correct glazing tape and setting blocks as per product Listing. Butyl tape is not acceptable.

.1 Approved Products:

.1 ‘Keralite Select L’ by Ventrotech/Saint-Gobain; and

.2 ‘FireLite Plus’ by Technical Glass Products; or

.3 Approved alternate.

.5 Back Painted Glass (SP1): CAN/CGSB 12.9 spandrel glass or ASTM C1048, Condition C, Type I, Quality-Q3 heat strengthened or fully

tempered clear float glass, elastomeric solvent-free coating non-accessible surface, colour selected by Consultant.

.1 Fabrication: Apply coating at a thickness of at least 13 mils wet or 5 mils dry. Provide accurate and straight edge deletions of coatings at areas of insulating glass assemblies where coating is applied to surfaces scheduled to be in contact with the primary seal of insulating glass units.

.2 Product: Opaci-Coat as manufactured by ICD High Performance Coatings, or approved alternate.

.3 Colour: to be selected by Consultant from Manufacturer's full range.

.6 Ceramic Fritted Glass: Coloured and patterned ceramic frit on clear glass covering 100 % of glass units as per Consultant's design.

.7 Low Iron Glass: where indicated, provide low iron glass with minimum 91% visible light transmittance when tested at 6 mm thickness.

2.4 Glazing accessories

.1 Setting Blocks: Neoprene, EPDM or silicone, 80 to 90 Shore A durometer hardness tested to ASTM D2240, length of 25 mm for each square metre of glazing or minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height to suit glazing method and pane weight and area. Maximum compression set to ASTM D395 and ASTM C864.

.2 Spacers: Neoprene EPDM or silicone, 40 to 60 Shore A durometer hardness tested to ASTM D2240, minimum 75 mm long x one half the height of the glazing stop x thickness to suit application. Quantity and location in accordance with IGMAC standards and as recommended by the frame and glass manufacturer. Provide face shims when gunnable materials or non-shimmed tapes are used. Provide anti-walk edge blocks or side shims in dry glazed frames to limit glass lateral movement.

.3 Glazing Tape: Preformed butyl compound, UV resistant, self-adhering, coiled on release paper, service temperature range of minus 40 to plus 50 ºC, colour as selected by Consultant, minimum 3 mm thickness and as follows:

.1 Glass up to 2,540 United Millimetres: 5 mm.

.2 Glass Units over 2,540 United Millimetres: 6 mm.

.3 Double Glazed Units: 7 mm.

.4 Pre-Shimmed Glazing Tape: Pre-formed butyl tape, UV resistant, self-adhering, integral continuous serrated synthetic rubber shim and release paper, 10 to 15 Shore A durometer hardness, service temperature range of minus 54 to plus 104 °C, designed for 25 to 50 % compression, colour as selected by Consultant, minimum 3 mm thick.

.5 Glazing Wedges and Splines: Precision extruded neoprene or EPDM compound, UV resistant, 55 to 65 Shore A durometer hardness, designed for use with pre-shimmed glazing tape, sized to suit glazing channel retaining slot.

.6 Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

.7 Structural Silicone Glazing Sealant: Structural sealant as specified in Section 07 92 00 – Sealants.

2.5 Sealed insulating glass units

.1 Fabricate sealed glass units through the Insulating Glass Manufacturers Association of Canada Certification Program to CAN/CGSB 12.8 or ASTM E2910. Sealed units shall bear IGMAC or IGCC/IGMA Certified Products List number and be properly identified.

.2 Sealant:

.1 Primary Seal: Polyisobutylene as recommended by glazing manufacturer to meet performance criteria.

.2 Secondary Seal: two part silicone or polysulfide as recommended by glazing manufacturer to meet performance criteria.

.3 Perimeter Seal shall consist of three components; a "Warm Edge" spacer; a primary polyisobutylene seal between spacer and glass sheets, and a secondary two-part silicone or polysulfide perimeter seal.

.4 Gas fill with Argon to manufacturer's specifications after completion of sealed unit fabrication.

.5 Clear Low-Emissivity (Low E) Coating: High performance sputtered low-E coating. Low emissivity coating as outlined below complying with ASTM

C1376 pyrolytically (magnetic sputter vacuum) coated low-emissivity glass, and resulting in a stable, uniform, nearly invisible coating:

.1 Low E: “Energy Select 28” by AGC Glass North America, or approved alternate.

.6 Gas fill: Argon to manufacturer's recommended pressure.

.7 Insulated glass unit assemblies (GL1):

.1 Performance:

.1 Minimum Visible Light Transmittance: 62 %

.2 Visible Reflectance (out): 13 %

.3 Maximum Solar heat Gain Coefficient: 0.28

.4 Maximum winter ‘U’ value (Btu/H Ft2 deg F): 0.24

.2 Outer Glass Pane:

.1 Tint: Clear

.2 Glass Type: TPG

.3 Thickness: 6 mm

.4 Coating: Low E on Surface 2

.3 Spacer: 12 mm warm edge spacer, black.

.4 Inner Glass Pane:

.1 Tint: Clear

.2 Glass Type: TPG

.3 Thickness: 6 mm

.4 Coating: No coating

2.6 Glazing films

.1 Glazing film (FILM1): monolithic translucent film.

.1 Product: Fasara by 3M or approved alternate.

.2 Colour, pattern and finish: Frosted transparent finish, to be later selected by Consultant from manufacturer’s standard range.

.2 Vision Strips (VS): Contrasting continuous horizontal vision strip, 50 mm width, at a height indicated on drawings. To meet Accessibility for Ontarians with Disabilities Act (AODA) requirements:

.1 Product: Fasara by 3M or approved alternate.

.2 Colour, pattern and finish: Frosted transparent finish, pattern to be later selected by Consultant from manufacturer's standard range.

.3 Cleaners: Types recommended by glazing film manufacturer.

3 Execution

3.1 Examination

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 Preparation

.1 Clean contact surfaces with solvent recommended for use by the sealant manufacturer, and wipe dry thoroughly.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 Exterior glazing

.1 Aluminum Frames - Tape / Gaskets

.1 Cut glazing tape to length and set against permanent stops, level with sight line. Seal corners by butting tape and dabbing with sealant.

.2 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.

.3 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.

.5 Install removable stops with gaskets inserted between glazing and applied stops.

.2 Wet Method -Sealant / Sealant

.1 Place setting blocks at ¼ points and install glazing light or unit.

.2 Install removable stops with glazing centred in space by inserting spacer shims both sides at 600 mm intervals, 6 mm below sight line.

.3 Fill gaps between glazing and stops with sealant to depth of bite on glazing, maximum 10 mm below sight line to ensure full contact with glazing and continue air and vapour seal.

.4 Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

.3 Structural Silicone Glazing

.1 Cut glazing tape to length and set against permanent stops, 6mm back from sight line. Seal corners by butting tape and dabbing with sealant.

.2 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.

.3 Rest glazing on setting blocks and push against tape with sufficient pressure to attain full contact at perimeter of light or glass unit.

.4 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.

.5 Install backer rod and weather seal between glass unit edges.

.6 Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.4 Interior glazing

.1 Wet Method - Sealant / Sealant

.1 Install glazing resting on setting blocks. Install applied stop and centre light by use of spacer shims at 600 mm centres, 6 mm below sight line.

.2 Locate and secure glazing light using glazers' clips.

.3 Fill gaps between glazing and stops with glazing sealant until flush with sight line. Tool surface to straight line.

.2 Steel Frames - Tape / Sealant

.1 Cut glazing tape to length and set against permanent stops, 3 mm below sight line. Seal corners by butting tape and dabbing with sealant.

.2 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.

.3 Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.

.4 Install removable stops with spacer strips inserted between glazing and applied stops below sight line. Place glazing tape on glazing light or unit with tape 6 mm below sight line.

.5 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 6 mm below sight line.

.6 Apply cap bead of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.5 Plastic film installation

.1 Install plastic film in locations and to designs indicated on the drawings.

.2 Clean glass to receive film, thoroughly and let dry.

.3 Install plastic film in accordance with film manufacturer's instructions.

.4 Remove all air bubbles, creases or visible distortion.

.5 Fit tight to glass perimeter.

3.6 Cleaning & protection

.1 During installation, remove all corrosive or foreign materials or droppings resulting from work of this trade.

.2 Perform initial cleaning operation of all glass and mirrors upon completion of installation. Do not remove labels or protective films until time of final cleaning.

.3 After initial cleaning, mark large lites with an "X" by using removable plastic tape. Do not use masking tape. Do not mark heat absorbing or reflective glass units.

.4 Provide instructions for the proper method and materials to be used in the cleaning and maintenance of finished surfaces. Remove all remaining labels and protective films at time of final cleaning.

3.7 Glazing schedules

.1 Refer to Windows Schedules and Screen Schedules on the Drawings for locations and extent of all glazing types specified herein.

.2 Hollow Metal Doors and Borrowed Lights:

.1 Single 6 mm clear tempered safety glazed light, as indicated.

.2 Single 8 mm clear fire rated glazed light (FRG), for fire rated doors and frames.

.3 Wood Doors and Borrowed Lights:

.1 Single 6 mm (¼ in.) clear tempered safety glazed light.

.2 Single 8 mm clear fire rated glazed light (FRG), for fire rated doors and frames.

.4 Aluminum Entrances:

.1 Interior vestibules: Single 6 mm (¼ in.) clear tempered safety glazing.

.2 Exterior entrances: Insulating glass unit (GL1). .

.5 Aluminum curtain wall:

.1 Vision areas; insulating glass units (GL1).

.2 Spandrel areas: Provide 6 mm tempered, back painted spandrel glass (SP1) with insulated back pan.

End of section

1 General

1.1 Summary

.1 This Section includes requirements for supply and installation of fixed louvers, bird screens, blank-off panels and attachment brackets as shown on drawings, as specified and as required for complete and proper installation.

.2 Fixed louvers to be furnished include the following:

.1 Storm Resistant Louver

1.2 Related requirements

.1 Section 04 22 00 – Concrete Masonry Units

.2 Section 05 40 00 – Cold Formed Metal Framing

.3 Section 05 50 00 – Metal Fabrications

.4 Section 06 10 00 – Rough Carpentry

.5 Section 07 92 00 – Sealants

1.3 References

.1 American Society for Testing and Materials (ASTM):

.1 ASTM B209-10, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate

.2 ASTM B211-12e1, Standard Specification for Aluminum and Aluminum Alloy Rolled or Cold Finished Bar, Rod, and Wire

.3 ASTM B221-12, Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

.4 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.2 Canadian Standards Association (CSA):

.1 CAN/CSA-S157-05/S157.1-05 (R2010), Strength Design in Aluminum / Commentary on CSA S157-05, Strength Design in Aluminum

.2 CAN/CSA-S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members

.3 Architectural Aluminum Manufacturers Association (AAMA):

.1 AAMA 605.2-95, Voluntary Specification for High Performance Organic Coatings on Aluminum Extrusions and Panels

.2 AAMA 800-10, Voluntary Specifications and Test Methods for Sealants

.3 AAMA 2605-11 Superior Performing Organic Coatings on Aluminum Extrusions and Panels

.4 AAMA TIR Metal Curtain Wall Fasteners (2000 Addendum)

.4 Air Movement and Control Association International Inc. (AMCA):

.1 AMCA Standard 500-L-12, Laboratory Methods of Testing Louvers for Rating

.2 AMCA Publication 501-09, Application Manual for Louvers

.3 AMCA Publication 511-10 (Rev. 8/12), Certified Ratings Program - Product Rating Manual for Air Control Devices

1.4 Administrative requirements

.1 Coordination: Coordinate the Work of this Section with the installation of ductwork; Sequence work so that installation of louvers coincides with installation of HVAC materials without causing delay to the Work.

.2 Pre-Construction Conference: Arrange a site meeting attended by the Contractor, the Subcontractor, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section; as indicated in Section 01 31 19 – Project Meetings.

.1 Review methods and procedures related to installation, including manufacturer's written instructions;

.2 Examine substrate conditions for compliance with manufacturers installation requirements;

.3 Review temporary protection measures required during and after installation.

1.5 Submittals

.1 Provide requested information in accordance with Section 01 33 00 – Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data:

.1 Air flow and water entrainment performance test results

.2 Material types and thickness

.2 Shop Drawings: Submit shop drawings showing the location, finished appearance and dimensions of each type of louver. Show all material, thicknesses, connections, fastenings, shapes and finishes.

.3 Coating Samples: Submit samples of factory applied coatings and finishes for Consultant's initial selection.

.4 Samples: Submit for approval 305 mm (12 in.) long sample lengths of each type of louver blade and frame extrusion prior to full scale production, showing finish colour.

.3 Information Submittals:

.1 Certification: Submit product test reports based on evaluation of comprehensive tests performed by a qualified testing agency for each type of louver required for this project.

.2 Performance Requirements: Provide AMCA test data as required to confirm that the louvers have the specified air and water performance characteristics.

.3 Structural Requirements: Design all materials to withstand wind load of 20 psf (955 Pa) and snow loads as required by the applicable building code, and recommended by the louver manufacturer.

.1 Ensure louver members deflect no more than L/180 of span between supports when subjected to wind load applied horizontally to louver face.

.4 Delegated Design Submittals: Furnish complete design calculations and details, fabrication and erection shop drawings and site review

for fixed louvers, bearing the seal of a Professional Engineer registered in the Province of the Work, in accordance with applicable Building Code and Contract Documents.

.4 Sustainable Design Submittals:

.1 Refer to Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

1.6 Closeout submittals

.1 Operation and Maintenance Data: Submit manufacturer's written instructions for cleaning solutions, materials and procedures, include name of original installer and contact information in accordance with Section 01 78 00 – Closeout submittal.

.1 Provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.7 Quality assurance

.1 Qualifications: Provide proof of qualifications when requested by Consultant:

.1 Manufacturer / Supplier: Obtain materials from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties.

.2 Installers: Execute Work of this Section using qualified personnel skilled in installation of work of this Section, having a minimum of three (3) years proven experience of installations similar in material, design, and extent to that indicated for this Project.

1.8 Delivery, storage and handling

.1 Delivery: At the time of delivery, visually inspect all materials for damage. Note any damaged boxes, crates, or louver sections on the receiving ticket and immediately report to the shipping company and the material manufacturer.

.2 Storage: Store louver raised off the ground and cover with a weather proof flame resistant sheeting or tarpaulin.

.3 Handling:

.1 Material shall be handled in accordance with sound material handling practices and in such a way as to minimize racking.

.2 Louver sections may be hoisted by attaching straps to the jambs and lifting the section while it is in a vertical position.

.3 Louver sections should only be lifted and carried by the jambs. Heads, sills and blades are not to be used for lifting or hoisting louver sections.

1.9 Site conditions

.1 Verify dimensions of actual opening by field measurements before fabrication and indicate measurements on Shop Drawings where fixed louvers are indicated to fit walls and other construction.

.2 Establish dimensions and proceed with fabricating fixed louvers where field measurements cannot be made without delaying the work; allow for trimming and fitting.

1.10 Warranty

.1 Warrant the work of this section in accordance with General Conditions, but for two (2) years period starting from date of Substantial Performance, and agree to repair or replace faulty materials or work which becomes evident during the Contract warranty period without cost to the Owner and at the Owner's convenience.

.2 Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on aluminum louvers within the specified warranty period and agreeing to repair finish or replace louvers that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, colour fade, chalking, cracking, peeling, and loss of film integrity for a period of ten (10) years from date of Substantial Performance.

2 Products

2.1 Materials

.1 Aluminum Extrusions: ASTM B211, Aluminum Alloy 6063-T52.

.2 Aluminum Sheet: ASTM B209, Aluminum Alloy 6063-T52.

.3 Fastenings: Provide zinc plated steel or AISI Type 304 stainless steel for screws and fasteners.

.4 Structural Support: Designed and furnished by louver manufacturer to support wind load of 955 Pa (20 psf), unless otherwise specified.

2.2 Fixed louver systems

.1 Horizontal drainable louvers:

.1 Louver Depth: 2 inches (50 mm)

.2 Blade Profile: Drainable blade with front gutter for water diversion to jambs

.3 Frame and Blade Nominal Thickness: Not less than 0.063 in. (1.60 mm) for blades and frames.

.4 Louver Performance Ratings:

.1 Free Area: Not less than 7.91 sq. ft. (0.73 sq. m) for 48 in. (1220 mm) wide by 48 in. (1220 mm) high louver.

.2 Point of Beginning Water Penetration: Not less than 889 fpm (4.5 m/s).

.3 Air Performance: Not more than 0.12 in. wg (30-Pa) static pressure drop at 800 fpm (4.1-m/s) free-area velocity.

.4 AMCA Seal: Product must be tested and certified by AMCA. Louver units to be marked with AMCA Certified Ratings Seal.

.5 Approved product: Model E2DS by Architectural Louvers Co. (Harray, LLC) or approved alternate.

2.3 Accessories

.1 Sill Flashing: Provide sill flashing of same material and finish as adjacent louver, as approved by the Consultant.

.2 Structural Support:

.1 Louver Support: Designed and furnished by louver manufacturer to support wind load of 955 Pa (20 psf), unless others specified.

.2 Support Angle: Louvers openings greater then 3 m (10 ft.) high require horizontal girt at mid span, as indicated in Section 05 50 00 – Metal Fabrications.

.3 Bird Screens:

.1 12 mm (½ in.) opening, 1.13 mm (0.044 in.) re-galvanized steel wire mesh, in an extruded aluminum frame. Removable screen frame to be independent to louver assembly, attaching to the interior face of the louver, providing continuous coverage.

.4 Insect Screens:

.1 Supply manufacturer's standard aluminum mesh insect screen, welded to aluminum frame. Removable screen frame to be independent to louver assembly, attaching to the interior face of the louver, providing continuous coverage.

.5 Blank-Off Panels:

.1 Insulated Blank-off Panels:

.1 Aluminum faced prefinished insulated blank-off panels, consisting of 51 mm (2 in.) thick semi rigid, mineral wool core insulation, having an R value of R-4.2/1". Ensure insulation is continuous and applied around all penetrations and building elements including structural supports.

.2 Finish:

.1 Exterior face sheet: Finished to match adjacent louver.

.2 Interior face sheet: Mill finish.

2.4 Fabrication

.1 Fabricate as required for optimum performance with respect to water penetration, strength, durability and uniform appearance.

.2 Fabricate louvers to outside dimensions indicated, with allowance of 10 mm (3/8 in.) on each side for sealant joints. Coordinate size, location and placement of units, with installer, prior to fabrication.

.3 Fabricate louvers to minimize field adjustments, splicing, mechanical joints and field assembly of units. Assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling.

.4 Clearly mark units for assembly and coordinated installation. Include vertical structural supports, where required.

.5 Provide vertical mullions of type and spacing indicated but not greater than 1524 mm (5 ft.) o/c. Mechanically assemble louvers using stainless steel or zinc plated steel fasteners recommended by manufacturer.

.6 Provide supports, anchors and accessories required for a complete assembly.

2.5 Finishes

.1 High Performance Organic Finish:

.1 Two (2) Coat PVDF Coating: AA-C12 Chemical Finish, cleaned with inhibited chemicals; C40 Chemical Finish, conversion coating; R1x Organic Coating, manufacturer's standard two (2) coat, thermo-cured system consisting of specially formulated inhibitive primer and fluoropolymer colour topcoat containing not less than 70 % PVDF resin by weight; prepare, pre-treat, and apply coating to exposed metal surfaces in accordance with AAMA 2604 and with coating and resin manufacturers' written instructions.

.1 Colour: As selected by the Consultant from the manufacturer’s standard colour offering.

.2 Basis of Design Material: PPG Duranar by PPG Industries or approved alternate.

3 Execution

3.1 Examination

.1 Verification of Conditions:

.1 Examine openings to receive work and surrounding adjacent surfaces for conditions affecting installation. Coordinate with related sections providing openings to ensure proper dimensions are maintained.

.2 Verify dimensions of supporting structure by accurate field measurements so that work will be accurately designed, fabricated and fitted to the structure.

.2 Notify Contractor in writing of any conditions that are not acceptable.

.3 Proceed with installation after verification and correction of surface conditions acceptable to manufacturer.

3.2 Installation

.1 Comply with manufacturer's instructions and recommendations for installation of the work, as shown on approved Shop Drawings.

.2 Anchor louvers to the building substructure as indicated on Shop Drawings and architectural drawings.

.3 Erection Tolerances:

.1 Maximum variation from plane or location shown on the approved shop drawings 3 mm in 3,048 mm (1/8 in. in 10 ft.).

.2 Maximum offset from true alignment between two members abutting end to end, edge-to-edge in line: 1.6 mm (1/16 in.).

.3 Erection tolerances shall prevail under both load and no load conditions.

.4 Cut and trim component parts during erection only with the approval of the manufacturer, and in accordance with the manufacturer’ recommendations. Restore finish completely.

.5 Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

.6 Set units level, plumb and true to line, with uniform, tight joints to adjacent work.

.7 Provide necessary fastenings, anchors, clip angles, sills and sill flashings required to complete the installation.

3.3 Protection

.1 Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

3.4 Cleaning

.1 Progress Cleaning: Leave work area clean at the end of each work day, ensuring safe movement of passing pedestrians.

.2 Final Cleaning: At completion of installation, clean all surfaces so they are free of foreign matter using cleaners recommended by material manufacturer.

.3 Restore louvers and accessory components damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the Consultant, remove and replace damaged systems with new at no additional cost to the Owner.

.4 Waste Management: Co-ordinate recycling of waste materials and packaging at appropriate facility, diverting waste from landfill. Certified installer shall be responsible for ensuring waste management efforts are practiced.

End of section

1 General

1.1 Related documents

.1 Schedule of finishes applies to finishes located in division 02 to 48 where applicable.

.2 Refer to room finish schedule, and drawings for location of applied finishes schedule in this section.

.3 Refer to technical specifications for submittal, quality and installation requirements for each product and finish listed in this schedule of finish.

1.2 Schedule includes

.1 This schedule includes Basis of Design finish and product selections.

.2 Submit alternate to Basis of Design products in accordance with Section 01 25 00 - Substitution Procedures.

SECTION	CODE	ITEM	BASIS OF DESIGN
06 40 23	PL-1	**Plastic Laminate**	**Manufacturer:** Formica **Product:** Danish Maple 8906-58 **Finish:** Matte 58
06 40 23	PL-2	**Plastic Laminate**	**Manufacturer:** Formica **Product:** ColorCore 2 White 949-90 **Finish:** Gloss 90 **Grade:** CC (ColorCore2 Solid Color Laminate – HCS)
06 40 23	PL-3	**Plastic Laminate**	**Manufacturer:** Formica **Product:** Infiniti, ColorCore 2, New White, 7223C-AN **Finish:** Gloss 90 **Grade:** CC (ColorCore2 Solid Color Laminate – HCS)
06 61 16	SS-1	**Solid Surface Countertop**	**Manufacturer:** WilsonArt **Colour:** Night Stars 9105CS **Thickness:** 12 mm
06 61 16	SS-2	**Solid Surface Countertop**	**Manufacturer:** Corian **Colour:** Modern White **Thickness:** 12 mm

SECTION	CODE	ITEM	BASIS OF DESIGN
06 61 16	SS-3	**Solid Surface Countertop**	**Manufacturer:** Corian **Colour:** Deep Cloud **Thickness:** 12 mm
08 14 00		**Wood Doors**	**Manufacturer:** Lambton Doors **Product:** PLS-101 Village Oak **Colour:** Maple **Cut:** Plain Sliced
09 30 00	T-1	**Porcelain Tile Vestibule 122**	**Tile:** **Supplier:** Olympia Tile **Series:** Design Industry **Material:** Porcelain **Size:** 300 mm x 600 mm **Colour:** Oxyde Light **Finish:** Matte **Pattern:** Brick **Grout:** **Manufacturer:** TBD **Colour:** TBD
09 30 00	T-2	**Porcelain Tile Base**	**Tile:** **Supplier:** Olympia Tile **Series:** Design Industry **Material:** Porcelain **Size:** 150 mm x 600 mm **Colour:** Oxyde Light **Finish:** Matte **Grout:** **Manufacturer:** TBD **Colour:** TBD
09 30 00	T-3	**Porcelain Tile Washroom Floor**	**Tile:** **Supplier:** Centura **Product:** Cemento Stone – CEBL1224 **Material:** Porcelain **Size:** 300x600X9 **Colour:** Black **Finish:** Matte **Grout:** **Manufacturer:** TBD **Colour:** TBD

SECTION	CODE	ITEM	BASIS OF DESIGN
09 30 00	T-4	**Porcelain Tile Base Washroom**	**Tile:** **Supplier:** Centura **Product:** Cemento Stone – CEBL1224 **Material:** Porcelain **Size:** 150x600X9 **Colour:** Black **Finish:** Matte **Grout:** **Manufacturer:** TBD **Colour:** TBD
09 30 00	T-5a	**Washroom Wall Tile**	**Tile:** **Supplier:** Centura **Product:** Rainbow – FL416WG **Material:** Porcelain **Size:** 100x400X8 **Colour:** White **Finish:** Glossy **Grout:** **Manufacturer:** TBD **Colour:** TBD
09 30 00	T-5b	**Washroom Wall Tile**	**Tile:** **Supplier:** Centura **Product:** Rainbow – FL416DE **Material:** Porcelain **Size:** 100x400X8 **Colour:** Denim **Finish:** Glossy **Grout:** **Manufacturer:** TBD **Colour:** TBD
09 03 00	T-6	**Mosaic Tile Shower Floors**	**Tile:** **Supplier:** Centura **Product:** Cemento Stone – CEBLMO22 **Material:** Porcelain **Size:** 300x300X9 **Colour:** Black **Finish:** Matte **Grout:** **Manufacturer:** TBD **Colour:** TBD

SECTION	CODE	ITEM	BASIS OF DESIGN
09 03 00	T-7	**Backsplash Tile**	**Tile:** **Supplier:** Centura **Product:** Rainbow – FL416WG **Material:** Porcelain **Size:** 100x400X8 **Colour:** White **Finish:** Glossy **Grout:** **Manufacturer:** TBD **Colour:** TBD
09 30 00	SP	**Stone Panel System**	**Manufacturer:** RealStone Systems **Product:** Charcoal Shadowstone Panel **Material Type:** Slate **Finish**: Natural **Size:** 6”X24”
09 65 00	VB	**Vinyl Base**	**Manufacturer:** Johnsonite Tarkett **Product:** Traditional Vinyl Base (1/8”, type TV) **Profile:** with toe **Colour:** 20 Charcoal WG **Height:** 100mm
09 65 00	SV	**Sheet Vinyl Flooring**	**Manufacturer:** Forbo **Product:** Marmoleum Real **Colour:** Serene Grey
09 90 00	EPX-1	**Epoxy Wall System**	**Refer to specifications**
09 67 23	EPX-2	**Epoxy Floor System**	**Refer to specifications**
09 67 23	CB	**Integrated Cove Base**	**Refer to specifications** **Height**: 200mm
09 68 13	CPT	**Carpet Tile**	**Manufacturer:** Interface **Size:** 250X1000 **Series:** BP411 **Colour:** 104662 Dove/Lime **Installation:** Ashlar

SECTION	CODE	ITEM	BASIS OF DESIGN
09 90 00	PT-1	**Paint**	**Manufacturer:** Benjamin Moore **Product:** OC-55 Paper White **Finish:** Eggshell
09 90 00	PT-2	**Paint**	**Manufacturer:** Benjamin Moore **Product:** AF-490 Tranquility **Finish:** Eggshell
09 90 00	PT-3	**Paint**	**Manufacturer:** Benjamin Moore **Colour:** 2027-40 Grape Green **Finish:** Eggshell
08 11 13/ 09 90 00	PT-4	**Paint**	**Manufacturer:** Benjamin Moore **Colour:** Match Accent Panel Colour: 2897 Light Pewter from Vicwest. **Location:** Exterior side of all hollow metal doors and frames leading outside.
08 11 13/ 09 90 00	PT-5	**Paint**	**Manufacturer:** Benjamin Moore **Colour:** Colour match black mullions. **Location:** Interior side of all hollow metal doors and frames leading outside, and all interior hollow metal doors and frames.
09 90 00	HPC	**High Performance Coating**	**Refer to specifications**
12 48 29	FM	**Entrance Mats**	**Manufacturer:** Construction Specialties **Description:** Pedimat M1 **Finish:** Mill **Colour:** 9332 Anthracite

End of section

1 General

1.1 Section includes

.1 This Section includes requirement for supply and installation of components required for a complete wall and ceiling assembly with proprietary components as follows:

- .1 Non-Loadbearing Steel Framing:
  - .1 Metal Studs
  - .2 Floor and Ceiling Partition Track
  - .3 Furring Members
  - .4 Shaft wall framing
  - .5 Drywall Grid Suspension for Ceilings
- .2 Gypsum board panels:
  - .1 Standard Gypsum Wallboard
  - .2 Fire-Rated Gypsum Board 'Type X'
  - .3 Gypsum Ceiling Board
  - .4 Tile Backer Board
  - .5 Cement Board
  - .6 Exterior Sheathing Board
  - .7 Shaft wall liner panels
- .3 Gypsum Wallboard Accessories
- .4 Access Panels.
- .5 Acoustic insulation and accessories

1.2 Related requirements

.1 Section 04 21 13 – Brick Veneer Masonry

.2 Section 04 22 00 – Concrete Masonry Units

.3 Section 05 40 00 – Cold Formed Metal Framing

.4 Section 05 50 00 – Metal Fabrications

.5 Section 06 10 00 – Rough Carpentry

.6 Section 07 27 00 – Membrane Air Barrier

.7 Section 07 84 00 – Firestopping and Smokeseals

.8 Section 07 92 00 – Sealants

.9 Section 08 11 13 – Steel Doors and Frames

.10 Section 08 31 00 – Access Doors and Panels

.11 Section 08 41 13 – Aluminum Framed Entrance and Storefronts

.12 Section 09 90 00 – Painting

1.3 Reference standards

.1 Canadian Standards Association (CSA):

.1 CSA S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-7.1-98, Lightweight Steel Wall Framing Components

.3 American Society for Testing and Materials International (ASTM):

.1 ASTM A641/A641M-09a, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.2 ASTM A653/A653M-11 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.4 ASTM A875/A875M-10, Specification for Steel Sheet, Zinc-5% Aluminum Alloy-coated by the Hot Dip Process.

.5 ASTM A1003/A1003M-12, Specification for Steel Sheet, Carbon, Metallic and Non-Metallic Coated for Cold Formed Framing Members.

.6 ASTM C11-10a, Standard Terminology Relating to Gypsum and Related Building Materials.

.7 ASTM C473-12, Standard Test Methods for Physical Testing of Gypsum Panel Products.

.8 ASTM C475/C475M-12, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.9 ASTM C514-04(2009)e1, Standard Specifications for Nails for the Application of Gypsum Board.

.10 ASTM C645-11a, Standard Specification for Nonstructural Steel Framing Members.

.11 ASTM C665-12, Standard Specification for Mineral-Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.12 ASTM C754-11, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.13 ASTM C834-10, Standard Specification for Latex Sealants.

.14 ASTM C840-11, Standard Specification for Application and Finishing of Gypsum Board.

.15 ASTM C841-03(2008)e1, Standard Specification for Installation of Interior Lathing and Furring.

.16 ASTM C954-11, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness.

.17 ASTM C955-11c, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

.18 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.19 ASTM C1047-10a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.20 ASTM C1177/C1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.21 ASTM C1178/C1178M-11, Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.

.22 ASTM C1186-08, Standard Specification for Flat Fiber-Cement Sheets.

.23 ASTM C1278/C1278M-07a(2011), Standard Specification for Fiber-Reinforced Gypsum Panel.

.24 ASTM C1325-08b, Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units

.25 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.

.26 ASTM C1658/C1658M-12, Standard Specification for Glass Mat Gypsum Panels.

.27 ASTM D3273-12, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

.28 ASTM D3274-09, Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation.

.29 ASTM D3678-97(2008)e1, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior-Profile Extrusions.

.4 Gypsum Association (GA):

.1 GA-214-10, Recommended Levels of Gypsum Board Finish.

.2 GA-216-10, Application and Finishing of Gypsum Board.

.3 GA-231-06, Assessing Water Damage to Gypsum Board.

.4 GA-238-03, Guidelines for the Prevention of Mold Growth on Gypsum Board.

1.4 Design criteria

.1 Where specified deflection limits and loading are exceeded, provide metal framing in accordance with Section 05 40 00 – Cold Formed Metal Framing.

.2 Lateral loading, Typical Partitions: Design and install gypsum board components so that the completed partition will withstand a minimum inward and outward pressure of 240 Pa normal to the plane of the wall.

.3 Loading Criteria, Special Partitions: Design and install gypsum board components so that the completed system will withstand the minimum inward and outward pressure of not less than 480 Pa normal to the plane of the wall. This criteria shall apply to the following areas:

.1 Partitions surrounding stairs.

.2 Partitions surrounding plenum and air shafts.

.3 Partitions surrounding atriums.

.4 Partitions Surrounding Elevators Shafts.

.4 Design and install elevator gypsum shaftwall enclosure components so that the completed system will withstand the minimum inward and outward air pressure recommended by the elevator manufacturer, but in no case less than 720 Pa without failing and while maintaining an airtight and smoke-tight seal. Apply design loads transiently and cyclically under in-service conditions for maximum heights of partitions indicated.

.5 Deflection Criteria: Limit metal framing systems deflection under load to the following:

.1 Deflection, Support Framing Gypsum Board Partitions: Deflection of support framing for gypsum board partition systems shall be limited to L/240 of the span in height, except as otherwise shown or specified.

.1 In areas where room side finish is veneer plaster or ceramic tile, deflection of partitions shall be limited to L/360 of the span in height.

.2 Deflection, Support Framing Gypsum Board Ceilings: Gypsum board interior suspended ceilings, and partitions supporting tile, shall be designed for deflection not to exceed L/360 of the distance between supports

.3 Deflection, Support Framing Shaftwall Systems: Deflection of shaftwall systems shall be limited to L/240 of the span in height.

.1 In areas where room side finish is veneer plaster or ceramic tile, deflection of shaftwall systems shall be limited to L/360 of the span in height.

.6 Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ULC or similar UL listed design assemblies acceptable to authorities having jurisdiction.

.7 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to

ASTM E90 and classified according to ASTM E413 by an independent testing agency.

.8 Design Modifications: Make design modifications only as may be necessary to meet performance requirements and coordinate the Work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Consultant for review.

1.5 Quality assurance

.1 Contractor executing work of this Section shall have a minimum of five (5) years continuous Canadian experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Perform Work in accordance with ASTM C840, GA-214, GA-216 and GA-600.

.3 Handling Gypsum Board: Comply with GA-801.

1.6 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings: Submit shop drawings showing the design, construction and relevant details of furring, enclosures and partitions which require a fire rating.

.4 Product Data: Submit manufacturer's current technical literature for each component.

.5 Samples: Supply for Consultant's review, if requested, samples of the following:

.1 Board: Submit sample of each panel product specified, 150 mm (6 in.) square.

.2 Trim: Submit sample of each type of trim specified, 305 mm (12 in.) long.

.3 Texture: Submit sample, 305 mm (12 in.) square, of textured coated gypsum board.

.6 Quality Assurance Submittals:

.1 Design Data, Test Reports: Provide manufacturer's test reports indicating product compliance with indicated requirements.

.2 Manufacturer's Instructions: Provide manufacturer's written installation instructions.

1.7 Delivery, storage, handling and protection

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, enclosed, under cover storage location. Do not load any area beyond the design limits.

.2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact, in accordance with GA-238 and manufacturer's recommendations.

.4 Protect bagged products from excessive moisture or wetting. Store metal component sections in crates to prevent damage to material. Do not use bent or deformed material.

1.8 Project conditions

.1 Establish and maintain environmental conditions for application and finishing gypsum wallboard to comply with ASTM C 840 and in accordance with manufacturer's written instructions.

.2 In cold weather (outdoor temperatures less than 13 °C, controlled heat in the range of 13 °C to 21 °C must be provided. This heat must be maintained both day and night, twenty four (24) hours before, during, and after entire gypsum board joint finishing and until the permanent heating

system is in operation or the building is occupied. Minimum temperature of 10 °C shall be maintained during gypsum board application.

.3 Ventilate building spaces to remove excess moisture and humidity during the drying process. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials - wallboard

.1 Standard Gypsum Wallboard:

.1 Conforming to ASTM C1396, ivory paper faced, tapered edges, 1,220 mm (48 in.) wide sheets of maximum practical lengths to minimize end joints, ½ in. thick unless indicated otherwise on drawings.

.1 ProRoc by CertainTeed Gypsum Canada Inc.;

.2 ToughRock by Georgia-Pacific Gypsum LLC;

.3 Sheetrock by CGC Inc.; or

.4 Approved alternate.

.2 Fire-Rated Gypsum Board 'Type X':

.1 Conforming to ASTM C1396, 1,220 mm (48 in.) wide sheets of maximum practical lengths to minimize end joints, tapered edges, 16 mm (5/8 in.) thick, as indicated on drawing.

.1 Sheetrock Brand Gypsum Panels, Firecode Core by CGC Inc.;

.2 ProRoc Type X by CertainTeed;

.3 ToughRock Fireguard Gypsum Board by Georgia-Pacific Canada; or

.4 Approved alternate.

.3 Gypsum Ceiling Board:

.1 Sag Resistant Gypsum Board: Meeting requirements of ASTM C1396M, ceiling board manufactured to have more sag resistance than regular type gypsum board with long edges tapered, and as follows:

.1 Location: Ceiling surfaces.

.2 Acceptable Materials:

.1 Sheetrock Interior Ceiling Board by CGC Inc.;

.2 Tough Rock CD Ceiling Board by Georgia Pacific Canada;

.3 ProRoc Interior Ceiling Board by CertainTeed; or

.4 Approved alternate.

.4 Tile Backer Board:

.1 Glass Mat Water Resistant Gypsum Backer Board: Manufactured in accordance with ASTM C1178 and C1658 to produce greater resistance to water penetration and to provide improved surface bonding characteristics for ceramic tile than standard gypsum board:

.1 Acceptable Materials:

.1 ‘Diamondback Tile Backer’ by CertainTeed Gypsum Canada Inc.;

.2 ‘DensShield Tile Backer’ by Georgia-Pacific Gypsum LLC;

.3 ‘Durock Glass-Mat Tile Backerboard’ by CGC Inc.; or

.4 Approved alternate.

.5 Gypsum Board - Shaft liner (GBS): ASTM C1396 and ASTM C1658, glass-mat faced, Type X, maximum available size in place; bevelled edges, ends square cut.

.1 Mould Resistance: ASTM D3273, score of ten (10) as rated according to ASTM D3274.

.2 Thickness: 25.4 mm.

.3 Exposure Warranty: Manufacturers standard twelve (12) month warranty.

.4 Product:

.1 ‘GlasRoc Shaftliner-Type X’ by CertainTeed Gypsum Canada Inc.;

.2 ‘DensGlass Shaftliner’ by Georgia-Pacific Gypsum LLC;

.3 ‘Sheetrock Glass-Mat Liner Panels’ by CGC Inc.; or

.4 Approved alternate.

.6 Glass Mat Gypsum Board and Exterior Gypsum Sheathing (SGB): ASTM C1177/C1177M, gypsum based board with water-resistant treated core, fully embedded glass fibre mats on both sides with a polymer modified gypsum surface and acrylic face coating, 1200 wide by longest lengths practicable. Thickness unless specified otherwise 16 mm thickness; ends square cut, tapered along longest length.

.1 Mould Resistance: ASTM D3273, score of (ten) 10 as rated according to ASTM D3274.

.2 Microbial Resistance: ASTM D6329 will not support microbial growth.

.3 Exposure Warranty: Manufacturers standard twelve (12) month warranty.

.4 Acceptable Materials: Subject to compliance with the requirements products that may be incorporated into the Work include the following:

.1 'GlasRoc Sheathing Type X' by CertainTeed Corp.;

.2 'DensGlass Gold Fireguard Type X' by Georgia-Pacific Gypsum LLC;

.3 'Securock Glass-Mat Sheathing Type X' by CGC Inc.; or

.4 Approved alternate.

2.3 Materials - steel framing

.1 Non-Loadbearing Steel Framing:

.1 General:

.1 Steel sheet components shall comply with ASTM C645 requirements for metal, unless otherwise indicated.

.2 Steel for non-loadbearing members shall have metallic coats that conform to ASTM A653M or ASTM A792M with

minimum metallic coating weighs (mass) of Z120 and AZM150 respectively.

.3 Framing members shall comply with the CAN/CSA S136 - North American Specification for the Design of Cold Formed Steel Structural Members, for conditions indicated.

.4 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

.2 Metal Studs:

.1 Minimum 0.0179 in. (25 gauge), screwable with crimped web and returned flange. Provide knockout openings in web at 150 mm (6 in.) O.C. to accommodate (if required) horizontal mechanical and electrical service lines, and bracing. Widths as indicated on drawings. Provide structural studs where indicated.

.2 Framing behind all fire resistant gypsum board shall be minimum 0.0329 in. (20 gauge).

.3 Where metal stud framing forms walls are to be thermally insulated as indicated on drawings, provide metal studs with integrated fastening system for glass fibre/mineral fibre insulation.

.4 Provide special shapes indicated on drawings as part of steel stud/drywall assemblies.

.3 Studs and Tracks – Shaft Wall Assemblies: ASTM C645; galvanized sheet steel.

.1 Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated, 0.84 mm thick, CH shape unless otherwise indicated.

.2 Runner Tracks: Manufacturer's standard J-shape track with manufacturer's standard long-leg length, but at least 51 mm long and matching studs in depth, metal thickness matching studs.

.3 Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

.4 Elevator Hoistway Entrances: Manufacturer's standard J-shape jamb strut with long-leg length of 76 mm, matching studs in depth and thickness.

.5 Deflection track: Provide steel sheet top track to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and width to accommodate depth of studs.

.4 Floor and Ceiling Partition Track:

.1 Made from galvanized sheet steel, minimum 0.0179 in. (25 gauge), with minimum 30 mm (1 3/16 in.) legs, top track having longer legs were required to compensate for deflection of structure above. Width to suit metal studs.

.5 Furring Members:

.1 Hat-shaped, rigid furring channels shall comply with the ASTM C645 and shall have a minimum base steel thickness of (25 gauge) and a minimum depth of 22 mm (7/8 in.) the minimum width of furring attachment flanges shall be 13 mm (½ in.).

.2 Resilient furring channels designed to reduce sound transmission shall have a minimum base steel thickness of 0.0179 in. (25 gauge) and have a minimum depth of 13mm (1/2 in.).

.3 Furring members shall be used for furring out any surface for application of gypsum wallboard finish and for secondary furring member in suspended ceilings/soffits.

.4 All furring members shall be hot-dipped galvanized.

.6 Drywall Grid Suspension for Ceilings: Conforming to ASTM C645 and ASTM C754, direct hung system composed of main beams and cross furring members that interlock and as follows:

.1 Tie Wire: Tie wire shall comply with ASTM A641/A641M zinc-coated, soft annealed.

.1 8 gauge used for hangers in suspended ceiling grid work.

.2 12 gauge for drywall suspension system.

.3 18 gauge for wire-tying channels in wall furring and ceiling construction.

.2 Furring Runners: Manufactured from 0.020 in. thick steel, 35 mm (1⅜ in.) wide with knurled face by 38 mm (1½ in.) high by 305 mm (12 ft.) long, with factory punched cross tee slots, hanger holes and non-directional bayonet end tab couplings.

.3 Furring Tees: Manufactured from 0.0179 in. (25 gauge) thick steel, 35 mm (1⅜ in.) wide with knurled face by 38 mm (1½ in.) high by 1,220 mm (4 ft.) long with stab-type end tab couplings, with factory punched cross tee slots, and hanger holes.

.4 Furring Cross Channels: Manufactured from 0.0179 in. (25 gauge) thick steel, 35 mm (1⅜ in.) wide with knurled face by 22 mm (7/8 in.) high by 1,220 mm (4 ft.) long with straight locking end tabs.

.5 Cross Tees: Manufactured from 0.0179 in. (25 gauge) thick steel, 24 mm (15/16 in.) wide by 22 mm (7/8 in.) high by 1,220 mm (4 ft.) long with stab-type end tab couplings, with factory punched cross tee slots, and hanger holes.

.6 Wall Track: Manufactured from 0.0179 in. (25 gauge) thick steel, 39 mm (1 9/16 in.) high by 3,048 mm (10 ft.) long with a 25 mm (1 in.) top and bottom flange.

.7 Basis of Design System: 660-C Stab Drywall Grid Suspension System by Rockfon, or acceptable alternate by Armstrong World Industries Inc. as approved by the Consultant, or other approved alternate.

2.4 Acoustic materials

.1 Acoustic Insulation: CAN/ULC-S702 or ASTM C665; preformed glass or mineral fibre, thickness as indicated.

.1 Acoustic Partition Insulation: Friction fit type, unfaced, width to suit stud spacing:

.1 Glass fibre;

.1 ‘EcoTouch QuietZone PINK FiberGlas Acoustic Insulation’ by Owens Corning Canada LP;

.2 ‘Sound-Shield’ by Johns Manville; or

.3 Approved alternate.

.2 Mineral wool;

.1 ‘AFB evo Batts’ by Rockwool; or

.2 Approved alternate.

.2 Acoustic Sealant: As specified in Section 07 92 00 – Sealants.

.3 Acoustic Hangers for STC Rated Ceilings: Purpose made double deflection neoprene hanger with eyebolts for ceiling isolation.

.1 Product: ‘WHD Architectural Ceiling Hanger’ or similar selected for required load rating by Mason Industries, or approved alternate.

.4 Acoustic Isolation Hangers: Purpose made double deflection neoprene hanger with eyebolts for ceiling isolation.

.1 The isolation hanger deflection shall be selected from manufacture pre-engineered system to provide a maximum natural frequency of 3.3 Hz.

.2 Hangers shall be tested by an independent laboratory

.3 Cold Rolled Channel: Provide 38 mm x 13 mm, 16 gauge cold-rolled steel channel provided by this section and incorporated into hanger assembly.

.4 The hanger assembly bracket shall be designed to accept cold-rolled channel. Provide APB (Air Performance Bracket) Hanger bracket by listed manufacture including a 9.5 mm (⅜ in.) threaded insert for attaching threaded rod below the hanger for optional equipment suspension below drywall ceiling.

.5 Basis of design product and manufacture: ‘KSCH-Hangers’ manufactured by Kinetics Noise Control, Inc. or approved alternate.

.5 Acoustic Putty Pads: Provide non-hardening, permanently resilient, water resistant, acoustic putty. Maintains acoustical ratings per ASTM C919.

.1 Products:

.1 ‘SealTight’ by Kinetics Noise Control Inc.;

.2 ‘QuietPutty 380’ manufactured by Serious Materials and distributed by CertainTeed;

.3 ‘Putty-Pads’ by Soundproof Company Inc.; or

.4 Approved alternate.

2.5 Accessories

.1 Concrete Anchors:

.1 Self-drilling tie wire anchors, "Red-Head No. T-32" by Phillips Drill Company, Division of ITT Industries of Canada Ltd., or approved alternate.

.2 Concrete Inserts:

.1 Hot-dip galvanized "turtle back" type concrete inserts to suit conditions as approved by Consultant, by Acrow-Richmond National Concrete Accessories, Division of Premetalco Inc., or approved alternate.

.3 Gypsum Wallboard Accessories:

.1 In general, gypsum wallboard accessories shall conform to ASTM C1047.

.2 Corner Beads:

.1 Made from galvanized steel sheet conforming to ASTM A653, minimum 0.0179 in. (25 gauge). Minimum width of flanges 28 mm for 13 mm (1⅛ in. for ½ in.) thick wallboard and 32 mm for 16 mm (1¼ in. for 5/8 in.) thick wallboard.

.3 Casing Beads:

.1 Made from galvanized steel sheet conforming to ASTM A653, minimum 30 gauge, U-shaped designed for finishing with joint compound.

.4 Control Joints:

.1 Made from galvanized sheet steel conforming to ASTM A653, minimum 0.0179 in. (25 gauge), or roll-formed zinc-alloy to resist corrosion, with expansion joint material perforated flanges.

.1 'Zinc Control Joint No. 093' by CGC Inc.; or

.2 Approved alternate.

.5 Reveals:

.1 Galvanized sheet steel conforming to ASTM A653, minimum 0.0179 in. (25 gauge), in profiles as indicated on drawings.

.4 Wallboard Screws:

.1 Corrosion resistant, self-drilling, self-tapping gypsum wallboard screws conforming to ASTM C1002 (Type S) and ASTM C954 (Type S-12), 25 mm (1 in.) long No. 6 for single layer application, 41 mm (1 5/8 in.) long No. 7 for double layer application.

.2 At fire rated construction, type and size of wallboard screw shall be same as used in fire-rating test.

.5 Joint Compound for Interior Gypsum Board:

.1 Conforming to ASTM C475 and as recommended by gypsum wallboard, fire-rated gypsum wallboard and exterior wallboard manufacturers to suit conditions.

.6 Joint Compound for Tile Backing Panels:

.1 Gypsum based tile backing board: Use setting type taping and setting type, sandable topping compounds.

.7 Exterior Sheathing Joint-And-Penetration Treatment Materials:

.1 Silicone Emulsion Sealant: Meeting ASTM C920, Type S, Grade NS, compatible with glass fiber mesh tape and for treating joints and covering exposed fasteners.

.2 Glass-Fiber Mesh Tape: Self-adhering glass-fiber tape, minimum 50 mm (2 in.) wide, 10 x 10 or 10 x 20 threads/in. (390 x 390 or 390 x 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

.8 Resilient Sponge Tape:

.1 Closed cell neoprene sponge type tape with self-sticking adhesive on one side. 'Permastik 122X' by Jacobs and Thompson Ltd.; or

foamed vinyl type tape, 'Arnofoam' by Arno Adhesive Tape Incorporated; or approved alternate.

.9 Adhesive:

.1 Conforming to CGSB 71-GP-25M, and as recommended by manufacturer and compatible with contacted surfaces.

.10 Building Paper:

.1 No. 15 asphalt building paper conforming to CAN/CGSB-51.32-M.

.11 Access Panels: Refer to Section 08 31 00 – Access Doors and Panels.

3 Execution

3.1 Examination

.1 Examine gypsum wallboard panels for damage and existence of mould. Install only undamaged panels.

.2 Examine gypsum wallboard in accordance with GA-231 for water damage.

.3 Examine areas and substrates, with installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

.4 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

.1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

.2 Coordinate installation of gypsum board suspension systems with installation of acoustical ceiling tiles (ACT) suspension systems. Where gypsum board suspension systems abut ACT systems, ensure that ceiling tiles grid fit into gypsum grid without affecting overall design and appearance.

.3 Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 Installation - general

.1 Conform to ASTM C840, except as otherwise specified herein. Co-operate with mechanical, electrical and other trades to accommodate fixtures, fittings and other items in wallboard areas.

.2 Review extent of temporary heat provided. Carry out the work of this Section only when temperature is maintained and controlled in the range of 13 °C to 21 °C for at least twenty four (24) hours before installing gypsum wallboard and is maintained or can be maintained until joint compound and adhesives are dried or cured.

.3 Metal studs in partitions and bulkheads are to be continuous to underside of steel deck, except where noted otherwise on drawings. Continue framing around ducts penetrating partitions above ceiling.

.4 Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

.5 Install bracing at terminations in assemblies.

.6 Do not bridge building control and expansion joints with non-loadbearing steel framing members. Frame both sides of joints independently.

.7 Bring gypsum board into contact, but do not force into place.

3.4 Stud partitions

.1 Install studs in accordance with ASTM C754, GA-216, GA-600, and manufacturer's written instructions.

.2 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

.3 Provide continuous dampproof course to underside of floor track.

.4 Install studs so flanges within framing system point in same direction.

.5 Provide accurately aligned partition tracks at top and bottom of partitions. Secure at 610 mm (24 in.) O.C. and 50 mm (2 in.) from each end.

.6 Erect studs vertically in partition tracks at 406 mm or 610 mm (16 in. or 24 in.) O.C. maximum as required, and not more than 50 mm (2 in.) from abutting walls, openings and each side of corners.

.7 Install cut to length intermediate vertical studs, in same manner and spacing as wall studs, over door frames and above and below other openings.

.8 Door Openings:

.1 Extend studs on each side of openings from floor to ceiling or structure above, whichever is indicated.

.2 Install cut to length piece of runner horizontally over door frames.

.3 Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

.4 Install two (2) studs at each jamb, unless otherwise indicated.

.5 Install cripple studs at head adjacent to each jamb stud, with a minimum 13 mm (½ in.) clearance from jamb stud to allow for installation of control joint in finished assembly.

.9 Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

.10 Fire-Resistance Rated Partitions: Install framing to comply with fire-resistance rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

.11 Where studs extend over 3,658 mm (12 ft.) in height provide internal horizontal bridging spaced approximately 1,220 mm (4 ft.) O.C. vertically and provide double studs at each side of door frames.

.12 Size, brace and reinforce studs as necessary to provide sturdy, rigid partitions to heights and lengths required.

.13 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress affects due to torsion between lines of bridging. Wallboard shall not be used to help

restrain member rotation and translation perpendicular to the minor axis. Maximum bridging spacing to be 1,220 mm (48 in.) O.C.

.14 Securely anchor framing to building structure making allowance for deflection of structure above with relief joint to avoid transmission of structural loads to partitions.

.15 Where horizontal runs of service lines are to be installed, arrange with applicable trades to have lines installed prior to wallboard application.

.16 Z-Furring Members:

.1 Erect insulation, as specified in Section 07 21 00 – Thermal Insulation, vertically and hold in place with Z-furring members.

.2 Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or power-driven fasteners spaced 24 in. O.C.

.3 At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 in. from corner and cut insulation to fit.

.17 Install each framing member so fastening surfaces vary not more than 3 mm over 305 mm (⅛ in. over 12 ft.) from the plane formed by face of adjacent framing.

.18 Ensure close contact of surfaces. Surfaces with depression shall be built up by Contractor, or high points ground down, otherwise effectively caulk the wall perimeter to retard passage of sound waves. Provide acoustic sealant or sponge tape at junction of sound resistant walls and all other walls.

3.5 Ceiling furring

.1 Install in accordance with ASTM C754, GA-216 and manufacturer's written instructions.

.2 Install suspension system components in sizes and spacings indicated on drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

.3 Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

.4 Hangers:

.1 Hangers for suspended gypsum wallboard ceiling, bulkheads and duct furring shall support the grillage independent of walls, columns, pipes, ducts, conduit and similar components.

.2 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

.3 Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.

.4 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

.1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

.5 Wire Hangers: Secure by looping and wire tying, either directly to structure or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

.6 Do not attach hanger to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

.7 Powder actuated fasteners are not approved.

.8 Do not attach hangers to or through steel deck. Attach hangers to steel joists. Where joist spacing is not suitable and where ducts and other equipment interfere, provide adequate cross channels between joists and securely wire tie in position for support of hangers.

.9 Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

.10 Do not connect or suspend steel framing from ducts, pipes, or conduit.

.11 Recessed ceiling fixtures which exert a load in excess of 10 lbs/ft² (48.824 kg/m^2) shall be suspended independent of ceiling furring for gypsum wallboard application.

.12 Prior to installation of suspension system confirm that ceiling heights called for on room finish schedules and drawings can be maintained and that all recess lighting can be accommodated and shall not interfere with piping, ductwork and the like.

.13 Space hangers at maximum 1,220mm (4 ft.) O.C. along the runner channels and not more than 150 mm (6 in.) from the ends to support weight of ceiling and superimposed loads such as lighting fixtures, diffusers and grilles.

.14 Where ducts are large or where combination of ducts, or combination of ducts and other items interfere so that hanger spacing exceeds 1,220 mm (4 ft.), increase size of main runner channels and hangers accordingly to sustain increased loading and span.

.15 For fire-resistant rated assemblies, wire tie furring channels to supports.

.16 Install suspension systems that are level to within 3 mm (⅛ in.) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

.5 Carrying Channels:

.1 Space carrying channels at maximum 1,220 mm (4 ft.) O.C. and not more than 150 mm (6 in.) from boundary walls, interruptions of continuity and changes in direction.

.2 Run channels at right angles to structural framing members where splices are necessary, lap members at least 200 mm (8 in.) and wire each end with minimum double strand of tie wire. Avoid clustering or lining up splices.

.3 Attach channels to rod hangers by bending hanger sharply under bottom of flange of runner and securely wire in place with a saddle tie.

.6 Cross Furring:

.1 Erect furring channels at right angles to carrying channels.

.2 Space furring channels at 610 mm (24 in.) O.C. and not more than 150 mm (6 in.) from boundary walls, interruptions in ceiling continuity and change in direction.

.3 Secure furring channels to each support with a double strand of tie wire or with clip approved by manufacturer of furring components. Splice joints by nesting and tying channels together.

.4 The wallboard furring channels shall be level to a maximum tolerance of 3 mm over 3,658 mm (⅛ in. over 12 ft.) non-cumulative.

3.6 Board installation – general

.1 Install gypsum board in accordance with ASTM C840, GA-216 and GA-600, and manufacturer's instructions.

.2 Vertically, with edges and ends occurring over firm bearing. Erect single layer gypsum board in non-fire rated partitions in most economical direction, with ends and edges occurring over firm bearing.

.3 Erect single layer fire rated gypsum board

.4 Use screws when fastening gypsum board to metal furring or framing.

.5 Double Layer Applications: Unless otherwise required for fire resistance ratings, install double layer gypsum board as follows:

.1 Apply gypsum board for first layer, placed perpendicular to framing or furring members. Use fire rated gypsum backing board for fire rated partitions and ceilings.

.2 Place second layer with fasteners perpendicular to first layer. Offset joints of second layer from joints of first layer.

.6 Place control joints consistent with lines of building spaces as indicated. Where not indicated install as directed at maximum 3.5 m spacing. Construct joints using back-to-back casing beads filled with a low modulus

sealant capable of flexible joint movement. Maintain fire-resistance rating of wall assemblies.

.7 Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials and as indicated

.8 Provide Types of board material indicated, scheduled and generally as follows:

.1 Standard Gypsum Board (GWB):

.1 Provide unless specific type of board is indicated, scheduled or specified herein.

.2 Fire Rated Gypsum Board (Rated wall assembles):

.1 Provide where required for an approved rated assembly.

.3 Glass-Mat, Water-Resistant Backing Board (Tile Backing Board):

.1 Provide for where tile finish is scheduled.

.4 Gypsum Board - Shaft liner (GBS):

.1 Provide at shaft wall assemblies enclosures.

.5 Glass Mat Gypsum Board and Exterior Gypsum Sheathing (SGB):

.1 Provide where Exterior Gypsum Sheathing is scheduled.

.2 Provide at interior wet location including washroom wall and ceilings where paint finishes is scheduled.

3.7 Board installation - exterior gypsum sheathing (SGB)

.1 Install where exterior gypsum sheathing is indicated or scheduled on steel stud framing.

.2 Install exterior gypsum sheathing in accordance GA-253 Application of Gypsum Sheathing, ASTM C1280 Standard Specification for Application of Gypsum Sheathing as well as manufacturer's printed instructions. Apply boards horizontally and fasten to framing at maximum 200 mm o.c.

.1 Make vertical ends and edge joints over the centers of framing members and offset end joints a minimum of one framing bay between adjacent rows of sheathing panels.

.2 Seal Joints and Fastener Heads: Apply sealant and specified tape to board and perimeter joints and around penetrations, in

accordance with wall sheathing manufacturer's instructions. Seal fastener heads with sealant.

3.8 Shaft wall assemblies

.1 General: Install gypsum board shaft wall assemblies to conform to requirements of fire rated assemblies indicated, manufacturer's written installation instructions, and ASTM C754 other than stud-spacing requirements.

.2 Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

.1 Elevator Hoistway: At elevator hoistway entrance door frames, provide jamb struts on each side of door frame.

.2 Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.84 mm minimum thickness, accurately positioned and secured behind at least one layer of face panel.

.3 Penetrations: At penetrations in shaft wall, maintain fire rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

.4 Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

.5 Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

.6 Cant Panels: At projections into shaft exceeding 102 mm, install 13 or 16 mm thick gypsum board cants covering tops of projections.

.1 Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 610 mm o.c. with screws fastened to shaft wall framing.

.2 Where steel framing is required to support gypsum board cants, install framing at 610 mm o.c. and extend studs from the projection to shaft wall framing.

3.9 Acoustic accessories installation

.1 Install resilient furring channels horizontally at maximum 600 on centre. Locate joints over framing members. Install with fasting flange at the bottom.

.2 Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

.1 Conform to ASTM C919 and with insulation manufacturer's instructions for closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

.3 Install acoustic sealant at gypsum board partition perimeters, in accordance with Section 07 92 00 – Sealants, at:

.1 Metal Framing: Two beads. Alternatively, install two continuous strips of acoustical separation tape.

.2 Face Layer. Seal with 10 mm bead.

.3 Seal all penetrations of partitions by conduit, pipe, duct work, rough-in boxes, and cables where Acoustic Sheet Putty Pads are specified and required for Wall Type STC Rating.

.4 Install Acoustic Putty Pads at all penetrations of partitions by conduit, pipe, duct work, rough-in boxes, and cables for partitions with STC ratings of 52 or greater.

3.10 Fire resistant assemblies

.1 Fire resistance rating of gypsum board assemblies and framing shall be as called for on drawings or schedules, and as required to conform with applicable codes and requirements of authorities having jurisdiction.

.2 Appropriate ULC designs as listed in current ULC list of equipment and materials, Volume II, Building Construction, shall be placed when applicable. Extend partitions full height through ceiling space unless otherwise noted on drawings.

.3 Vertical bulkheads in ceiling spaces over fire rated glazed partitions, doors and the like shall have same fire rating as the door or partition over which they occur. All such bulkheads shall be of drywall construction unless otherwise noted.

.4 Use fire rated gypsum board as specified.

.5 Where lighting fixtures, diffusers, and the like are recessed into fire rated ceilings or bulkheads, provide enclosure to maintain required fire rating. Form removable panel to give access to fixture outlet box.

.6 Where fire hose cabinets or other fixtures or equipment are recessed in fire rated walls or partitions, provide drywall enclosure or backing to maintain required fire rating, unless otherwise detailed.

3.11 Control joints

.1 Install control joints using metal control joint strip as specified where:

.1 A partition, furring or column fireproofing abuts a structural element, dissimilar wall or partition assembly, or other vertical penetration, or ceiling.

.2 A ceiling or soffit abuts a structural element, dissimilar wall or partition assembly or other vertical penetrations.

.3 Wings of "L", "U" and "T"-shaped ceiling/soffit areas are joined;

.4 Construction changes within the plane of the partition or ceiling or soffit.

.5 Partition, restrained ceiling or furring run exceeds 9,144 mm (30 ft.).

.6 Unrestrained ceiling dimensions exceed 15,240 mm (50 ft.) in either direction.

.7 Expansion or control joints occur in the base exterior wall.

.8 Wallboard is installed over masonry control joints.

.9 And elsewhere as indicated on the drawings.

.2 Install in accordance with manufacturer's instructions. Where application is on furring members and double furring members at control joints, place one furring member on each side of the control joint.

3.12 Bulkheads

.1 Fur out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.

.2 Ensure hangers are installed as to prevent splaying.

3.13 Pressed steel (hollow metal) frames

.1 Install pressed steel (hollow metal) frames where they occur in gypsum wallboard partitions.

.2 Anchor frames securely to studs using a minimum of three (3) anchors per jamb for jambs up to 2,134 mm (7 ft.) high and minimum of four (4) anchors per jamb for jambs over 2,134 mm (7 ft.) high.

3.14 Access doors

.1 Access doors supplied by this Section and Divisions 20 and 26 shall be built-in by this Section where required in gypsum wallboard installations, in accordance with manufacturer's recommendations, to match and blend with surrounding surfaces. Refer to drawings for locations.

3.15 Thermal break

.1 Install self-sticking resilient sponge tape at edges of wallboard in contact with metal windows and exterior door frames to provide a thermal break. Adhere tape to casing bead and compress during installation.

3.16 Finishing

.1 Before proceeding with installation of finishing materials ensure the following:

.1 Wallboard is fastened and held close to framing and furring.

.2 Fastening heads in wallboard are slightingly below surface in dimple formed by driving tool.

.2 Levels of Gypsum Wallboard Finish:

.1 Level 0: Temporary construction only.

.2 Level 1: Plenum areas and above ceilings. Where a fire-resistance rating is required finishing should be in accordance with reports of

fire tests of assemblies that have met the requirements of the fire rating imposed.

.3 Level 2: Areas of water resistant gypsum backing board under tile, exposed areas where appearance is not critical.

.4 Level 3: Service corridors and areas to receive heavy or medium textured coatings or heavy-duty wall coverings.

.5 Level 4: Areas to receive light textured coatings or lightweight wall coverings.

.6 Level 5: Areas to receive gloss, semi-gloss or flat sheen paints and critical lighting conditions. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat over entire surface for corridors, long hallways, walls and ceilings longer than 7,500 mm or walls higher than 3,600 mm , and for all curved or angled wall surfaces.

.3 Finish gypsum wallboard in strict accordance with ASTM C840, GA-214 and GA-216 and as follows:

.1 Fill and tape joints and internal corners and fill screw depressions in board face and smooth out along corner beads and metal strip with joint compound.

.2 Mix joint compound (powder) in accordance with manufacturer's written instructions.

.3 Prefill "V" grooves of rounded edges with special setting type joint compound using a 127 mm to 150 mm (5 in. to 6 in.) joint finishing knife. Finish flush with tapered surface ready for tape reinforcing application. Allow prefill material to dry thoroughly before application of embedding compound and tape.

.4 Apply joint compound in thin uniform layer. Embed reinforcing tape accurately centred on joint and securely pressed in, leaving sufficient compound under tape to provide proper bond. Immediately apply skim coat over tape application. Allow to dry thoroughly before application of next coat.

.5 Apply fill coat finishing the tapered depression flush with board surfaces. Allow to dry thoroughly before application of finish coat.

.6 Apply finish coat extending slightly beyond the filler coat and feathered out onto the board surface. Do not apply finish coat to gypsum board scheduled to be sprayed with acoustic surfacing finish.

.7 Sand between coats and following the finishing coat, where necessary, and leave surface smooth and ready for painting.

.8 Finish screw depressions with filler material and finish coat as specified above.

.9 Joint and depression finish shall in no case protrude beyond the plane of the board surface.

.10 Furnish corner beads and metal trim flush with board surface using filler and finishing coats feathered out approximately 50 mm (2 in.) and 100 mm (4 in.) respectively onto the board surface.

.11 Provide metal casing beads at exposed edges, at junctions of gypsum/cement board with dissimilar material, at control joints and at junction with columns. Casing beads are required at perimeter of gypsum/cement wallboard ceilings and soffits. Fasten with screws at 305 mm (12 in.) O.C. along entire length.

.12 Finish gypsum board to receive a Level 4 finish.

3.17 Repairs

.1 After taping and finishing has completed, and before decoration, repair all damaged and defective work, including non-decorated surfaces.

.2 Patch holes or openings 13 mm (½ in.) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.

.3 Repair holes or openings over 13 mm (½ in.), or equivalent size, with 16 mm (5/8 in.) thick gypsum wallboard secured in such a manner as to provide solid substrate equivalent to undamaged surface.

.4 Tape and refinish scratched, abraded or damaged finished surfaces including cracks and joints in non-decorated surface to provide smoke tight construction, fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

3.18 Protection

.1 Protect installed products from damage during remainder of construction period.

.2 Remove and replace panels that are damaged.

End of section

1 General

1.1 Section includes

.1 The work in this section includes supply and installation for the following:

.2 Porcelain Tile (T) and tile bonding systems for floor and wall.

.3 Stone Panel System (SP)

.4 Waterproof membrane

.5 Crack isolation membrane

.6 Tile bonding accessories

.7 Site quality control

1.2 Related requirements

.1 Section 03 35 00 – Concrete Finishing

.2 Section 06 40 23 – Interior Architectural Woodwork

.3 Section 07 92 00 – Sealants

.4 Section 09 06 00 – Finishes Schedule

.5 Section 09 21 16 – Gypsum Wallboard

.6 Section 09 65 00 – Resilient Flooring and Accessories

.7 Section 09 90 00 – Painting

1.3 Reference standards

.1 American National Standards Institute/Ceramic Tile Institute (ANSI/CTI):

.1 ANSI/CTI A108.1-2011, Specification for the Installation of Ceramic Tile: Collection of 20 ANSI/CTI A108, A118 and A136 Series of Standards on Tile Installation

.2 American Society for Testing and Materials (ASTM):

.1 ASTM C241/C241M-09, Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic

.2 ASTM C627-10, Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester

.3 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants

.4 ASTM C1028-07e1, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

.5 ASTM C1178/C1178M-11, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-75.1-M88, Tile, Ceramic

.4 Terrazzo, Tile and Marble Association of Canada (TTMAC):

.1 2019/2021 Specification Guide 09 30 00, Tile Installation Manual

.2 Hard Surface Maintenance Guide

1.4 Performance requirements

.1 Tile products manufactured and tested to ISO 10545 Series and ANSI A137.1.

.2 Slip Resistance: Minimum dynamic coefficient of friction (DCOF) of 0.42 wet to ANSI A137.1.

.3 Floor Traffic Load Bearing Performance: ASTM C627, meeting minimum moderate duty, and outlined in this section and the TTMAC Guide Specification.

.4 Floor flatness tolerances and preparation for large format tiles should be specified in this Section. Specify starting concrete flatness requirements in Section 03 35 00 – Concrete Finishing; add additional flatness requirements for tile materials 400 x 400 mm (16 x 16 inches) and larger or where tile manufacturers indicate a higher degree of flatness. Coordinate with the structural engineer when entire floor areas require the tighter flatness tolerance. Modify the following paragraphs to suit specific project requirements.

.5 Surface Flatness Tolerances:

.1 Small Format Floor Tile less than 100 x 100 mm: Floor flatness as specified in Section 03 35 00 – Concrete Finishing.

.2 Standard Format Floor Tile 100 x 100 mm to 400 x 400 mm: Floor flatness measured to a minimum FF35; equivalent to 5 mm with maximum two (2) gaps under a 3 m straightedge measurement.

.3 Large Format Floor Tile 400 x 400 mm: Floor flatness measured to a minimum of FF50; equivalent to 3 mm with maximum two (2) gaps under 3 m straightedge measurement.

.4 Wall Tiles: Wall levelling similar to floors tiles having similar sizes listed above.

1.5 Pre-installation conference

.1 Contractor shall hold pre-installation conference two (2) weeks prior to commencing work of this Section. Conference shall be attended by the Contractor, Owner, Consultant, concrete finishing subcontractor, tile installers and tile manufacturer's representative, setting bed and grout manufacturer's representative to discuss the following, but not limited to the following:

.1 Substrate conditions, non-structural cracks, structural cracks and preparation requirements.

.2 Floor and wall surface irregularities and levelness tolerances, including all remedial requirements.

.3 Installation of anti-fracturing membranes and setting bed materials.

.4 Installation of tiles and grouting.

.5 Edge details and treatments.

.6 Installation of tile and grout sealers.

.2 Contractor shall ensure that manufacturer's representatives issues written installation instructions at the pre-installation conference, to all parties attending the pre-installation conference and the Consultant, for all tile types, setting beds, grouts and sealers required for the work of this Section.

.3 Contractor shall within seventy two (72) hours of the pre-installation conference, prepare minutes of the conference, and issue minutes to all parties attending the pre-installation conference and the Consultant. Contractor shall clearly indicated required actions and by which party.

1.6 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Product Data: For each product. Include installation instructions for using setting materials and grouts.

.4 Shop Drawings: Plans indicating details of special fittings, expansion joints, control joints, and joint layout, graining orientation of tile, and pattern.

.5 Samples:

.1 Submit sample panel of each type and colour tile, 610 mm x 610 mm (24 in. x 24 in.). Adhere to a rigid board with setting compound, grout and a dummy control joint showing sealant as specified. Identify samples by project number, date, name of sub-contractor and tile type. Tile and grout used in the building shall correspond to appearance of approved samples in all respects. Do not install tile until samples are approved.

.2 Upon Consultant's request submit samples of base, trim and fittings.

1.7 Submittals for information

.1 Installation Data: Manufacturer's special installation requirements.

.2 Tile setting material manufacturer's review report.

.3 Field test reports.

1.8 Closeout submittals

.1 Operation and Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.9 Maintenance material submittals

.1 Extra Stock Materials: Provide a minimum 3 % of total of each type and of each colour of floor tile and trim used from same production run for project maintenance upon completion. Provide two (2) boxes of each type and colour of wall tile. Neatly package and identify materials and deliver to location specified by Owner.

1.10 Quality assurance

.1 Perform work in accordance with TTMAC Specification Guide, Tile Installation Manual.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

.4 Tile Setting Material Manufacturer's Review:

.1 Prior submitting Submittals obtain tile setting manufacturer’s review and approval for conformance of tile installation methods and procedures with warranty requirements.

.2 Prepare and submit report signed by the tile setting manufacturer.

.3 Review of waterproofing membrane installation, and provide required testing ensuring waterproofing membrane manufactures recommended thickness is achieved.

1.11 Mock-up

.1 Provide:

.1 1500 x 1500 mm mock-up of a sample installation illustrating in a cutaway fashion the floor tile, wall tile, stone panel system, base and grout for the following:

.2 Washroom floor and wall.

.2 Build mock-ups using personnel, materials, and methods of construction that will be used at Project site

.3 Locate where directed by Consultant.

.4 Allow for multiple iterations until mock-up approved by Consultant.

.5 Retain approved mock-ups as standard of quality for installation.

1.12 Delivery, storage, handling and protection

.1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location. Do not load any area beyond the design limits.

.2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

.4 Restrict traffic by other trades during installation.

.5 Provide adequate protection of completed tiled surfaces to prevent damage by other trades until final completion of this project. Minimum protection shall consist of 4 mil polyethylene sheets lapped 4 in. and taped.

.6 Heavily travelled areas shall have additional 13 mm (½ in.) thick fibreboard sheet protection with taped joints over polyethylene sheet protection as specified above.

.7 Protect exposed edges of floor tile with same thickness as tile x 102 mm (4 in.) wide tapered strip of plywood adhered to floor until adjoining floor finish is to be installed.

1.13 Site conditions

.1 Ambient Conditions: Apply tile after completion of work by other Sections is complete; to surfaces sufficiently dry, clean, firm, level, plumb and free from oil or wax or any other material deleterious to tile adhesion and as follows:

.1 Temperature: Maintain tile materials and substrate temperature between TTMAC recommended minimum and maximum temperature range; unless indicated otherwise by manufacturer, for forty eight (48) hours before and during installation until materials are fully set and cured; provide additional heat during

winter months or at any other time when there is a risk that surface temperatures may drop below minimum recommended temperatures.

.2 Ventilation: Maintain adequate ventilation where Work of this Section generates toxic gases or where there is a risk of raising relative humidity to levels that could damage building finishes and assemblies.

1.14 Warranty

.1 Warrant the work of this Section against defects in materials and workmanship in accordance with the General Conditions, but for a period of five (5) years from date of Substantial Performance, and agree to promptly make good defects which become evident during the warranty period without cost to the Owner. Defects shall include but not be limited to the following: cracking, crazing, discolouration, staining, pitting, splitting and deformation of tiles and grout.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements

2.2 Materials – porcelain tile

.1 To ANSI 137.1; cushion edges; colour through rectified porcelain tiles, mosaic tile as indicated.

.2 Refer to Section 09 06 00 – Finish Schedule for type, product, size, colour and finish textures.

2.3 Materials – stone panel system

.1 Refer to Section 09 06 00 – Finish Schedule for type, product, size, colour and finish textures.

.2 Use bonding adhesive for large format tile, and install in accordance with Manufactures recommendations.

2.4 Mortar and grout materials – general

.1 Acceptable Tile Setting Materials: Subject to conformance to requirements, mortar and grout materials listed below shall be of a uniform quality for each adhesive, and grout component from a single manufacturer and each aggregate from one source or producer as follows:

.1 Laticrete International Inc.;

.2 Mapei Corporation;

.3 TEC Incorporated Building Products Group, an H.B. Fuller Company;

.4 Flextile Ltd.; or

.5 Approved alternate.

.2 Setting and Grouting Materials: Conform to material standards in ANSI's Specifications for the Installation of that apply to materials and methods specified.

.1 Grout Colours: Unless otherwise indicated, to be selected by Consultant.

.3 Source limitations: All materials shall be from one manufacturer, forming a complete system.

.4 Products: Provide like products from same production run. Install products in sequence from sequentially numbered dye lots.

2.5 Mortar and grout setting systems

.1 Public Washroom Floors, and other floors not containing showers listed below, concrete substrate: TTMAC Detail 311F-2019/2021-A, and ANSI A108/A118/A136.1.

.2 Concrete and Concrete Block Walls: TTMAC Detail 303W-2019/2021.

.3 Walls with Glass-Mat, Water-Resistant Backing Board (Tile Backing Panels) on Metal Stud Wall Framing: TTMAC Detail 305W-2019/2021-B.

.4 Materials General: to ANSI A108/A118/A136.1 and TTMAC Detail indicated:

.1 Thinset Mortar:

.1 4237 latex additive and 211 Crete filler powder by Laticrete;

.2 Kerabond with Keralastic by Mapei;

.3 TA 382 Ultimate LFT by TEC, HB Fuller;

.4 '51 Premium Wall & Floor Thin-Set Mortar with 44 Acrylic Additive' by Flextile; or

.5 Approved alternate.

.2 Trowelable Underlayment and screed Compound:

.1 226/3701 mortar mix by Laticrete;

.2 Topcem by Mapei;

.3 TA 305 Fast Set Deep Patch by TEC, HB Fuller;

.4 FAST-SET SCREED BY Flextile; or

.5 Approved alternate.

.3 Grout: ANSI A108/A118/A136.1:

.1 Standard for dry locations:

.1 SPECTRALOCK PRO Premium Grout by Laticrete; or

.2 Mapei UltracolorPlus; or

.3 PowerGrout by TEC, HB Fuller; or

.4 1600 RSG by Flextile; or

.5 Approved alternate.

.2 Epoxy Grout: Public Washrooms

.1 SPECTRALOCK PRO Premium Grout by Laticrete; or

.2 Kerapoxy by Mapei;

.3 AccuColour EFX by TEC, HB Fuller;

.4 FLEX-EPOXY 100 GROUT by Flextile; or

.5 Approved alternate.

.4 Crack suppression membrane type 1 and type 2 as required.

2.6 Tile setting systems for wet areas

.1 Showers and shower change room area to comply with: TTMAC Detail 317-SP-2019/2021.

.2 Materials General: to ANSI A108/A118/A136.1 and TTMAC Detail indicated:

.1 Scratch/Skim/ Bond Coat:

.1 211/4237 by Laticrete;

.2 Kerabond mixed with Keralastic additive by Mapei;

.3 TA392/393 SUPERFLEX ULTRA PREMIUM THIN SET by TEC;

.4 #51 FLOOR & WALL PREMIUM MORTAR MIXED #44 ACRYLIC ADDITIVE by Flextile; or

.5 Approved alternate.

.2 Mortar Bed/levelling coat: For bed thicknesses over 40 mm, suspend reinforcing mesh within mortar bed.

.1 226/3701 mortar mix by Laticrete;

.2 Topcem with Planicrete AC by Mapei;

.3 TA305 Fast-Set Deep Patch with Patch Additive by TEC;

.4 Fast-Set Screed or 4:1 Dry Pack with #44 Acrylic Additive by Flextile; or

.5 Approved alternate.

.3 Waterproof Membrane: ANSI A118.10

.1 Hydroban by Laticrete;

.2 Aquadefense by Mapei;

.3 TA 316 Hydraflex by TEC, HB Fuller;

.4 WP-900 HYDRO-BLOCK by Flextile; or

.5 Approved alternate.

.4 Grout: ANSI A108/A118/A136.1 Epoxy Grout:

.1 SPECTRALOCK PRO Premium Grout by Laticrete;

.2 Kerapoxy by Mapei;

.3 AccuColour EFX by TEC, HB Fuller;

.4 FLEX-EPOXY 100 GROUT by Flextile; or

.5 Approved alternate.

.5 Fibreglass reinforcing mesh and cleavage membrane, as recommended by manufacture.

2.7 Adhesive for stone panel system (SP)

.1 Latex Portland Cement Mortar: For thick beds, and scratch/plaster coats, UL GreenGuard Gold certified.

.1 Compressive Strength (ASTM C270): Over 2900 psi (20 MPa).

.2 Shear Bond Strength (ANSI A118.4 5.2.4): Over 300 psi (2.1 MPa).

.3 Sag On Wall (EN 1308): 0.0 mm.

.4 Total VOC Emissions: Less than 0.22 mg/m^3.

.5 Product: Provide LATICRETE MVIS Premium Mortar Bed as manufactured by LATICRETE or approved alternate.

.2 Stone Sealer: clear penetrating type, natural look unless otherwise noted.

.1 Aqua Mix Sealer's Choice Gold by Centura Tile;

.2 Lithofin MN Stain-Stop by CIOT Marble and Granite; or

.3 Approved alternate.

.3 Accessories: as recommended by stone panel system manufacture.

2.8 Accessories

.1 Water: Fresh, clean, potable, free from deleterious matter, acids or alkalis.

.2 Sealant: movement and joint sealants as specified in Section 07 92 00 – Sealants.

.3 Tile Backer Board: As Specified in Section 09 21 16 – Gypsum Wallboard.

.4 Metal Edge Strips: Purpose made metal extrusions; stainless steel, for terminating cut tile, at junction of tile flooring and dissimilar materials. Size to suit tile thickness.

.1 Wall Tile to Gypsum Board Trim: Brushed stainless steel trim; Schluter model Quadec or approved alternate.

.2 Floor Tile Cove Base Trim: Brushed stainless steel; Schluter model Dilex-AHK or approved alternate; Include matching trims for inside and outside corners, and three-way joints.

.3 Outside corner: Brushed stainless steel; Schluter model Quadec/-K or approved alternate.

.4 Floor Tile to Other Flooring Transitions: Brushed stainless steel; Schluter model Schiene, Deco, Reno-TK, Reno-U, or approved alternate.

.5 Provide fillers, primers, reinforcing fabric and all other materials and accessories as recommended by the crack suppression membrane manufacturer.

.6 Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers and as follows:

.1 Job Site Cleaner: Phosphoric acid/nitric acid based cleaning solution mixed in accordance with cleaner manufacturer's recommendations and as recommended by tile manufacturer.

.2 Maintenance Cleaner: Non-toxic, electrolytic, biodegradable, non-ammonia containing, pH controlled cleaning solution mixed in accordance with manufacturer's recommendations.

2.9 Crack suppression membrane

.1 Crack Suppression Membrane Type 1 (For non-structural cracks less than 3 mm wide). Provide one of the following, or equivalent from listed manufacturer:

.1 One component, water based, elastomeric type crack suppression membrane capable of spanning cracks up to 3 mm wide without failure.

.1 'Plani/Lastic' by Mapei Canada Inc.; or

.2 WP-900 Waterproof & Crack Isolation Membrane by Flextile; or

.3 Approved alternate.

.2 One component, liquid rubber, elastomeric type crack suppression membrane reinforced with reinforcing fabric and capable of spanning cracks up to 3 mm wide without failure.

.1 'Laticrete 9235 Anti-Fracture Membrane' by Laticrete International Inc.;

.2 'TA 316 Hydraflex' by TEC, HB Fuller;

.3 WP-980 WATERPROOF & CRACK ISOLATION MEMBRANE by Flextile; or

.4 Approved alternate.

.2 Crack Suppression Membrane Type 2 (For non-structural cracks 3 mm wide and greater, and all structural cracks). Provide one of the following, or equivalent from listed manufacturer:

.1 Two component, elastomeric type crack suppression membrane reinforced with reinforcing fabric and capable of spanning cracks 3 mm wide and greater without failure.

.1 'Planicrete W' by Mapei Canada Inc.; or

.2 Approved alternate.

.2 One component, liquid rubber, elastomeric type crack suppression membrane reinforced with reinforcing fabric and capable of spanning cracks 3 mm wide and greater without failure.

.1 'Laticrete 9235 Anti-Fracture Membrane' by Laticrete International Inc.;

.2 'TA 316 Hydraflex' by TEC, HB Fuller;

.3 WP-980 Waterproof & Crack Isolation Membrane by Flextile; or

.4 Approved alternate.

2.10 Mortar and grout mixing

.1 Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

.2 Add materials, water, and additives in accurate proportions.

.3 Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated or specified.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that surfaces are ready to receive work.

.1 Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated or specified.

.2 Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

.3 Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Consultant.

.3 Verify sealants and grout are cured for manufactured recommended periods at required temperatures and relative humidity conditions, before water immersion.

.4 Crack Suppression Membranes:

.1 Prepare all surfaces of non-structural and structural cracks in strict accordance with the crack suppression membrane manufacturer's written instructions.

.2 Prime and fill all surfaces of non-structural and structural cracks in strict accordance with the crack suppression membrane manufacturer's written instructions.

.5 Commencement of installation shall signify complete acceptance of surfaces and conditions.

3.2 Preparation

.1 Surface Preparation:

.1 Make backing surfaces level and true to a tolerance in plane of ± 3 mm in 2 m (⅛ in. in 8 ft.) for walls and ± 3 mm in 3 mm (⅛ in. in 10 ft.) for floors using levelling bed mortar.

.2 Surfaces shall be structurally sound, well fastened, clean and free from dust, oil, grease, paint, tar, wax, curing agents, primers, sealers, form release agents or any deleterious substances that may act as bond barriers.

.3 Backing surfaces shall be dry and fully cured. Dampness must not exceed 5 % by volume.

.2 Examine concrete substrate, repair as required to produce level, clean surface for new tile installation. Repair Work shall include levelling, filling, grinding or cutting, in accordance with Section 03 35 00 – Concrete Finishing.

.3 Work of other trades that are required before new tile installation (i.e. electrical conduit installed below ceramic tile) shall be installed, complete and approved before tile installation.

.4 Fill cracks, holes, and depressions in concrete substrates for tiling installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

.5 Check as per ASTM F710 for Concrete Preparation for excessive moisture levels & pH of the slab.

3.3 Installation - general

.1 Installation of the tile shall be by thin-set method, as indicated on the drawings and as specified herein;

.1 Install wall tile to gypsum wallboard and moisture resistant wallboard in dry areas using latex modified thin-set setting bed and latex modified wall grout in strict accordance with tile manufacturers written installation instructions as per the pre-installation conference.

.2 Apply floor tile and prepare floor slabs in strict accordance with tile manufacturers written installation instructions as per the pre-installation conference.

.2 Install mortar bed, tile, and grout to referenced TTMAC Manual and TTMAC systems listed.

.3 Thoroughly clean surfaces to which tile is to be applied.

.4 Back butter all tile.

.5 Neatly cut tile around fitments, fixtures, access panels, and the like. Splitting of tile is expressly prohibited except where no alternative is possible. Form intersections, corners and returns accurately.

.6 Finish surfaces flat and level or, sloped and graded as required.

.7 Joint Widths: Install tile with the following joint widths, unless indicated on drawings:

.1 Wall Tile: 2 mm (1/16 in.)

.2 Stone Panel System (SP): No joint and no visible gaps between panels.

.3 Floor Tile: 6 mm (¼ in.), unless otherwise indicated on the Drawings.

.4 Make joints consistent width and alignment within tile area.

.5 Maintain 2/3 of grout joint depth free of setting material.

.8 Joints in base shall match floor patterns. Joints shall be watertight without voids, cracks or excess grout.

.9 Lay out tile so that fields or patterns are centred on wall areas or architectural features and so that no tile less than 1/2 size occurs.

.10 Arrange and set recessed accessories in tile work so that they are evenly spaced, centred with joints and set true with correct projection. Rigidly install accessories.

.11 Provide manufacturer's standard trim pieces at changes of direction and at terminations. Unless otherwise indicated provide the following corner and edge conditions:

.1 Internal horizontal corners: Coved.

.2 External vertical and horizontal corners: Bullnosed.

.3 Internal vertical corners and unexposed edges: Square.

.12 Install tiles in patterns and locations as indicated on drawings.

.13 Install wall tile full wall height unless shown otherwise.

.14 Coordinate work of this Section with work of other Sections for items requiring to be recessed into work of this Section.

.15 Sound tiles after setting and remove and replace tiles not fully bedded.

.16 Re-point joints after cleaning to eliminate imperfections. Avoid scratching tile surfaces.

.17 Finished tile work shall be clean and free of tiles which are pitted, chipped, cracked or scratched. All damaged tile shall be removed and replaced.

.18 Where indicated on Drawings or as required, install continuous single piece metal edge trims centred under doors in closed position and other locations where tile meets other floor finishes.

.19 Allow tile to set for a minimum of forty eight (48) hours prior to grouting.

.20 Stone Panel System (SP)

.1 Install stone panel system (SP) in accordance with manufacture recommendations.

.2 Do not use panels smaller than 1/3 standard size. No visible gaps are permitted between stone panels.

.3 Install so joints end joints must overlap minimum 200 mm.

.4 Seal panels with one coat of stone sealer prior to installation.

.5 Keep joints clean and free from mortar. No visible mortar in joints is permitted.

.6 Upon completion clean panels and apply final coat of stone sealer.

3.4 Grouting

.1 Grout tiles in accordance with ANSI A108.10 and as specified herein.

.2 When grouting a fresh laid floor, make certain that traffic and grouting will not cause movement of floor in setting bed. Protect floor by using kneeling boards or gypsum board to defend floor against traffic while grouting.

.3 Mix grouts and install in strict accordance with the manufacturer's instructions.

.4 Excess grout shall be removed from the surface of tiles using the edge of a rubber float held at a 45 ° angle, moving it diagonally to the joints. Fill all gaps and air holes.

.5 Do not allow grout to harden on face of tile. Refer to manufacturer's instructions for thorough removal.

.6 Floors which required damp curing shall be cured for the required length of time using heavy kraft paper, not polyethylene sheets. Consult manufacturer for instructions.

3.5 Control joints and sealing

.1 Control joints of a flexible caulking material shall be placed every 4877mm to 6096mm (16 to 20 ft.) apart, directly over existing control joints and/or where indicated on drawings or as required in accordance with TTMAC Detail No. 301MJ-2019-2021, Details E, F and G, whichever is applicable. Control joints shall be placed around the floor perimeter at walls, around columns, and where tile abuts other hard materials or vertical surfaces. Saw cutting of tile after installation is prohibited. Tile shall be cut if required and installed along each side of control joints.

.2 Expansion joints must always be placed directly over all slab expansion joints in accordance with TTMAC Detail No. 301MJ-2019-2021, Details A and B, whichever is applicable.

.3 Locate expansion, control, contraction, and isolation joints, as indicated below, unless specifically indicated otherwise on the Drawings:

.1 Interior: 5 m (16 ft.) o.c. maximum; 6 mm (¼ in.) joint width.

.4 Joints around fixtures, pipes or other fittings shall be sealed with a sealant. Refer to Section 07 92 00 – Sealants for type of sealants to be used.

.1 Colour of sealant shall match grout as selected later by Consultant.

3.6 Waterproofing

.1 Install waterproofing in accordance with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

.2 Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.7 Cleaning and finishing

.1 Clean tiled areas after grouting has cured, using compatible solutions and methods as recommended by the manufacturer.

.2 Remove grout residue from tile as soon as possible.

.3 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation.

.4 Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.

.5 Flush surface with clean water before and after cleaning.

.6 Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies.

3.8 Protection of finished work

.1 Protect installed work.

.2 Do not permit traffic over finished floor surface for four (4) days after installation.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation of:

.1 Acoustical panel ceiling systems (ACT).

.2 Suspended metal grid ceiling system and perimeter trim.

.3 Supplementary acoustic insulation over system units.

.4 Site quality control.

1.2 Related requirements

.1 Section 09 21 16 – Gypsum Wallboard

.2 Section 09 90 00 – Painting

.3 Division 20 – Mechanical; Supply and Installation of Mechanical Diffusers

.4 Division 26 – Electrical; Supply and Installation of Light Fixtures

1.3 References

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C635/C635M-13a, Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

.2 ASTM C636/C636M-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

.3 ASTM E1264-14 Standard Classification for Acoustical Ceiling Products

.2 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.4 Design and performance requirements

.1 Suspension System:

.1 Determine the superimposed loads that will be applied to suspension systems by components of the building other than the ceiling and ensure that adequate hangers are installed to support

the additional loads in conjunction with the normal loads of the system.

.2 Design supplemental suspension members and hangers where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with location of hangers at required spacing to support standard suspension system members:

.3 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

.4 Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of L/360.

.5 Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to applicable code.

.6 Surface-Burning Characteristics: Conform to CAN/ULC S102 or ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 Administrative requirements

.1 Coordinate layout and installation of ceilings with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and fire-suppression system.

1.6 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Product Data: Submit product data for each type of product specified.

.4 Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling mounted items indicating the following:

.1 Ceiling suspension system members.

.2 Method of attaching suspension system hangers to building structure.

.3 Ceiling mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special mouldings at walls, column penetrations, and other junctures of acoustic ceilings with adjoining construction.

.5 Samples:

.1 Submit two (2) 300 x 300 mm samples illustrating material and finish of each type of acoustic unit.

.2 Submit two (2) 300 mm long samples of suspension system main runner, cross runner, and perimeter moulding.

1.7 Submittals for information

.1 Qualifications Data: For Installer.

.2 Installation Data: Manufacturer's special installation requirements, including perimeter conditions requiring special attention.

.3 Professional Structural Engineer’s Letters of Assurance:

.1 Provide letters or completed Owner-prescribed forms signed by the professional structural engineer used to prepare the shop drawings, stating that the ceiling system has been designed accordance with the structural performance requirements of the applicable codes, including verification that:

.1 Specified products have been used.

.2 Designs and installations as tested, have been installed on the Project.

.3 Loads and movement requirements have been achieved.

1.8 Maintenance material submittals

.1 Extra Stock Materials:

.1 Acoustical Ceiling Units: Full size units equal to three percent of quantity installed, of each tile type.

.2 Suspension-System Components: Quantity of each concealed grid and exposed component equal to 3 % of quantity installed.

1.9 Quality assurance

.1 Conform to Ceilings and Interior Systems Contractors Association (CISCA) Ceiling Systems Handbook requirements.

.2 Qualifications of Installer: Approved by suspension system manufacturer.

1.10 Regulatory requirements

.1 Conform to applicable code for combustibility requirements for materials.

.2 Conform to applicable code for seismic requirements for ceiling system.

1.11 Delivery, storage, handling and protection

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.

.2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

1.12 Site conditions

.1 Ambient Conditions: Install acoustic unit ceilings only when building is enclosed, has sufficient heat, when overhead mechanical and electrical work is complete, and dust and moisture producing activities are complete; maintain uniform temperatures and relative humidity within range recommended by material manufacturer from the time of installation until Substantial Performance for the project; make adjustments to temperature and humidity gradually within tolerances indicated by manufacturer.

1.13 Warranties

.1 Provide two (2) year manufacturers warranty starting from date of Substantial Performance by manufacturer of acoustic ceilings covering defects in products and failure to meet specified requirements.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Manufacturers

.1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include the following:

.1 Armstrong World Industries Canada Ltd.;

.2 CertainTeed Gypsum Canada Inc. a Division of Saint-Gobain;

.3 CGC Inc. a USG Company;

.4 Rockfon LLC; or

.5 Approved alternate.

2.3 Metal suspension systems

.1 Grid Components: ASTM C635/C635M, intermediate duty; exposed, downward access removable T; components die cut and interlocking; minimum 38 mm high bulb tee design.

.1 Recycled Content: minimum 50 %

.2 Grid Materials: Hot dip galvanized steel with factory paint finishes.

.3 Grid Finish: White, manufacturer’s standard.

.4 Module: Sized as appropriate to acoustic panel size.

.5 Mouldings:

.1 Perimeter Moulding: Formed to provide shadow reveal profile moulds unless shown otherwise in baked white enamel finish.

.6 Exposed Suspension System (Type 1): Provide standard exposed 'T' bar system: zinc-coated steel with baked white enamel finish for exposed surfaces in colour to match acoustic panels.

.1 Acceptable Products:

.1 ‘Prelude XL HRC’ manufactured by Armstrong World Industries Canada Ltd.;

.2 ‘15/16” Classic Stab System’ by CertainTeed Gypsum Canada;

.3 DONN Brand Suspension System, 25 mm exposed face; ‘Donn DX/DXL HRC’ by CGC Inc.;

.4 ‘Chicago Metallic 1200HRCMax 15/16” Stab System’ by Rockfon LLC; or

.5 Approved alternate.

2.4 Acoustic ceiling panels (ACT)

.1 Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by the nominal values for types, patterns, acoustic ratings, and light reflectance class, unless otherwise indicated.

.2 Surface burning properties, all types: Flame spread of 25 or less and smoke developed of 50 or less when tested in accordance with CAN/ULC S102, substantiated by ULC labels on materials supplied.

.3 Acoustic Panel (ACT): ASTM E1264, Type XII, Form II, Pattern G:

.1 Performance:

.1 NRC: Min. 0.70.

.2 Thickness: 19 mm.

.3 Surface Texture: Fine.

.4 Surface Colour: White.

.2 Edge Profile: Square.

.3 Sizes: 610 x 610 mm.

.4 Suspension System: Type1.

.5 Mold and Mildew Resistant.

.6 Approved Products:

.1 ‘ULTIMA SQ Lay-In series’ manufactured by Armstrong World Industries Canada Ltd.;

.2 ‘Symphony M series ’ by CertainTeed Ceilings Canada;

.3 ‘MARS ClimaPlus HRC 85/35 series’ manufactured by CGC Inc.;

.4 ‘Artic’ by Rockfon LLC; or

.5 Approved alternate.

2.5 Accessories

.1 Accessories: Stabilizer bars, clips, perimeter mouldings and splices required for suspended grid system.

.2 Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

.3 Ties Wire: minimum 1.98 mm (14 ga.) Ø steel wire, galvanized.

.1 Hanger Attachments to Concrete: 1 #12 galvanized annealed steel wire for support of a maximum weight of 68 kg. per hanger; #9 galvanized annealed steel wire for support of a maximum weight of 140 kg. per hanger; 4.5 mm diameter galvanized annealed steel rod to support a maximum weight of 250 kg. per hanger.

.4 Anchors: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488 by an independent testing agency; Minimum tensile strength 390 MPa.

.5 Acoustic Sealant for Perimeter Mouldings: As specified in Section 07 92 00 – Sealants.

.6 Edge Trim:

.1 ‘Axiom Classic Trim’ by Armstrong World Industries Canada Ltd. or approved alternate.

.1 Height: 50 mm and 102 mm high as indicated.

.2 Colour: White.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that layout of hangers will not interfere with other work.

3.2 Installation – general

.1 Install acoustical ceilings according to CISCA publication Ceiling Systems Handbook.

3.3 Installation - lay-in grid suspension system

.1 Install suspension system to manufacturer instructions and ASTM C636/C636M, and as supplemented in this section.

.2 Install system in accordance with ASTM E580/E580M.

.3 Install system capable of supporting imposed loads to a deflection of L/360 maximum.

.4 Lay out system to a balanced grid design with edge units no less than 50 percent of acoustic unit size, unless otherwise detailed.

.5 Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

.6 Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

.7 Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

.8 Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 150 mm of each corner; or support components independently.

.9 Do not eccentrically load system, or produce rotation of runners.

.10 Perimeter Moulding:

.1 Install edge moulding at intersection of ceiling and vertical surfaces into bed of acoustic sealant.

.2 Use longest practical lengths.

.3 Overlap corners.

.4 Provide at junctions with other interruptions.

3.4 Installation - acoustic units

.1 Install acoustic units to manufacturer's instructions.

.2 Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

.3 Install units after above ceiling work is complete.

.4 Install acoustic units level, in uniform plane, and free from twist, warp, and dents.

.5 Cutting Acoustic Units:

.1 Cut to fit irregular grid and perimeter edge trim.

.6 Where round obstructions occur, provide preformed closures to match perimeter moulding.

.7 Where indicated, lay acoustic insulation for a distance of one (1) 200 mm either side of acoustic partitions.

.8 Install panel hold-down clips, where specified, to retain panels tight to grid system.

3.5 Erection tolerances

.1 Maximum Variation from Flat and Level Surface: 3 mm in 3 m.

.2 Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 °.

3.6 Site quality control

.1 Engage a professional structural engineer experienced in design and installation of this work and licensed in the Province where the Project is located to:

.1 Perform timely and regular inspections.

.2 Verify installation conforms to applicable code.

.3 Prepare and submit inspection reports.

End of section

1 General

1.1 Section includes

.1 This Section includes, but is not limited to, the following:

.1 Resilient sheet materials:

.1 Homogeneous sheet rubber flooring.

.2 Resilient accessories:

.1 Resilient wall bases

.2 Resilient accessories for transition strips, area dividers

1.2 Related requirements

.1 Section 03 35 00 – Concrete Finishing

.2 Section 09 06 00 – Finishes Schedule

.3 Section 09 21 16 – Gypsum Wallboard

.4 Section 09 90 00 – Painting

1.3 Reference standards

.1 American Society for Testing and Materials (ASTM):

.1 ASTM F1066, Standard Specification for Vinyl Composition Floor Tile

.2 ASTM F1861, Standard Specification for Resilient Wall Base

.3 ASTM F1869, Standard Test Method for Measuring Moisture Vapour Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-51.34-M, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

1.4 Administrative requirements

.1 Coordination: Close spaces to traffic during flooring installation and until time period after installation recommended in writing by manufacturer; install flooring and accessories after other finishing operations, including painting and ceiling construction have been completed.

.2 Pre-Installation Conference: Conduct conference at Project site in accordance with requirements of Section 01 31 19 – Project Meetings, to verify project requirements, substrate conditions, patterns and layouts, coordination with other Sections affected by work of this Section, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Action Submittals:

.1 Product Data: Submit one copy of product data for each type of product specified.

.2 Shop Drawings: Submit shop drawings indicating:

.1 Location of seams and edges

.2 Location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cut-out locations

.3 Type and style of resilient transition strip used between adjacent flooring types

.3 Samples for Selection: Submit manufacturer's colour charts and samples for initial selection consisting of full range of colours and patterns available for each type of product indicated.

.4 Samples for Verification:

.1 Resilient Flooring: Submit samples of each different specified product for verification of colour and pattern in manufacturer's standard size, but not less than 150 mm x 150 mm (6 in. x 6 in.) in size for tile or sheet material, or 150 mm (6 in.) long for resilient accessories.

.4 Informational Submittals: Provide the following submittals during the course of the work:

.1 Site Quality Control Test Results: Submit results or moisture emission testing of concrete subfloors prior to installation of flooring. Results shall include comparison of manufacturer's recommended moisture content to actual moisture vapour emission rate.

.5 Maintenance Data and Operating Instructions:

.1 Operation and Maintenance Data: Submit manufacturer's written instructions for maintenance and cleaning procedures, include list of manufacturer recommended cleaning and maintenance products, and name of original installer and contact information in accordance with Section 01 78 00 – Closeout Submittals.

.6 Safety Data Sheets:

.1 Submit WHMIS safety data sheets for incorporation into the Operation and Maintenance Manual. Keep one copy of WHMIS safety data sheets on site for reference by workers.

.7 Maintenance Materials:

.1 Provide 5 % of each colour of vinyl composition tile and 9,150 mm (30 ft. 0 in.) lineal feet coil stock of each colour of resilient base specified, boxed and labelled.

.2 Store maintenance materials on the premises as directed by the Owner.

1.6 Quality assurance

.1 Contractor executing work of this Section shall have a minimum of five (5) years continuous Canadian experience in successful and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

.2 Resilient Flooring Installer: Use an installer who is competent in heat welding and have a minimum of five (5) years documented experience in the installation of resilient sheet flooring and seams in accordance with manufacturer's training or certification program:

1.7 Delivery, storage, handling and protection

.1 Coordinate deliveries to comply with Construction Schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.

.2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

.4 Restrict traffic by other trades during installation.

.5 Provide adequate protection of completed tiled surfaces to prevent damage by other trades until final completion of this project. Minimum protection shall consist of kraftpaper.

1.8 Environmental conditions

.1 Temperature of room, floor surface and materials shall not be less than 21 °C for forty eight (48) hours before, during and for forty eight (48) hours after installation. Concrete floors shall be aged for a minimum of twenty eight (28) days and shall be dry before application of the resilient floor tile.

.2 Moisture content of floor shall not exceed a maximum of (1.4 kg) 3 lbs. of water per 93 m^2 (1,000 $ft.^2$) of concrete slab area over a twenty four (24) hour period as measured by one of the following methods, as approved by Consultant:

.1 Rubber Manufacturer's Association (RMA) moisture test using anhydrous calcium chloride.

.2 Does not exceed 3 % as measured by Calcium Carbide Hygrometer procedure.

.3 Does not exceed 5 % as measured by normal Protimeter.

.3 Avoid exposure to high humidity, cold drafts and abrupt temperature changes.

1.9 Warranty

.1 Warrant the work of this Section against defects in materials and workmanship in accordance with the General Conditions but for an extended period of five (5) years from date of Substantial Performance and agree to repair or replace faulty materials or work which become evident during warranty period without cost to the Owner. Defects shall include, but not limited to, bond failure, and extensive colour fading.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Manufacturers

.1 Basis-of-Design Manufacturers: Manufacturers named in this Section were approved to provide work specified in this Section. Additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements indicated and provided requests for substitution are provided in accordance with Section 01 25 00 – Substitution Procedures, a minimum of five (5) days in advance of Bid Closing.

.2 Approved manufacturers:

.1 Forbo;

.2 Johnsonite;

.3 Armstrong Flooring; or

.4 Approved alternate.

.3 Sheet Flooring (SV): homogeneous floor covering fabricated from flax seed oil, rosin binders, wood flour, limestone and dry pigments which are mixed and then calendared onto a natural jute backing and conforming to ASTM F2034 and the following:

.1 Type: I – Linoleum Sheet with Backing.

.2 Colour and Basis of Design Product: Refer to 09 06 00 Finishes Schedule.

.3 Fire Resistance: FSR – 150; SDC – 145 when tested in accordance to CAN/ULC S102.2, Standard Test Method for Flame Spread Rating and Smoke Development of Flooring Materials.

.4 Slip resistance: >0.5 for flat surfaces when tested in accordance with ASTM D 2047, Standard Test Method for Static Coefficient of Friction.

.5 Thickness: nominal 2.5 mm.

.6 Width: Nominal 2000 mm.

.7 Length: Manufacturers standard roll length

2.3 Resilient accessories

.1 Resilient Wall Base (VB-1): Smooth, buffed exposed face and ribbed or grooved bonding surface supplied in maximum practical length, with pre-moulded end stops and external corners to match base, conforming to ASTM F1861 and as follows:

.1 Type: TP – Thermoplastic Rubber

.2 Group: 1 – Homogeneous

.3 Style: C – Butt-to

.4 Height: 100 mm (4 in.)

.5 Thickness: 3 mm (⅛ in.)

.6 Length: Manufacturers standard maximum length

.7 Basis of Design products: Refer to 09 06 00 – Finish Schedule

.2 Resilient Transition and Edge Strips (TS): Extruded vinyl shapes meeting or exceeding ADA Recommendations for change of level transitions for transition between floors finishes having different levels, i.e.: between resilient flooring on underlayment to carpet with no cushion or underlayment; acceptable materials as follows:

.1 Basis of Design products: Refer to 09 06 00 – Finish Schedule

.2 Refer to Schedule of Finishes for Transition Strip types.

.3 Trowellable Levelling and Patching Compounds: Latex modified, portland cement based formulation provided or approved by resilient product manufacturer for applications indicated; Gypsum based materials will not be accepted for use on this project.

.4 Fillers and Primers:

.1 Types and brands approved, acceptable to flooring material and resilient base manufacturers for the applicable conditions. Use non-shrinking latex compound.

.5 Resilient Floor Adhesive: Waterproof, clear setting type and brands as recommended by the sheet flooring manufacturer.

.6 Polyethylene: 150 mm (6 in.) thickness conforming to CAN/CGSB51.34.

.7 Tape: Self adhesive 75 mm (3 in.) wide cloth tape.

3 Execution

3.1 Examination

.1 Testing and Inspections: Test moisture emission rate of concrete subfloor prior to installing flooring, using the calcium chloride test method in accordance with ASTM F1869.

.2 Examine substrates, areas, and conditions affecting work are in accordance with manufacturer's requirements, and as follows:

.1 Verify that floor surfaces are smooth and flat to plus or minus 3 mm over 3,000 mm (⅛ in. over 10 ft.); notify Consultant in writing where floor tolerances are not within acceptable values.

.2 Verify that concrete slabs exhibit normal alkalinity of between 5 and 9 and that they are free of carbonization or dusting deleterious to flooring installation or adhesive bond.

.3 Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits that could interfere with flooring installation.

3.2 Preparation

.1 Comply with resilient flooring manufacturer's written installation instructions for preparing substrates indicated to receive flooring.

.2 Fill cracks, holes, and depressions in substrates using trowellable levelling and patching compounds in accordance with manufacturers written instructions and as follows:

.1 Levelling and patching shall be restricted to correcting minor deviations or imperfections to bring floor surface finish to within flooring manufacturers tolerances for flatness.

.3 Remove coatings from concrete substrates, including curing compounds and other substances that are incompatible with flooring adhesives, and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer; do not use solvents.

.4 Broom and vacuum clean substrates immediately before installing flooring.

3.3 Installation

.1 Comply with resilient flooring manufacturer's written installation instructions.

.2 Unroll flooring and allow stabilizing before cutting and fitting in accordance with manufacturer’s installation instructions.

.3 Apply primer in strict accordance with manufacturer's printed instructions. Permit primer to dry.

.4 Apply adhesive uniformly with an approved notchtooth spreader at the recommended rate. (Mechanical spreader not approved). Do not spread more adhesive than can be covered before initial set takes place. Use waterproof adhesive throughout. Follow manufacturer's instructions.

.5 Layout sheet flooring as follows:

.1 Maintain uniformity of resilient flooring direction.

.2 Arrange for a minimum number of seams, where seams are necessary place them in inconspicuous and low traffic areas, and not less than 150mm (6") away from parallel joints in flooring substrates.

.3 Match edges of flooring for colour shading and pattern at seams in accordance with manufacturer's written recommendations.

.4 Obtain Consultant’s acceptance in writing before installing materials having cross seams; make adjustments to seaming plan as directed by Consultant to minimize or eliminate cross seams.

.5 Weld seams with welding rod where optional with manufacturer in accordance with written instructions for treatment of flooring adjacent to seams.

.6 Route joints of sheet flooring, leaving recommended joint profile for welding rod and permanently weld seams in accordance with ASTM F1516.

.7 Install flooring flush with adjoining floor covering surfaces.

.8 Roll sheet flooring in both directions in accordance with manufacturer's instructions.

.6 Layout resilient base as follows:

.1 Fit joints tight and vertical.

.2 Joints along one plane shall be at minimum 7 m (23 ft.) spacing, at inconspicuous locations.

.3 Mitre internal corners, use pre-moulded sections for external corners and exposed ends.

.4 Install base on solid backing. Adhere tightly to wall and floor surfaces.

.5 Scribe and fit to door frames and other obstructions.

.6 Install straight and level to variation of plus or minus 3 mm over 300,0 mm (⅛ in. over 10 ft.) straight edge.

.7 Do not stretch base during installation.

.8 Shave back of base where necessary to produce snug fit to substrate.

.7 Layout resilient accessories as follows:

.1 Install edge strips at unprotected and exposed edges where flooring terminates.

.8 Accurately scribe sheet flooring around walls, and other floor conditions.

.9 Each type of material used shall be from one manufacturer throughout the work and material in each area shall be of same production run.

.10 Remove and replace loose, damaged and defective sheet flooring where required and as directed by Consultant.

3.4 Cleaning, sealing and finishing

.1 Cleaning, of resilient sheet flooring shall be performed using the cleaning, sealing and finishing materials specified of one manufacturer in accordance with the manufacturer's instructions and recommendations. Allow a minimum of four (4) days to elapse after completion of each resilient flooring installation before commencing cleaning, sealing, and finishing operations.

.2 Work shall be handed over to the Owner free of blemishes and in perfect condition.

End of section

1 General

1.1 Section includes

.1 Labour, products, equipment, and services necessary for resinous flooring systems as follows:

.1 Epoxy Flooring System (EPX-2)

1.2 Related requirements

.1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

1.3 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Provide product data and sample showing compliance with specified requirements.

.4 Shop Drawings: provide shop drawings of line marking for Consultants review.

.5 Provide maintenance proposal detailing proposed inspection services and costs of providing maintenance services.

.6 Provide certificate, after installation, signed by applicator and manufacturer stating that work complies with specified requirements.

.7 Manufactures testing and inspection reports:

.1 Pre-installation manufactures testing of Substrate: Submit written acceptance of substrate and environmental conditions prior to installing the Work of this Section.

.2 Installation Inspection report: Comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for

components of traffic coating system meeting system performance criteria.

1.4 Quality assurance

.1 Installer: Trained and approved by the manufacturer and having a minimum three years experience in the installation of the work described in this Section and can show evidence of satisfactory completion of projects of similar size, scope and type. If requested, provide letter of certification from manufacturer stating that installer is certified applicator of its products, and is familiar with proper procedures and installation requirements required by the manufacturer.

.2 Maintenance Seminars: Instruct Owner's personnel on proper care, cleaning and maintenance procedures.

.3 Pre-Installation Meeting: Two (2) weeks prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the site and review preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Consultant of the date and time of the meeting.

.4 Manufacturer's Site Inspection: Have the manufacturer's technical representative inspect the Work at suitable intervals during application and at conclusion of the work of this Section, to ensure the Work is correctly installed. When requested, submit manufacturer's inspection reports and verification that the work of this Section is correctly installed.

.5 Pre-installation manufactures testing of substrate: Verify concrete has cured minimum twenty eight (28) days, and after preparation for Product installation is complete and patching or levelling compound is fully cured. Conduct testing simultaneously on floors free of sealer, curing compounds, oil, grease and other agents detrimental to the test and Product performance. Locate test sites to cover representative installation areas. Do not proceed with work when the test results do not conform to the specified allowable.

.1 Cohesive strength: Minimum 1.5 MPa by tensile load as tested in accordance with CSA A23.1/A23.2. Do one test for every 45 m^2 or fraction thereof.

.2 Bond strength to concrete: Minimum 5.3 MPa as tested in accordance with ASTM D4541. Do one test for every 45 m^2 or fraction thereof.

.3 Moisture Vapour Transmission: Determine moisture content of slab using Tramex® CM/E meter and or 100 % R.H. to ASTM F2170 in situ R.H. probes.

.4 Surface temperature: Calculation obtained from measurement of substrate surface temperature, ambient air temperature and humidity level both measured 300 mm above substrate, minimum 4 degree C above the measured dew point.

.5 Minimum/Maximum ambient and substrate temperature during application and cure: 10 °C/33 °C.

.6 Ambient air temperature relative humidity: maximum 85 % during applications.

1.5 Mock-up

.1 Provide a minimum 5 m x 5 m (15 ft. x 15 ft.) sample installation complete with base on the Project in location designated by the Consultant. Modify sample installation as necessary to obtain acceptance.

.2 Accepted sample installation may remain as part of the completed work.

.3 Remainder of work of this Section shall match the approved sample installation.

1.6 Delivery, storage and handling

.1 Keep materials dry, with containers sealed, and protected from weather and other damage. Store materials in heated, dry areas maintained between 5 °C and 32 °C.

1.7 Project conditions

.1 Store material between 5 °C and 32 °C. Condition material to temperature between 18 °C and 30 °C before use.

.2 Maintain substrate and ambient temperature for twenty four (24) hours before, during, and forty eight (48) hours after application or until cured.

.3 Ventilate work area.

.4 Ensure salts of any kind, from any source, and other contaminants, are not allowed on substrates which are to receive traffic coating system.

1.8 Warranty

.1 Submit a five (5) year warranty of materials and workmanship starting from date of Substantial Performance against failure and specifically against leaks, except as the result of structural faults or other causes beyond control of the work of this Section.

.2 Cracks arising from normal shrinkage and/or expansion and contraction of concrete shall not be considered as structural failure. Hairline cracks which result from these causes shall be considered normal and consequently the warranty shall not be voided as a result of such minor defects.

1.9 Warranty maintenance

.1 During the warranty period, carefully inspect the work of this Section together with Owner's representative and applicator, twice yearly during the first year and once a year for duration of the warranty period. Submit typewritten reports to the Owner indicating the condition of the work and defects found, if any.

.2 Make good all defects covered by the warranty at no cost to the Owner. Submit proposal for correction of defects not covered by warranty.

2 Products

2.1 Manufacturer

.1 This specification is based on system by Stonhard, substitution having equal or better performance characteristics to specified system may submitted by below listed Manufacturer and subject to Consultant’s review:

.1 Sika Canada Ltd;

.2 BASF; or

.3 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Epoxy Flooring System (EPX-2): two component, solid colour, high solids, silicone free, low viscosity, self-priming, smooth, glossy epoxy finish and as follows, System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

.1 Compressive Strength: 10,000 psi after 7 days per ASTM C 579.

.2 Tensile Strength: 1,750 psi per ASTM C 307.

.3 Flexural Strength: 4,000 psi per ASTM C 580.

.4 Water Absorption: < 1 % per ASTM C 413.

.5 Impact Resistance: > 160 in. lbs. per ASTM D 2794.

.6 Flammability: Class 1 per ASTM E-648.

.7 Hardness: .85 to .90, Shore D per ASTM D 2240.

.8 Flexural Modulus of Elasticity: 2.0 x 106 psi per ASTM C-580.

.9 Abrasion Resistance: 0.01 gm max. weight loss per ASTM D-4060, CS-17.

.10 Thermal Coefficient of Linear Expansion: 11 x 10-6 in./in.°F per ASTM C-413.

.11 Thickness of Coats: nominal ¼ in. (6.4 mm).

.12 Number of Coats: One (1).

.13 Aggregates: Aggregates: Quartz pigmented blended aggregate; with 25 % Post-industrial recycled glass.

.14 Colour: to be later selected from manufacture standard range.

.15 Basis of Design system: Stonclad GR® Unsealed system by Stonhard, Inc. or approved alternate.

.2 Mortar base: Stonclad GS or approved alternate.

.3 Primer: Moisture Resistant Primer, as recommended by Manufacturer.

.4 Line Marking: Resinous flooring manufactures standard. Colour: White and Safety yellow as indicated.

.5 Patching material: 100 % Solid epoxy patching material as recommended by the coating system manufacturer.

.6 Sealant: Self levelling sealant as recommended by the traffic coating system manufacturer.

.7 Backer Rod: Closed cell polyurethane.

3 Execution

3.1 Preparation

.1 Examine substrates and environmental conditions before commencement of work of this Section. Ensure substrates are sound, free from substances detrimental to bond, are at proper moisture content, and that correct elevations and slopes have been provided.

.2 Perform pre-installation manufactures testing of substrate.

.3 Prepare substrate as necessary to ensure proper bond and performance of the traffic coating system.

.4 Abrade and clean concrete substrates using a steel shot blast machine which employs an iron-shot and vacuum process, to remove laitance, impurities, and curing and sealing compounds.

.5 Route out and vacuum clean cracks and construction joints in substrates.

.6 Cut 6 mm x 6 mm (¼ in. x ¼ in.) chase in substrate at any point where termination of traffic coating is subjected to vehicular traffic. Fill chase with patching material.

.7 Mask surfaces neatly and accurately to provide sharp, straight lines for bases.

.8 Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to manufacturer's written recommendations.

.9 Provide sealant cants at penetrations and at deck-to-wall butt joints.

.10 Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

.11 Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

.12 Prime patch area in accordance with Manufactures written instructions and as follows.

3.2 Application – epoxy flooring (EPX-2)

.1 Mix and apply material in accordance with manufacturer’s written installation instructions and procedures. Apply to manufacturer’s recommended coverage rates unless thicker coverage is specified in this Section.

.2 Follow manufacturer’s written recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.

.3 Do not apply while ambient and substrate temperatures are rising.

.4 Apply resinous flooring with care to ensure that no laps, voids, or other marks or irregularities are visible. Apply to achieve appearance of uniform colour, sheen and texture; all within limitations of materials and areas concerned.

.5 Match colours and textures of Consultant accepted samples.

3.3 Application – bases (CB)

.1 Provide integral base at walls, columns, curbs and similar vertical surfaces adjacent to floor coating. Except where otherwise shown or schedule, base shall be 200 mm (8 in.) high.

.2 Featheredge terminating edge of base coat on horizontal surfaces so it will not show through the subsequent coats.

.3 Apply topcoat over cured base coat, full coverage.

3.4 Line marking

.1 Apply line marking in accordance with manufactures written recommendations, and reviewed shop drawings.

3.5 Field quality control

.1 Testing Agency: Owner will engage a qualified testing agency to perform the following field tests and inspections:

.1 Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Consultant and Contractor.

.2 Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.

.3 Testing agency shall verify thickness and adhesion of coatings during traffic-coating application for each 18 m^2 of installed traffic coating.

.4 The average results of adhesion tests shall exceed 1 MPa.

.2 Replace or repair non-conforming membrane as recommended in writing by traffic coating manufacturer.

.3 Prepare test and inspection reports.

3.6 Manufacturer's field service

.1 Require site attendance of roofing and insulation materials' manufacturers daily during installation of the Work.

.1 Inspect and review materials, surface preparation, and workmanship including storage, handling and protection. Advise Consultant and Owner 48 hours in advance of inspections.

.2 Monitor and report installation procedures, unacceptable conditions.

.3 Correct identified defects or irregularities.

3.7 Cleaning

.1 Remove surface blemishes from completed surfaces using cleaners and procedures recommended by the traffic coating manufacturer.

.2 Clean and make good surfaces soiled or otherwise damaged as a result of work of this Section. Pay cost of restoring finishes which cannot be satisfactorily restored.

3.8 Protection

.1 Do not pile or store materials on traffic coating, and bar traffic from completed work for a minimum of twelve (12) hours.

.2 Protect surfaces which are not to receive traffic coating from being soiled due to work of this Section.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation for tile carpeting.

1.2 Related requirements

.1 Section 09 06 00 – Finishes Schedule

.2 Section 09 65 00 – Resilient Flooring and Accessories

1.3 Reference standards

.1 American Society for Testing and materials (ASTM):

.1 ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

.2 ASTM F1869, Standard Test method for measuring moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

.2 Carpet and Rug Institute (CRI), as endorsed by the Canadian Carpet Institute (CCI):

.1 CRI Installation Technical Bulletins

.2 CRI Green Label Program

.3 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102.2, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

1.4 Administrative requirements

.1 Coordination: Install carpeting before installing items indicated for installation on top of carpet and after other finishing operations, including painting and ceiling construction, has been completed.

.2 Pre-installation Conference: Conduct conference at Project site in accordance with requirements of Section 01 31 00, to verify project requirements, substrate conditions, patterns and layouts, coordination with

other Sections affected by work of this Section, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit manufacturer's standard product data indicating requirements for installation.

.2 Samples: Submit samples of each type of tile carpeting and adhesive required for the project for confirmation of project requirements.

.4 Informational Submittals: Provide the following submittals during the course of the work:

.1 Certificates: Submit proof of performance for each material specified in this Section as follows:

.1 Indoor Air Quality (IAQ): Confirmation of participation in Carpet and Rug Institute's Carpet Testing Program requirements including certificate number including expiration date; or participation certificate indicating participation in ISO 14001 Registration or Scientific Certification System.

.2 Site Quality Control Test Results: Submit results or moisture emission testing of concrete subfloors prior to installation of flooring. Results shall include comparison of manufacturer's recommended moisture content to actual moisture vapour emission rate.

1.6 Project closeout submissions

.1 Operation and Maintenance Data: Submit manufacturer's written instructions for maintenance and cleaning procedures, include name of original installer and contact information in accordance with Section 01 78 00 – Closeout Submittals as follows:

.1 Detailed printed instructions for maintenance procedures to ensure maximum life and appearance of floor covering.

.2 Information on recycling of tile carpeting including manufacturer's reprocessing program; indicate what portions of materials are recyclable.

.2 Maintenance Materials: Provide extra materials that match installed products; packaged with protective covering for storage, and identified with labels describing contents in accordance with requirements of Section 01 78 00 – Closeout Submittals as follows:

.1 Tile Carpeting Materials: 5 % of total installation with a minimum of two (2) boxes of each colour and type.

.2 Tile Carpeting Accessories: 5 % of total installation with a minimum length of 3, 000 mm (10 ft.) of each colour and type.

1.7 Quality assurance

.1 Regulatory Requirements: Use only carpeting materials that have been tested and accepted for labelling under ULC S102.2 and meeting requirements of the Authority Having Jurisdiction.

1.8 Site conditions

.1 Ambient Conditions: Maintain temperature and ventilation in work area using permanent heating system, and portable supply and exhaust fans in accordance with manufacturer's requirements and as follows:

.1 Install Tile Carpeting when wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

.2 Install Tile Carpeting over concrete subfloor once slabs have cured and are sufficiently dry to bond with adhesive and concrete subfloor have pH range recommended by carpet manufacturer.

1.9 Warranty

.1 Joint and Several Warranty: Notwithstanding the twelve (12) months warranty period specified in the General Conditions of Contract, the carpet manufacturer's warranty specified in this Section is extended to a period of ten (10) years from date of Substantial Performance.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Tile Carpeting (CPT): As indicated in Section 09 06 00 – Finishes Schedule.

2.3 Accessories– finishes schedule

.1 Adhesive and Seam Cement: Self release type, recommended by tile carpeting manufacturer; low odour based, low VOC.

.2 Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

.3 Resilient Accessories: Transition strips, nosings and rubber base as indicated in Section 09 06 00 – Finishes Schedule, of types indicated on drawings and as required to protect exposed edge of carpet; maximum lengths to minimize running joints.

3 Execution

3.1 Examination

.1 Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.

.2 Verification of Conditions (Concrete Substrates): Verify that concrete substrates and conditions are satisfactory for carpet installation and comply with the following specified requirements:

.1 Concrete subfloor complies with ASTM F710 and moisture emissions are within manufacturer’s recommendations in accordance with ASTM F1869.

.2 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.

.3 Slabs are free of cracks, ridges, depressions, scale, and foreign deposits that could affect the quality of the carpet installation.

.3 Pre-installation Testing: Provide three (3) working days notice to the Consultant before commencement of the Work; include cost of testing as a part of the price for work of this Section and as follows:

.1 Do not install flooring over concrete subfloor until slabs have cured and are sufficiently dry to bond with adhesive, as determined by carpet manufacturer's recommended bond and moisture test.

.1 Test pH level of slab and correct surfaces having an alkali content of pH 9 or higher.

.4 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

.1 Install in accordance with manufacturer’s printed instructions using material from same dye lot; mix materials to obtain consistent colour, pattern and texture match within any one visual area.

.2 Fit neatly around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses and around projections:

.1 Cut tile carpeting to fit accurately around perimeter of rooms into all recesses and around fixtures.

.2 Make cut outs for floor mounted service boxes, receptacles, switches, hardware where they occur on tile carpeting.

.3 Cut holes as close as possible to allow services to pass through and that trim will completely hide hole when installed.

.4 Cooperate and coordinate with electrical trade to ensure correct location of outlets is obtained.

.3 Install edging strips at all openings or doorways and where tile carpeting abuts other floor covering.

3.3 Closeout activities

.1 Clean-Up: Remove tile carpeting waste and debris from premises and leave installation clean after completion of carpeting operations in an area; protect finished areas from work following installation in accordance with manufacturer’s written instructions.

.2 Repairs: Replace damaged or defective tile carpeting at no cost to the Owner.

End of section

1 General

1.1 Section includes

.1 Linear wood acoustic ceiling panels (LWP).

1.2 Administrative requirements

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this Section.

.2 Coordinate and schedule work in conjunction with placement of inserts, outlets and access panels, mechanical components, electrical components and other fixtures and equipment avoid cutting and patching of acoustic panels.

1.3 Performance requirements

.1 Acoustical Performance: Sound absorption NRC values as specified according to ASTM C423 for applicable mounting according to ASTM E795, or other acceptable testing standard.

.2 Surface Burning: CAN/ULC-S102, Flame spread 25, smoke developed 409 or less. Identify products with appropriate markings of applicable testing agency.

.3 Panel Deflection: design suspension system not to exceed L/360 deflection under applicable live and dead loading.

1.4 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Manufacturer's descriptive literature for panel system, including component item data, physical sizes, and clearances required.

.3 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.4 Shop Drawings:

.1 Indicate grid layout and related dimensioning, integral access panels, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system and insulation.

.2 Indicate conformance to performance requirements including analysis data signed and sealed by a professional structural engineer licensed in the Province where the Project is located, and responsible for their preparation.

.5 Samples:

.1 Submit two minimum 600 mm long samples of each panel type, illustrating edge and corner. Include framing, retainer, mounting devices.

.2 Submit samples of each acoustical panel fabric from current dye lot of materials and colours.

1.5 Submittals for information

.1 Qualifications Data: For Installer.

.2 Manufacturer's Certificate: Certify that products meet or exceed specified performance requirements.

.3 Test Reports:

.1 Submit substantiating engineering data, test results of previous tests which purport to meet performance criteria, and other supportive data.

.2 Submit tests reports from a testing laboratory indicating that the components have passed all noted fire resistance requirements and acoustical requirements.

1.6 Quality assurance

.1 Conform to Ceilings and Interior Systems Contractors Association (CISCA) Ceiling Systems Handbook requirements.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years' documented experience and approved by the manufacturer.

1.7 Regulatory requirements

.1 Conform to applicable code for combustibility requirements for materials.

1.8 Mock-up

.1 Construct a 3 m x 3 m Mock-up of wall and ceiling panels specified, as directed by consultant.

.2 Locate where directed by Consultant.

.3 Approved mock-up may remain as part of the Work.

1.9 Delivery, storage and handling

.1 Comply with panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

.2 Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

.3 Handle materials and accessories carefully to avoid damaging mesh panels and finishes.

1.10 Environmental requirements

.1 Do not install panels until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings and within walls is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

.2 Air-Quality Limitations: Protect panels and fabric from exposure to airborne odours, such as tobacco smoke, and install under conditions free from odour contamination of ambient air.

1.11 Warranties

.1 Provide two (2) year manufacturers warranty starting from date of Substantial Performance of sound absorbing wall and ceiling units covering defects in products and failure to meet specified requirements.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Acoustic Wood Ceiling and Wall Panels (LWP):

.1 Prefinished acoustical linear wood ceiling system.

.2 Fire Performance: CAN/ULC S102; Flame Spread: 25; Smoke Developed: 450, and Class A in accordance with ASTM E84.

.3 Panel consisting of natural wood veneer, applied to fire retardant treated medium density fiberboard.

.4 Face Profile: Face grooves shall be 12 mm, on center.

.5 Thickness: 16 mm thick.

.6 Size, finish, colour: Refer to schedule of finishes.

.7 Acoustic properties: NRC 0.85-0.95.

.8 Reveal: Covered with Black Fiberfelt.

.9 System and Manufacturers: Subject to conformance with requirements of this Section provide products manufactured by:

.1 ‘Decoustics Veneer Finished Linear Wood panels’ by Decoustics; or

.2 Approved alternate.

2.3 Attachment system

.1 Suspension system: As recommended by manufacturer and as follows:

.1 Grid Components: ASTM C635/C635M, heavy duty; exposed, downward access removable T; components die cut and interlocking; minimum 38 mm high bulb tee design.

.2 Using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM 635 requirements, seismic codes and authority having jurisdiction.

.3 Accessories: Stabilizer bars, clips, perimeter mouldings and splices required for suspended grid system.

.4 Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

.5 Ties Wire: minimum 1.98 mm (14 ga.) Ø steel wire, galvanized.

.1 Hanger Attachments to Concrete: 1 #12 galvanized annealed steel wire for support of a maximum weight of 68 kg. per hanger; #9 galvanized annealed steel wire for support of a maximum weight of 140 kg. per hanger; 4.5 mm diameter galvanized annealed steel rod to support a maximum weight of 250 kg. per hanger.

.6 Anchors: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to five (5) times that imposed by construction as determined by testing according to ASTM E488 by an independent testing agency; Minimum tensile strength 390 MPa.

.7 Colour for all exposed suspension components: Black.

2.4 Accessories

.1 Provide all accessories as recommended by manufacturer.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify that adjacent materials and surfaces are dry, in a dust free environment, free of obstructions, and ready to receive system installation.

.3 Verify ceiling construction, painting, is complete prior to installation.

.4 Verify ceiling and wall penetrations have been acoustically sealed.

3.2 Installation - suspension system

.1 Install suspension system to manufacturer instructions and ASTM C636/C636M, and as supplemented in this section.

.2 Install system in accordance with ASTM E580/E580M.

.3 Install system capable of supporting imposed loads to a deflection of L/360 maximum.

.4 Lay out system to a balanced grid design with edge units no less than 50 % of acoustic unit size, unless otherwise detailed.

.5 Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

.6 Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

.7 Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

.8 Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 150 mm of each corner; or support components independently.

.9 Do not eccentrically load system, or produce rotation of runners.

3.3 Installation - wall and ceiling units

.1 Install panels and patterns as identified on approved shop drawings. Orient surface facings of panels to optimize absorption characteristics.

.2 Securely attach framing forming perimeters of panels to wall or partition or ceiling substrate using screws. Align, level and plumb components.

.3 Install acoustic wall panels with adhesive installation method in accordance with manufactures recommendations. Ensure no telegraphing of framing and substrate, and but joints tightly without gaps.

3.4 Site quality control

.1 Engage a professional structural engineer experienced in design and installation of this work and licensed in the Province where the Project is located to:

.1 Perform timely and regular inspections.

.2 Verify installation conforms to applicable code.

.3 Prepare and submit inspection reports.

3.5 Cleaning

.1 Clean installed work.

.2 Clean finish surfaces and accessories.

.3 Spot clean, if required, using a mild solvent, upholstery shampoo, or foam from a mild detergent.

3.6 Protection

.1 Protect installed panels with non-staining non-marking vinyl or polyethylene drop cloths.

End of section

1 General

1.1 Section includes

.1 Provide labour, materials, tools and other equipment, services and supervision required to complete interior and exterior, including above roof, painting and decorating work.

.2 Surface preparation for this section will be limited to priming and back-priming, and specific pre-treatments noted in this section or as specified in the Master Painters Institute (MPI) Painting Specification Manual.

.3 High performance coating (HPC), and Epoxy Paint (EPX-1) as indicated.

1.2 Related requirements

.1 Section 05 50 00 – Metal Fabrications

.2 Section 07 92 00 – Sealants

.3 Section 09 06 00 – Finishes Schedule

.4 Section 09 21 16 – Gypsum Wallboard

1.3 Reference standards

.1 Environmental Choice Paints and Surface Coatings, Low VOC Product Listings Program (ECP):

.1 Paints and Surface Coatings, Low VOC Product Listings

.2 The Master Painters Institute (MPI):

.1 New Surfaces: Architectural Painting Specification Manual.

.3 The Society for Protective Coatings (SSPC):

.1 Coating Materials Guidelines

.2 Surface Preparation Guidelines

.3 Application, Inspection and Quality Control Guidelines

1.4 Definitions

.1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows:

.1 G1: Matte of Flat: Lustreless or matte finish with a gloss range below 10 when measured at 85 ° to meter and 0 to 5 when measured at 60 °.

.2 G2: Velvet: Matte to low sheen finish with a gloss range of 10 to 35 when measured at 85 ° to meter and 0 to 10 when measured at 60 °.

.3 G3: Eggshell: Low sheen finish with a gloss range of 10 to 35 when measured at 85 ° to meter and 10 to 25 when measured at 60 °.

.4 G4: Satin: Low to medium sheen with a gloss range of minimum 35 when measured at 85 ° to meter and 20 to 35 when measured at 60 °.

.5 G5: Semi-Gloss: Medium sheen finish with a gloss range of 35 to 70 when measured at 60 ° to meter.

.6 G6: Gloss: High sheen finish with a gloss range of 70 to 85 when measured at 60 ° to meter.

.7 G7: High Gloss: Reflective sheen having a gloss range in excess of 85 when measured at 60 ° to meter.

.2 Gloss Values: Generally, provide paints and coatings having the following sheens when installed on the following substrates:

.1 Walls: Eggshell (G3) or Satin (G4) as selected by Consultant at a later date.

.2 Trim and Doors: Semi-gloss (G5).

.3 Ceilings: Flat (G1).

1.5 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit list of all painting materials used for the Work to the Consultant for review prior to ordering materials for each paint system indicated, including block fillers and primers.

.1 Material List: An inclusive list of required coating materials indicating each material and cross reference specific coating, finish system, and application; identify each material by manufacturer's catalogue number and general classification.

.2 Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

.2 Samples: Provide stepped samples, defining each separate coat, including block fillers and primers using representative colours required for the project; label each sample for location and application, and as follows:

.1 Drawdown Samples: Provide three (3) drawdown sample charts (cards) for each type, texture and colour of finish specified for verification purposes before ordering paint materials.

.3 Informational Submittals: Provide the following submittals when requested by the Consultant:

.1 Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.

1.6 Project closeout submissions

.1 Operation and Maintenance Data: Submit copies of paint manufacturer’s written maintenance information for inclusion in the operations manual in accordance with Section 01 78 00 – Closeout Submittals, including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

.2 Maintenance Materials: Deliver maintenance materials to Owner in quantities indicated and in accordance with Section 01 78 00 – Closeout

Submittals, that match products installed; packaged with protective covering for storage, and identified with labels describing contents and building location and as follows:

.1 Paints and Coatings: Minimum of 4-4L containers of field colours and 4-1 L containers of each accent colour, and all remnants.

1.7 Quality assurance

.1 Conform to the standards contained in the MPI Manual.

.2 Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in service performance, and as follows:

.1 Have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work.

.2 When requested provide a list of the last three (3) comparable jobs including, name and location, specifying authority, start and completion dates and cost amount of the painting work.

.3 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.3 Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats and as follows:

.1 Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual.

1.8 Environmental requirements

.1 Conform to MPI Manual and manufacturers requirements.

.2 Perform no painting or decorating work when the ambient air and substrate temperatures, relative humidity and dew point and substrate moisture content is below or above requirements for both interior and exterior work.

.3 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

.4 Ensure adequate continuous ventilation and sufficient heating and lighting is in place.

.5 Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.

.6 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground retain cleaning water and filter out and properly dispose of sediments.

.7 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

2 Products

2.1 Manufacturers

.1 Subject to compliance with requirements, manufacturers that have attained the prerequisites for ecologically sustainable labelling mark on their products and may be incorporated into the Work include; but are not limited to, the following:

.1 Sherwin-Williams LLC;

.2 Benjamin Moore and Co. Limited;

.3 ICI Paints (Canada) Inc.;

.4 Para Paints;

.5 PPG Canada Inc.- Architectural Finishes ;

.6 SICO Inc.;

.7 Stonehard; or

.8 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, and other painting materials shall be in accordance with the MPI Manual “Approved Product” listing and shall be from a single manufacturer for each system used.

.2 Materials such as linseed oil, shellac, and other accessory materials shall be the highest quality product of an approved manufacturer listed in the MPI Manual and shall be compatible with other coating materials.

.3 All materials and paints shall be lead and mercury free and shall have low VOC content where possible.

.4 Colour and Manufacturer: As indicated in the Section 09 06 00 – Finishes Schedule.

3 Execution

3.1 Preparation of surfaces

.1 Prepare surfaces in accordance with MPI Manual requirements. Refer to the Manual for specific surface preparation requirements for each substrate material.

3.2 Application

.1 Paint when substrates and environmental conditions (heating, ventilation, lighting and completion of other work) are acceptable for applications of products specified in this Section.

.2 Paint surfaces requiring paint or stain finish to Premium MPI Manual finish requirements with application methods in accordance with best trade practices for type and application of materials used.

.3 Continue paint finishes through behind wall mounted items.

.4 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.

.5 Apply a minimum of four coats of paint where deep or bright colours are used to achieve satisfactory results.

.6 Parking Areas and Pedestrian Areas:

.1 Parking bays lines shall be identified with 102 mm (4 in.) wide white or yellow painted lines with each bay consecutively numbered with 51 mm (2 in.) wide white or yellow painted numbers in accordance with approved parking layout and/or in accordance with the requirements or authorities having jurisdiction.

.2 Barrier free accessible parking bays and refuge areas shall be identified with appropriate symbol designation and/or in accordance with the requirements or authorities having jurisdiction.

.3 Pedestrian walkways shall be identified with 102 mm (4 in.) wide yellow painted lines at 45 ° to path of travel spaced at 457 mm (18 in.) O/C or in accordance with the requirements or authorities having jurisdiction.

3.3 Exterior surfaces

.1 Paint exterior surfaces in accordance with the MPI Manual painting systems listed in this section.

.2 Asphalt Surfaces (Zone / Traffic Marking for Drive and Parking Areas):

.1 EXT 2.1A: Latex Zone / Traffic Marking.

.2 EXT 2.1B: Alkyd Zone / Traffic Marking.

.3 Concrete Vertical Surfaces and Horizontal Soffits:

.1 EXT 3.1C - Waterborne light industrial G5 finish.

.4 Prime Painted Structural Steel and Metal Fabrications:

.1 EXT 5.1D - Alkyd G5 finish.

.5 Galvanized Metal:

.1 EXT 5.1T: Pigmented polyurethane and self-priming epoxy.

3.4 Interior surfaces

.1 Concrete Floors to Receive Floor Sealer: Two coats of concrete floor sealer in accordance with manufacturer's written instructions. Include associated prime coats, when recommended by manufacturer.

.2 High performance coating (HPC): high solid, high gloss, pigmented wall system, hard tile like finish, chemical and abrasion resistant.

.1 Basis of design:

.1 "Stonglaze VSR" system by Stonhard, minimum 12 mil thick, with minimum two (2) layers of Stonglaze E4, and manufacturer's recommended primer; or

.2 Approved alternate.

.2 Colour: to be later selected from manufactures standard range.

.3 Concrete Vertical Surfaces, Ceilings and Soffits:

.1 INT 3.1A - Latex G3 finish for low contact surfaces.

.2 INT 3.1C - High performance architectural latex G3 finish for high contact surfaces.

.4 Concrete Horizontal Surfaces:

.1 INT 3.2A - Latex floor enamel low gloss finish.

.5 Concrete Masonry Units:

.1 INT 4.2D - High performance architectural latex G3 finish in all other locations.

.2 INT 4.2G Epoxy ("Tile Like")(over epoxy block filler) for wet environments, G5 finish, provide where EPX-1 is indicated.

.6 Structural Steel and Metal Fabrications:

.1 INT 5.1R - High performance industrial latex, G2 finish; G5 finish in high contact areas.

.2 INT 5.1E - Alkyd, G5 finish for handrails only.

.7 Galvanized Metal (Not Chromate Passivated, including bench supports):

.1 INT 5.3M - High performance architectural latex G5 finish.

.2 INT 5.3C – Alkyd, G3 finish; G5 finish for in high contact areas.

.8 Gypsum Board - General:

.1 INT 9.2A - Latex G3 finish for ceilings and walls.

.2 INT 9.2B - High performance architectural latex G3 finish for walls in high contact areas.

.3 INT 9.2C - Alkyd G3 finish for ceilings and walls.

.4 INT 9.2F - Waterborne epoxy (tile-like) G5 finish in wet areas and behind urinals.

3.5 Mechanical and electrical equipment

.1 Paint “unfinished” conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and texture to match adjacent surfaces, in the following areas:

.1 In exposed-to-view exterior and interior areas.

.2 In interior high humidity interior areas.

.3 In boiler room, mechanical and electrical rooms.

.2 Leave conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks in unfinished areas.

.3 Paint inside of ductwork where visible behind louvers, grilles and diffusers beyond sight line with primer and one coat of matt black (non-reflecting) paint.

.4 Paint the inside of light valances gloss white.

.5 Refer to Mechanical and Electrical specifications for painting, banding, stencilling of other surfaces/equipment, and generally as follows:

.1 Paint gas piping gas standard yellow where visible in service spaces.

.2 Paint both sides and all edges of plywood backboards for equipment before installation.

.3 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.4 Do not paint over nameplates.

3.6 Site quality control

.1 Painted surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent at time of field review when viewed from a distance of 4 ft. from the painted surface:

.1 Runs, sags, hiding or shadowing by inefficient application methods

.2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles

.2 Painted surfaces will be considered as deficient if any of the following defects are apparent at time of field review, regardless of viewing distance.

.1 Damage due to touching before paint is sufficiently dry or any other contributory cause.

.2 Damage due to application on moist surfaces or caused by inadequate protection from the weather.

.3 Damage or contamination of paint due to windblown contaminants (dust, sand blast materials, salt spray, etcetera)

.3 Painted surfaces found as unacceptable shall be replaced or repaired at no cost to the Owner or Consultant:

.1 Small affected areas may be touched up

.2 Large affected areas or areas without sufficient dry film thickness of paint shall be repainted.

.3 Runs, sags or damaged paint shall be removed by scraper or by sanding before application of new paint coats.

3.7 Protection

.1 Protect newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry.

.2 Curing periods shall exceed the manufacturers recommended minimum time requirements.

.3 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.8 Cleanup

.1 Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

.2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of it in accordance with requirements of authorities having jurisdiction.

.4 Clean equipment and dispose of wash water or solvents, and other cleaning and protective materials (rags, drop cloths, masking papers, etcetera), paints, thinners, paint removers and strippers in accordance with the safety requirements of authorities having jurisdiction.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation of:

.1 Illuminated Monument Signs

.2 Illuminated Exterior Building Signs

.3 Exterior and Interior room signs.

1.2 Related requirements

.1 Section 03 30 00 – Cast-in-Place Concrete

1.3 References

.1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.

.2 Canadian Standards Association (CSA):

.1 CAN/CSA-S157/S157.1, Strength Design in Aluminum/Commentary on CAN/CSA-S157, Strength Design in Aluminum.

.2 CSA W59.2, Welded Aluminum Construction.

.3 American Architectural Manufacturers Association (AAMA):

.1 AAMA CW-10, Care and Handling of Architectural Aluminum From Shop to Site.

.2 AAMA CW-11, Design Wind Loads and Boundary Layer Wind Tunnel Testing.

.3 AAMA T1R-A1, Sound Control for Fenestration Products.

.4 AAMA 501, Methods of Test for Exterior Walls.

.5 AAMA 611, Voluntary Specifications for Anodized Finishes Architectural Aluminum.

.6 AAMA 612, Voluntary Specifications, Performance Requirements, and Test Procedures for Combined Coatings of Anode Oxide and Transparent Organic Coatings on Architectural Aluminum.

.7 AAMA 2604, Voluntary Specification Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

.8 AAMA 2605, Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

1.4 Quality assurance

.1 Fabricators: Regularly engage in, and maintain a regular force of workers skilled in fabricating work required by this Section.

.2 Applicators: Manufacturer's erection crew under the supervision of a competent factory trained foreman. Painting of messages shall be by experienced, qualified sign painters.

.3 Installation: Securely mount signs plumb and level, in locations as shown, with concealed and correctly sized bolts, expansion bolts, pop rivets, screws, and other fasteners to firmly hold signs in place. Design exterior free standing signs to withstand minimum wind load indicated for building perpendicular to the sign surface.

.4 Perform welding of aluminum in accordance with requirements of CSA W59.2 and CSA S244. Fabricator to be certified to Division 2.

1.5 Submittals

.1 Shop Drawings: Show in detail the construction of the various parts of the work, methods of joining and fastening signs, thickness of materials, finishes to be applied, details of anchoring joints, welds, fastenings, relationship of work to other Sections, including cutouts, and other pertinent data and information. Include also wiring diagrams and exact ballasts by manufacturer's numbers.

.1 Provide Engineered sealed shop drawings for illuminated monument signage box, and coordinate with Section 03 30 00 – Cast-in-Place Concrete for required embeds and anchor for monument signage.

.2 Layout Drawings: Submit full-size layouts of all signs to Consultant for approval before fabrication is initiated, show layouts including positions of all messages, lines, arrows, and other symbols.

.3 Templates and Instructions: Provide as necessary where supports or anchors have to be built in by other Sections, as required and so as not to delay the progress of the Work.

.4 Samples: Provide sample of each Owner provided digital printed element for review and approval. Submit duplicate representative sample of each type of sign, sign image and mounting method.

1.6 Protection

.1 Provide factory applied protection to prevent contamination and marring of sign surfaces and to prevent damage to surfaces, edges, and supports during handling, transportation, storage and installation.

.2 Do not use protective coverings which will become permanently bonded or which will damage surfaces or finishes when being removed.

1.7 Warranty

.1 Signage manufacturer to provide five (5) year labour and material warranty starting from date of Substantial Performance for Work of this Contract. Warranty to include discoloration and chipping of all finishes.

2 Products

2.1 Materials

.1 Structural aluminum:

.1 Aluminum Alloy 6061-T6.

.2 Structural aluminum framing shall conform to CSA HA Series.

.2 Aluminum Extrusions: AA 6006-T5.

.3 Aluminum Plate and Sheet: 1100-H14 alloy, anodizing quality.

.4 Acrylic Sheet: Polymethylmethacrylate (PMMA) cast sheet suitable for intended use in sign fabrication, colours as indicated.

.5 Signage Film: Purpose made vinyl sheeting, engineer grade, made with pressure-sensitive adhesive or other approved adhesive.

.6 Fasteners: '400' Series stainless steel, or '300' Series stainless steel.

.7 Electrical components: Coordinate lighting with division 26, and CSA approved.

.8 Welding materials: CSA W59.2 and CSA S244

.9 Self-Stick Foam Tape: 352.4 kg/cu.m. (22 pcf) density polyurethane open-cell foam tape for sign purposes, with synthetic self-stick adhesive on both sides. Width to suit sign sizes.

.10 Adhesives, Sealants and Solvents for Acrylic Sheet: Type recommended by sheet manufacturer for applicable condition.

.11 Isolation Coating: Butyl, extruded, macro-polyisobutylene type, size and hardness to suit application.

2.2 Sign graphics

.1 Sign Graphics: Well defined, arranged for balanced appearance, and properly word and letter spaced.

.2 Digital Print Process: Apply multi colour photographic produced printed images. Digital files will be provided by Owner to follow as a guideline. Provide verification samples of each printed sign for verification.

.3 Engraving: Apply sign images using pantograph mechanical engraving machine to obtain incised and raised areas for tactile lettering.

2.3 Illuminated sign boxes

.1 Fabricate illuminated monument sign boxes as detailed of structural aluminum framing, extruded aluminum plate with clear anodized finish, with digitally printed translucent acrylic sheet.

.2 Sign Casings:

.1 Design, construct and reinforce sign casing to provide strong, rigid, self-supporting, weathertight, light-tight, housing to accommodate sign faces and electrical components. Use one piece brushed aluminum frame around perimeter casing lengths and one piece face sheet of acrylic with signage indicated.

.2 Provide space in front of sign face for minimum 3.2 mm acrylic lift in panel for message image.

.3 Provide access for installation, maintenance, and relamping, through removable sign face, having concealed, tamperproof latches to prevent unauthorized access.

.4 Provide for thermal movement, heat and moisture dissipation by approved non-staining, concealed methods.

.5 Include clear anodized aluminum reflectors, minimum 1.52 mm thick. Paint remainder of interior white.

.6 Fabricate overhead hangers, wall brackets, wall fasteners for installation. Exposed materials as indicated on drawings: concealed material to be aluminum with mill finish.

.3 Sign Faces:

.1 Fabricate sign faces of opaque white acrylic sheet minimum 6 mm for wall mounted signs and 8 mm thick for monument.

.2 Support face along top, leaving sides and bottom floating to permit unrestricted thermal movement.

.3 Join abutting sign faces with clear transparent acrylic or PVC joining splines of approved type.

.4 Installed face to present rigid surface with minimal distortion: Moch-up to be reviewed by Owner and Consultant.

.5 Lift In Panels: 3 mm clear acrylic panels for each message (pictograph or word), capable of easy placement and removal yet secure when in place. Smooth on all edges.

2.4 Plates

.1 Interior plastic wall plates:

.1 Fabricate from acrylic sheet 6.4 mm thick. Sizes as indicated.

.2 Sign Graphics: Apply by digital print process.

.2 Washroom Pictographs: digital print on acrylic sheet, refer to drawings for details provide raised Braille, where indicated.

.3 Interior fixed Mounting: Prepare wall plates for fixing by self-stick foam tape. Include back-up plates for fixing to uneven surfaces where required.

2.5 Fabrication

.1 Fabricate signs in accordance with details, specifications and shop drawings.

.2 Build units square, true, accurate to size, free from visual or performance defects.

.3 Accurately fit and securely join sections to obtain tight, closed joints.

.4 Allow for thermal movement without distortion of components.

.5 Exposed fasteners permitted only where indicated or approved by Consultant and to be inconspicuous and same finish and colour as base material, or as noted.

.6 Polish exposed edges of plastic and metal to smooth, slightly convex profile.

.7 Do aluminum welding to CSA W59.2. Finish exposed welds flush and smooth.

.8 Apply bituminous paint to aluminum in contact with dissimilar metals, concrete or masonry.

.9 Manufacturer's nameplates on sign surface locations visible in completed work not acceptable.

2.6 Finishing

.1 Aluminum finishing:

.1 Anodized Aluminum: AAMA 611, Class I, 0.018 mm or thicker.

.2 Structural Concealed Aluminum: mill finish.

.3 Aluminium paint finish:

.1 Exterior: All exposed aluminum surfaces shall have two coat, thermo-setting, high performance 70% fluoropolymer finish coating, minimum 1.2 mils dry film thickness and conforming AAMA 2605.

.2 Interior: conforming to AAMA 2603.

.2 Acrylic sheet finishing:

.1 Paint: type recommended by acrylic sheet manufacture.

.2 Topcoat: clear, non-yellowing, exterior grade, satin finish, acrylic polyester resin protective coating, compatible with surface of acrylic sheet and as recommended by sheet manufacturer.

3 Execution

3.1 Installation

.1 Erect and secure signs plumb and level at elevations indicated.

.2 Comply with sign manufacturer's installation instructions and approved shop drawings.

.3 Mechanical attachment:

.1 To concrete or solid masonry use lag screws and expansion bolts or screws and fibre plugs, as appropriate for stresses involved.

.2 To hollow masonry use toggle bolts or equivalent.

.3 To steel use bolts with nut and lock washers, self-tapping screws.

.1 Do aluminum welding to CSA W59.2. Finish exposed welds flush and smooth.

.4 Secure into framing members behind stud walls or above ceilings.

.5 Mechanical fasteners on exterior to be non-staining, non-ferrous type.

.6 Fabricate special fasteners as required for installation conditions.

.7 Mechanical fasteners and methods of attachment subject to Consultant's approval. Obtain Consultant’s approval before fixing to structural steel.

.4 Adhesive attachment:

.1 Use self-stick adhesive foam tape to manufacturer's instructions to adequately fix sign and prevent "rocking". Keep tape maximum 3 mm from edges.

3.2 Cleaning

.1 Leave signs clean. Remove debris from interior of sign boxes.

.2 Touch up any damaged finishes.

End of section

1 General

1.1 Section includes

.1 This section specifies requirements for traffic control signs according to local provincial transportation standards and as specified.

1.2 Related sections

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 32 12 16 – Asphalt Paving

.3 Section 32 16 15 – Concrete Walks, Curbs and Gutters

1.3 References

.1 Work to be according to local Municipal Specifications.

.2 Occupational Health and Safety Act and Regulations for Construction Projects

1.4 Submittals

.1 Submit submittals according to the General Conditions and Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings:

.1 Submit fully dimensional shop drawings to Consultant showing construction, assembly, elevations, sections and interfacing with work of other Sections.

.2 Do not fabricate work of this section until shop drawings and all other related submittals, documentation, certifications and samples as required by this Section, have been reviewed by Consultant.

.3 Indicate metal thicknesses, fasteners and welds, all anchorage assemblies and components and erection details.

.4 Submit necessary templates and instructions where supports, anchors or services have to be built-in by others.

1.5 Delivery, storage, handling and protection

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location. Do not load any area beyond the design limits.

.2 Carefully check, unload, store and handle materials to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Store materials in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

.4 Remove from site unsatisfactory materials.

.5 Adequately protect the structure and work of other Sections during delivery, storage, handling and execution of the work of this Section.

.6 Provide tools, plant and other equipment required for the proper execution of the work of this Section.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Acceptable manufacturer

.1 As approved by local Municipality.

2.3 Signs

.1 "STOP" Signs.

.2 "SPEED LIMIT 15 in. Signs.

.3 "ACCESSIBLE PARKING SYMBOL" Signs.

.4 "NO PARKING, FIRE LANE" Signs.

.5 "KEEP RIGHT" Signs.

.6 "DO NOT ENTER" Signs.

.7 "YIELD" Signs.

.8 "RIGHT TURN ONLY" Signs.

.9 "LEFT TURN ONLY" Signs.

.10 "NO TRUCKS" Signs.

.11 PEDESTRIAN CROSSING" Signs.

.12 Miscellaneous Signs - See Contract Documents.

2.4 Posts

.1 Round, galvanized posts with galvanized sign-mounting hardware for each sign, or as otherwise specified.

3 Execution

3.1 Installation

.1 Install posts in 18 in. (450 mm) round x 4 ft. 0 in. (1.2 m) deep concrete foundations. Set posts vertical and plumb with bottom of sign at 6 ft. 6 in. (2.0 m) above finished grade.

.2 Mount signs according to manufacturer's written instructions.

3.2 Cleaning and adjusting

.1 Upon completion of the work of this Section, or if directed by Consultant, remove all protective coatings and coverings. Clean and polish all exposed surfaces.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation of a proprietary, premanufactured demountable partition system comprised of wall framing, glass and glazing materials, trim and finish panels, doors and hardware, and other components required for a complete installation.

1.2 Related requirements

.1 Division 26 – Electrical: Coordination conduit, wiring, cable trays and other materials.

.2 Division 27 – Communications: Coordination communications cabling and other materials.

1.3 Reference standards

.1 American National Standards Institute (ANSI):

.1 ANSI H35.1-2004, Standard Alloy and Temper Designation Systems for Aluminum

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM B429/B429M-06 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

.3 ASTM E90-04 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.3 Canadian Standards Association (CSA):

.1 CAN/CSA S136-01, North American Specification for the Design of Cold-Formed Steel Structural Members

1.4 Performance requirements

.1 System Design: Design and size components to loads acting normal to plane of wall.

.1 Interior Screens: Maintain deflection of not more than L/360 of distance between supports and withstand lateral loading (air pressure) of 0.5 kPa with deflection limit not more than L/360 of partition height.

.2 Deflection: Limit mullion deflection to flexure limit of glass of span; with full recovery of glazing materials.

.3 Seismic Performance: Partition system shall withstand the effects of earthquake motions determined according to requirements of applicable code.

.2 STC-Rated Assemblies: For STC-rated assemblies, provide glazing assembly meeting below STC ratings tested to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

.3 Fire: Provide exposed panel finishes and surfaces meeting fire hazard classification requirements in accordance with CAN/ULC S102 as follows:

.1 Flame Spread: 25 maximum.

.2 Fuel Contributed: 10 maximum.

.3 Smoke Developed: 40 maximum

1.5 Definitions

.1 Proprietary Demountable Partition System: Basis-of-Design materials are specified as complete partitions supplied and installed by this Section including materials specified in other Sections; other Sections are referenced as a central location for common material requirements and are not intended to establish work results outside of this Section.

1.6 Submittals for review

.1 Product Data: Provide data on partition, hardware and accessories, colours and finishes available.

.2 Shop Drawings: Indicate opening sizes, layout, details of required supports, static and dynamic loads, adjacent construction and finish trim, and stacking sizes.

.1 Include structural analysis data for attachments, signed and sealed by a qualified professional engineer licensed in the locality of the Project, and responsible for their preparation. Include design calculations for seismic restraints.

.2 Provide final engineered drawings relevant to material inclusions within, or connections to the moveable wall product.

.3 Samples:

.1 Submit two samples of surface finish on specified substrate, 300 x 300 mm size, illustrating quality, finishes and colours selected.

.4 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

1.7 Submittals for information

.1 Installation Data: Manufacturer's special installation requirements.

.2 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.8 Closeout submittals

.1 Operation and Maintenance Data:

.1 Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.9 Quality assurance

.1 Installer Qualifications: Installer with a minimum five (5) years’ experience, who has completed demountable partition systems similar in material, design, and extent to those indicated for this Project and whose work has

resulted in construction with a record of successful in-service performance.

.2 Manufacturer: Company specializing in manufacturing demountable partition systems with minimum five (5) years' documented experience.

.3 Source Limitations: Obtain demountable partitions from single source from single manufacturer with the capacity and resources to provide products of consistent quality in appearance and physical properties.

1.10 Delivery, storage, and protection

.1 Deliver demountable partitions palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

.2 Store frames at project site under cover in a dry location, off the ground, and in such a manner as to prevent deterioration. Store as near as possible to final installation location. Do not use covering material that will cause discoloration of aluminum finish.

1.11 Environmental requirements

.1 Environmental Limitations: Do not install demountable partitions until area of work are enclosed and weatherproof; wet work in spaces is complete and dry; flooring, walls, ceilings, and work above ceilings is complete; and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

.2 Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.12 Regulatory requirements

.1 Conform to applicable code for combustibility requirements for materials.

1.13 Warranty

.1 Correct defective Work within a five (5) year period starting from date of Substantial Performance.

.2 Provide a five (5) year warranty starting from date of Substantial Performance to include coverage for complete system for failure to meet specified requirements.

2 Products

2.1 Manufacturers

.1 Subject to conformance with requirements of this Section, provide Tekvue Fronts Demountable partitions by Teknion or approved alternate.

2.2 Components

.1 General: Provide interior aluminum frame components that comply with dimensions, profiles, and relationships to adjoining work of components indicated on Drawings.

.2 Aluminum Framing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or alloy and temper required to suit structural and finish requirements, not less than 1.6 mm thick

.3 Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers with 3.2 mm minimum thickness back up plates.

.4 Aluminum Doors: Extruded aluminum, reinforced for hinges, strikes, and closers with 3.2 mm minimum thickness. Manufacture standard narrow profile aluminum frame profile.

.5 Glazing Frames: Extruded aluminum, for glazing thickness indicated.

.6 Ceiling Tracks: Extruded aluminum.

.7 Trim: Santoprene base trim.

.8 Door Glazing: Minimum 10 mm thick

.1 Fully Tempered Float Glass (TPG): CAN/CGSB 12.1, Type 2- Fully Tempered, Class B or ASTM C1048; Type I; Quality-Q3; Kind FT (fully tempered); Class I (clear) unless otherwise indicated; of condition indicated.

.9 Wall system Glazing: Minimum 12 mm thick

.1 Heat Strengthened Float Glass: CAN/CGSB 12.9, Type 2 Heat Strengthened, Class A or ASTM C1048; Type I; Kind HS (heat strengthened); Quality-Q3; Class I (clear) unless otherwise indicated; of condition indicated.

.2 Laminated with interlayer to ASTM C1172; thickness as follows:

.1 Standard Polyvinyl Butyral Interlayer (PVB): 0.38 mm minimum.

.10 Door hardware:

.1 Break-out room door, non-locking door, provide:

.1 Pivot door hinges

.2 Bottom seal,

.3 Concealed door closer.

.4 Ladder pull: Teknion standard 25mm (1”) diameter non-locking half length or approved alternate.

.2 Office door, locking, provide:

.1 pivot door hinges

.2 concealed door closer

.3 ladder pull: Teknion standard 25mm (1”) diameter non-locking half length, with Adams rite lock body, Schlage keyed mortise cylinder, with i/c core, and Teknion standard thumbturn; or approved alternate.

.3 Hardware finish: To match Teknion standard ebony painted finish. Mortise cylinder and thumbturn to match Teknion standard 622-matte black. .

3 Execution

3.1 Examination

.1 Verification of Conditions: Verify that substrates and services required for demountable gypsum partition systems are in place, and that installation tolerances are acceptable before beginning of installation of products specified in this Section.

.2 Installation of products specified in this Section will denote acceptance of site conditions.

3.2 Erection

.1 Manufacturer's Instructions: Install demountable gypsum partitions in accordance with manufacturer's written instructions and shop drawing requirements; braced and supported to meet requirements of local Authority Having Jurisdiction using fasteners and anchorages that will not permanently damage ceiling, wall and floor materials installed by other Sections.

.2 Erect partitions plumb, square and level; accurately fitted and fastened to adjacent construction; adjust for floor irregularities and maintain level lines relative to ceiling construction.

.3 Erect partition systems conforming to acoustical requirements for the project; do not modify wall systems that have an effect on acoustical performance of installed system; install closed cell foam tape at perimeter of each partition; excluding carpeted floor, as a continuous strip compressed between partition materials and adjacent construction.

3.3 Closeout activities

.1 Adjusting:

.1 Adjust doors and operating hardware to operate easily without binding; leave work in complete and proper operating condition; remove and replace defective work including doors and framing that are warped, bowed or otherwise unacceptable.

.2 Adjust misaligned trim and base materials.

.2 Touch-Up Finishing: Repair or replace abraded or damaged finishes to match adjacent materials; remove and replace panels and other components that are damaged, improperly installed or soiled beyond satisfactory cleaning

.3 Cleaning:

.1 Perform cleaning of soiled panels and trim, and glass and other finished surfaces as required by Section 01 74 00 – Cleaning and Waste Management.

.2 Clean floor, ceiling and wall surfaces soiled as a result of work of this Section.

End of section

1 General

1.1 Section includes

.1 Horizontal Operable Partition:

.1 Folding panel acoustic partition, paired panel side stacking.

.2 Ceiling track and operating hardware.

1.2 Performance requirements

.1 Sound Transmission Coefficient (STC): measured in accordance with ASTM E90, tested on partition assembly in a laboratory, and calculated according to ASTM E413 and ASTM E90.

.2 Install partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

.3 Surface burning of MDF and marker board finishes: CAN/ULC-S102; flame/smoke rating of 25/50.

.4 Seismic Performance: Partition system shall withstand the effects of earthquake motions determined according to requirements of applicable code.

1.3 Administrative requirements

.1 Coordination:

.1 Coordinate with other work having a direct bearing on work of this Section.

.2 Coordinate the work with other sections providing panel finish materials to this section.

1.4 Submittals for review

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Provide data on partition operation, hardware and accessories, colours and finishes available.

.3 Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at

storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

.1 Include structural analysis data for attachments, signed and sealed by a qualified professional engineer licensed in the locality of the Project, and responsible for their preparation. Include design calculations for seismic restraints.

.4 Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

.5 Samples:

.1 Submit two 300 x 300 mm samples of surface finish on specified substrate illustrating quality, finishes and colours selected.

.6 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

1.5 Submittals for information

.1 Qualifications Data: For Manufacturer and Installer.

.2 Installation Data: Manufacturer's installation requirements including special procedures, perimeter conditions requiring special attention, and installation sequence.

.3 Manufacturer's Certificate: Certify that partition system meets or exceeds specified acoustic requirements.

1.6 Closeout submittals

.1 Operation and Maintenance Data:

.1 Include recommended cleaning methods, cleaning materials, and stain removal methods.

.2 Describe cleaning materials detrimental to finished surfaces and hardware finish.

1.7 Quality assurance

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum five (5) years documented experience.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience and approved by the manufacturer.

1.8 Regulatory requirements

.1 Conform to applicable code for combustibility requirements for materials.

1.9 Warranties

.1 Provide two (2) year manufacturer's warranty starting from date of Substantial Performance covering repair or replace components of partition system that fail in materials or workmanship.

.2 Provide manufacturer's lifetime warranty for hinges.

2 Products

2.1 Materials – general

.1 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Horizontal operable partition

.1 Manual paired panel acoustic partition:

.1 Subject to conformance with the requirements of this Section provide ‘Acousti-Seal Encore’ paired panel, manual wall partition system manufactured by Modernfold Inc, A DORMA Group Company; or

.2 An approved alternate product by one of the following:

.1 Corflex Toronto;

.2 Moderco Inc.; or

.3 Other approved alternate.

.2 STC value: 52

.3 Panel Construction:

.1 Framing: Manufacturer's standard, horizontal and vertical framing members fabricated from minimum 1.3 mm thickness formed steel with rigidly formed laps and welded corners, 108 mm thick by 1,295 mm wide panels. Top channels reinforced to support suspension system components. Frame designed with full vertical edges of formed steel and providing concealed protection of panel facing edges.

.2 Panel Substrate and Facing: Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction.

.3 Hinges: Full leaf butt hinges, attached directly to panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Hinges mounted into panel edge or vertical astragal are not acceptable.

.4 Vertical Interlocking Sound Seals between panels: Roll-formed astragals, with reversible tongue and groove configuration in each panel edge, for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

.4 Track: Formed steel, profile designed to support loads; steel sub-channel and track connectors; connected to structural support with threaded steel hanger rods. Pre-paint exposed track components manufacturer’s standard off-white.

.5 Carriers: Ball bearing, steel-tired wheels on trolley carrier at tops of panels; quantity per manufacturer’s standard. Size carriers to support imposed loads, and equip with threaded pendant bolt for vertical adjustment.

.6 Final Closure: Manufacturer's standard constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.

.7 Acoustic Seals: Manufacturer’s standard automatic retractable floor seals and flexible vinyl acoustic seals at ceiling.

.8 Accessories:

.1 Provide manufacturer’s standard fittings and attachments. No exposed panel trim.

.9 Acoustic Sealant: Manufacturer's standard.

.10 Panel finishes:

.1 Panel Facing: Refer to Schedule of Finishes.

.11 Pass door:

.1 ADA-compliant pass door of the same thickness, acoustical construction and finish as the basic panels. Locate where shown on the plans. Provide pass door with the following:

.1 Dead bolt Lock.

.12 Pocket Door: Unequal half, bi-folding pocket door.

.1 Basis of design: Type IV B pocket door by Modernfold Inc, or approved alternate.

.2 Finish to match panel.

2.3 Panel finishes

.1 Panel Facing: Reinforced vinyl wall covering with woven backing; PVC - free and GREENGUARD Indoor Air Quality Certified.

.2 Refer to Schedule of Finishes for Manufacturer, colours, patterns and finishes.

3 Execution

3.1 Examination

.1 Verify existing conditions before starting work.

.2 Verify attachment substrate and site conditions.

.3 Verify that field measurements are as indicated on shop drawings.

.4 Verify track supports are laterally braced and will permit track to be level within 6 mm of required position and parallel to the floor surface.

.5 Verify floor flatness of 3 mm in 3 m, non-cumulative.

3.2 Preparation

.1 Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.

3.3 Installation

.1 Install partitions to manufacturer's written instructions and ASTM E557.

.2 Installed panels to be correctly matched for overall appearance and between adjacent panels, and free of breaks, cracks, chips, and deformities.

.3 Fit and align partition assembly level and plumb.

.4 Lubricate moving components.

.5 Apply acoustic sealant to achieve required acoustic performance.

3.4 Adjusting

.1 Adjust partition assembly to provide smooth operation from stacked to full open position without warping or binding. Do not over-compress acoustic seals.

.2 Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

.3 Adjust to achieve light tight seal.

.4 Touch up minor finish damage. Remove and replace partition components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 Cleaning

.1 Clean installed work.

.2 Clean finish surfaces and partition accessories.

3.6 Closeout activities

.1 Demonstration: Demonstrate operation of partition, identify potential operational problems.

End of section

1 General

1.1 Section includes

.1 Furnish labour, materials and other services to complete the fabrication and installation of:

.1 washroom accessories and framed mirrors and

.2 Attachment hardware.

.2 Include all materials and fitments required for the operation of any unit furnished, in the manner, direction and performance shown on the shop drawings and specified herein.

1.2 Related requirements

.1 Section 06 10 00 – Rough Carpentry

.2 Section 09 21 16 – Gypsum Wallboard

.3 Section 09 30 00 – Tiling

1.3 References

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware

.2 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.3 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

.4 ASTM A1008/A1008M-12a, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

1.4 Submittals

.1 Submit in according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Shop Drawings: Show and describe in detail, materials, finishes, dimensions, details of connections and fastenings, elevations, plans, sections, metal gauges, hardware and any other pertinent information.

.4 Coordinate the work of this Section with the placement of internal wall reinforcement.

1.5 Delivery, storage and handling

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location.

.2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Store materials in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

.4 Unsatisfactory materials shall be removed from the site.

.5 Adequately protect the structure and work of other Sections during delivery, storage, handling and execution of the work of the Section.

.6 Provide tools, plant and other equipment required for the proper execution of the work of this Section.

2 Products

2.1 Manufacturers

.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures.

.2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 ASI Watrous - Global Partitions;

.2 Bobrick;

.3 Frost;

.4 Koala Kare;

.5 Dyson; or

.6 Approved alternate.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Provide one of the products indicated for each designation in the Washroom and Custodial Accessory Schedule below, subject to compliance with specified requirements.

.2 Stainless Steel: In accordance with ASTM A666, Type 304, with No. 4 finish (satin); minimum nominal thickness as established by product type.

.3 Sheet Steel: Steel: In accordance with ASTM A1008/A1008M, cold rolled, commercial quality; minimum nominal thickness as established by product type; surface preparation and metal pretreatment as required for applied finish.

.4 Galvanized Steel Sheet: In accordance with ASTM A653/A653M, minimum Z180 coating designation.

.5 Galvanized Steel Mounting Devices: In accordance with ASTM A153/A153M, hot dip galvanized after fabrication.

.6 Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.4 Fabrication

.1 Washroom and Custodial Accessories:

.1 Surface Mounted:

.1 Fabricate units with tight seams and joints, and exposed edges rolled.

.2 Hang doors and access panels with continuous stainless steel hinge.

.3 Provide concealed anchorage where possible.

.2 Recessed Mounted:

.1 Fabricate units of all welded construction, without mitred corners.

.2 Hang doors and access panels with full length, stainless steel hinge.

.3 Provide anchorage that is fully concealed when unit is closed.

.2 Workmanship shall be best grade of modern shop practice known to recognized manufacturers specializing in this work. Joints and intersecting members shall be accurately fitted, made in true planes with adequate fastening. Wherever possible fastenings shall be concealed.

.3 Isolate where necessary to prevent electrolysis between dissimilar metal to metal or metal to masonry or concrete contact.

.4 Fabricate and erect work square, plumb, straight, true and accurately fitted. Provide adequate reinforcing and anchorage.

.5 Drilling shall be reamed and exposed edges left clean and smooth.

.6 Include anchors and fastenings necessary to anchor work of this Section.

.7 Coordinate with Section 06 10 00 – Rough Carpentry, for wood blocking for attachment of washroom accessories.

.8 Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six (6) keys to Owner's representative.

3 Execution

3.1 Examination

.1 Inspect surfaces over which the work of this Section is dependent for any irregularities detrimental to the application and performance of the work. Notify Consultant in writing of all conditions which are at variance with those in the Contract Documents and/or detrimental to the proper and timely installation of the work of this Section. The decision regarding corrective measures shall be obtained from the Consultant prior to proceeding with the affected work.

.2 Commencement of work of this Section implies acceptance of surfaces and conditions.

3.2 Installation

.1 Make thorough examination of drawings and details, determine the intent, extent, materials, conditions of interfacing with other work and be fully cognizant of requirements.

.2 Work of this Section shall include complete installation of items specified herein. Installation shall be in strict accordance with manufacturer's printed instructions.

.3 Securely fasten accessories, level and plumb in the locations shown on the drawings and specified herein. All fastenings shall be concealed.

.4 Co-ordinate the work of this Section with the work of other Sections to provide the necessary recesses, edge conditions wood blocking for the accessories as required.

.5 Do all drilling of steel, masonry and concrete necessary for the anchorage of the work.

.6 Installed grab bars shall be capable of supporting a downward pull of 500 lbs. per lineal foot.

3.3 Adjusting

.1 Check mechanisms, hinges, locks and latches, adjust and lubricate to ensure that accessories are in perfect working order.

3.4 Cleaning

.1 Upon completion of the work of this Section or when directed by Consultant, remove all protective coatings, and coverings. Clean and polish exposed surfaces.

3.5 Washroom and custodial accessory schedule

.1 This schedule includes Basis of Design product and finish selections.

.2 Submit alternate to the following Basis of Design products in accordance with Section 01 25 00 - Substitution Procedures.

No.	Description / Model
CH1	Coat Hooks for Toilet Stalls: Satin finished stainless steel, square profiled robe hook with concealed mounting, provide 2 for each washroom, located as directed by Consultant: ASI 7340-S Bobrick B-76717
CH2	Coat Hooks for Change Rooms: Satin finished stainless steel, rectangular hook strip, 2mm thick, four stainless steel hooks snap down for safety, complete with tamper-resistant mounting screws. Unit 455mm wide x 140mm high x 20mm deep. Provide in change rooms, in locations indicated on the Drawings: Bobrick B-985
FNDU	Feminine Napkin Dispenser Unit: Surface mounted, equipped for two (2) coin operation, napkin and tampon dispenser, stainless steel construction, handicap accessible: ASI 0864 Bobrick B-2800x2 Frost 608-3
FND	Feminine Napkin Disposal: Surface mounted, concealed fastening, self closing disposal opening with leak proof plastic receptacle and 10 disposable liners for initial stocking purposes for each unit: ASI 0852 Bobrick B-270 Frost 622
GB1	Grab Bar: Horizontal 1.214mm (0.048") thickness; 915mm (36") long x 38mm (1-1/2") Ø, straight, stainless steel, slip resistant grip, concealed mounting, cap secured with vandal resistant set screws: ASI 3801-24P Bobrick B-6806.99x24

GB2	Grab Bar: Vertical 1.214mm (0.048") thickness; 765mm (30") long x 38mm (1-1/4") Ø, straight, stainless steel, slip resistant grip, concealed mounting, cap secured with vandal resistant set screws: ASI 3801-30P Bobrick B-6806.99x30
GB3	Grab Bar: Side "L"-shape grab bar, 760mm (30") long x 760mm (30") high 38mm (1-1/2") dia., stainless steel, slip resistant grip, concealed mounting, cap secured with vandal resistant set screws: ASI Type 04
GB4	Grab Bar: Swing up operation, 740mm (29") long x 32mm (1-1/4") Ø, stainless steel, concealed mounting, cap secured with vandal resistant set screws: Bobrick B-4998
GB5	Urinal Grab Bar: Vertical 1.214mm (0.048") thickness; 305mm (12") long x 38mm (1-1/4") Ø, straight, stainless steel, slip resistant grip, concealed mounting, cap secured with vandal resistant set screws: ASI 3801-12P Bobrick B-6806.99x12
RPTD	Paper Towel Dispenser and Disposal: Surface mounted, handicap accessible, capable of holding 600 C-fold or 800 multi-fold or 1100 single-fold paper towels, with leak proof waste container: ASI 64676-9 Bobrick B-380349 Frost 400C
MR1	Mirror (Tilt): Framed, 915mm (36") high x 460mm (18") wide, fixed tilt installation for barrier free access, mounted 1000mm (40") to bottom of frame: ASI 0535-1836 Bobrick B-293x1836
MR2	Mirror (Flat): Framed, 915mm (36") high x 460mm (18") wide, fixed installation, mounted 1000mm (40") to bottom of frame: ASI 0600-1836 Bobrick B-290x1836
MR3	Mirror (Flat) with Shelf: Framed, 915mm (36") high x 460mm (18") wide, fixed installation, mounted 1000mm (40") to bottom of frame: ASI 0600-1836 Bobrick B-166x1836
TPD	Toilet Tissue Dispenser: Double roll, surface mounted, tissue dispenser with concealed mounting, stainless steel construction, bright polished finish with theft resistant spindles: ASI 7305-2B-R009

	Bobrick B-686-60
TPD2	Combination Toilet Tissue Dispenser, Sanitary Napkin Disposal, and Seat-Cover Dispenser: Surface mounted, concealed fastening, self-closing disposal opening with leak proof plastic receptacle; Toilet-seat-cover disposal hold 500 paper covers, and double roll toilet tissue dispenser: Bobrick B-3579
TSC	Seat-Cover Dispenser: Surface-mounted toilet seat cover disperser, concealed fastening, type 304, 20 gauge stainless steel, one-piece seamless construction. Capacity: 250 single fold paper covers: Bobrick B-4221
SS-1	Shelf: Surface mounted shelf, 405mm (16”) long x 125mm (5”) wide, 18 gauge, type 304 stainless steel, satin finish. 19mm (3/4”) return front edge, hemmed: ASI 0692-516 Bobrick B-295 x 16
SD1	Counter-Mounted Soap Dispenser: All purpose valve, horizontal mounting stainless steel surface mounted dispenser, refillable from top with keyed lock cap, 1.18 L capacity with visible viewing window: ASI 0342 Bobrick B-2112 Frost 710A
SD2	Wall-Mounted Soap Dispenser: Heavy-duty all-purpose valve, wall-mounted stainless steel soap dispenser, 1.2L capacity with visible viewing window: Bobrick B-818615
JS	Janitor’s Shelf complete with Mop and Broom Holders and Hooks: 864mm (34") long x 330mm (13") high x 200mm (8") deep. Shelf constructed of minimum 18-8 stainless steel, type 304, 18 gauge. Utility hooks fabricated of 11 gauge stainless steel, and mop holders fabricated of cadmium plated steel. Pivoting, spring-loaded serrated rubber cam shall hold round handles of 22mm to 32mm (7/8" to 1-1/4") dia. ASI 1308-3 Bobrick B-239 x 34
HD	Hand Dryer: High-speed hand dryer, surface mounted, touch free infra-red activation. Motor: 208 V, 60 Hz.: ASI Roval Collection TRI-Umph High Speed Hand Dryer, Model 20200-2 Dyson Airblade Hand Dryer

SHC	Shower Curtain: Opaque, matte white vinyl, 0.2mm (.008") thick, containing antibacterial and flame retardant agents. Complete with grommets every 150mm (6"), and hemmed top, bottom and sides. ASI 1200-V Bobrick 204-2
SHCH	Shower Curtain Hook: Fabricated of type 304 stainless steel alloy 18-8, solid formed wire 2.5mm (0.98") in diameter. Hook shall accommodate 25mm to 32mm (1" to 1-1/4") diameter curtain rods. ASI 1200-SHU Bobrick 204-1
SHCR	Shower Curtain Rod: Extra-heavy duty rod, 32mm (1-1/4") diameter fabricated of alloy 18-8 stainless steel, type 304, 18 gauge. Flanges fabricated from 20 gauge stainless steel. Satin Finish. Length: As determined on the Drawings. ASI 1204 Bobrick B-6047
SHSD	Shower Soap Dish: Type 304 stainless steel, matte polished finish. Mounting clamp for stud walls. Unit 7 3⁄16" W, 5" H (185 x 125mm). Rough Wall Opening: 6" W, 4" H, 4" min. depth (150 x 100 x 100mm). ASI 7404 Bobrick B-4380
SHS	Shower Seat: Constructed of durable, water-resistant, ivory colored, 5⁄16" (8mm) thick solid phenolic. Frame and mounting bracket are Type 304 stainless steel and self-locking mechanism. Supports up to 500 lbs (227 kg) when properly installed. Seat 22" (560mm) wide, projects 15 13⁄16" (400mm) from wall. ASI 8203 Bobrick B-5192

3.6 Washroom accessory schedule – supplied by the owner

PTD	Paper Towel Dispenser: Supplied by Region's vendor and installed by vendor.
TTD	Toilet Tissue Dispenser: Supplied by Region's vendor and installed by vendor.
SD	Soap Dispenser: Supplied by Region's vendor and installed by vendor.

End of section

1 General

1.1 Section includes

.1 Portable Fire Extinguishers

.2 Fire Extinguisher Cabinets

.3 Fire Extinguisher Brackets

1.2 Related requirements

.1 Section 20 01 00 – Mechanical General Requirements

.2 Section 20 05 00 – Common Mechanical Work Results

1.3 References

.1 FM - Factory Mutual System - Approval Guide.

.2 NFPA 10 - Portable Fire Extinguishers.

.3 ULC - Fire Protection Equipment Directory.

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Submit shop drawings and product data for each of the following:

.1 Portable fire extinguishers.

.2 Cabinets.

.3 Wall hooks and Brackets.

1.5 Quality assurance

.1 Perform Work to NFPA 10.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.6 Regulatory requirements

.1 ULC listed and labelled.

.2 Rated and identified in conformance with CAN/ULC S508, "Rating and Fire Testing of Fire Extinguishers".

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 General

.1 Manufacturers: National Fire Equipment Ltd. and Strike First Corp. products specified, or approved alternate products by

.1 Wilson & Cousins;

.2 Badger Fire Protection;

.3 Kidde Fire Safety; or

.4 Approved alternate.

.2 All fire extinguishers shall be pressurized (stored pressure) rechargeable type, in accordance with NFPA 10, and ULC listed and labelled for the class of fires for which they are specified.

.3 Each extinguisher shall be complete with:

.1 A manufacturer's identification label indicating the extinguisher model number, rating, and operating instructions.

.2 An anodized aluminum or chrome plated forged brass valve with positive squeeze grip on-off operation and a pull-pin safety lock.

.3 Discharge hose with nozzle or horn and hose securing clip.

2.3 Multi-purpose dry chemical (ABC)

.1 5 lb (2.27 kg)

.1 Model No.: SF-ABC310 by Strike First Corp. or approved alternate.

.2 ULC Rating: minimum 3A:10BC.

.2 10 lb (4.54 kg)

.1 Model No.: SF-ABC680 by Strike First Corp. or approved alternate.

.2 ULC Rating: minimum 6A:80BC.

2.4 Carbon dioxide (BC)

.1 5.0 lb (2.3 kg)

.1 Model No.: SF-5CO2A by Strike First Corp. or approved alternate.

.2 ULC Rating: minimum 5BC.

.2 10.0lb (4.5kg)

.1 Model No.: SF-10CO2 by Strike First Corp. or approved alternate.

.2 ULC Rating: minimum 10BC.

2.5 Cabinets

.1 Fully Recessed

.1 5.0 lb (2.3 kg) dry chemical extinguisher.

.1 Recessed fire extinguisher cabinet, 8 in. x 17 in. x 5 in. (200 mm x 425 mm x 125 mm), constructed of 22 ga. (0.76 mm) steel tub with a 16 ga. (1.57 mm) steel door and trim with a ¼ in. (6 mm) return frame, a full length semi concealed piano hinge and flush stainless steel door latch. Entire cabinet finished in backed enamel paint and glazed with 3/16 in. (5 mm) clear glass.

.2 Model No.: 102F by National Fire Equipment Ltd. or approved alternate.

.2 10.0 lb (4.5 kg) dry chemical extinguisher.

.1 Recessed fire extinguisher cabinet, 10 in. x 30 in. x 8 in. (250 mm x 750 mm x 200 mm), constructed of 18 ga. (1.19 mm) steel tub and 14 ga. (2.0 mm) steel door and trim with

½ in. (13 mm) return frame, a full length semi-concealed piano hinge and flush stainless steel door latch. Front section to have a full 2 in. (51 mm) adjustment to wall. Entire cabinet finished in baked enamel paint and glazed with 3/16 in. (5mm) clear glass.

.2 Model No.: CE-950-3 by National Fire Equipment Ltd. or approved alternate.

.3 Size: to accommodate specified extinguisher.

.2 Semi-Recessed

.1 5.0 lb (2.3 kg) dry chemical extinguisher.

.1 Semi-recessed fire extinguisher cabinet 8 in. x 17 in. x 5 in. (200 mm x 425 mm 125 mm), constructed of 22 ga. (.76 mm) steel tub and 16 ga. (1.57 mm) steel door and trim with 1 in. (25 mm) return frame, a full length semi-concealed piano hinge and flush stainless steel door latch. Entire cabinet finished in baked enamel paint and glazed with 3/16 in. (5 mm) clear glass.

.2 Model No.: 102RS by National Fire Equipment Ltd. or approved alternate.

.2 10.0 lb (4.5 kg) dry chemical extinguisher.

.1 Semi-recessed fire extinguisher cabinet 9 in. x 24 in. x 6 in. (225 mm x 600 mm x 150 mm), constructed of 22 ga. (.76 mm) steel tub and 16 ga. (1.57 mm) steel door & trim with 2 in. (51 mm) return frame, a full length semi-concealed piano hinge and flush stainless steel door latch. Entire cabinet finished in baked enamel paint and glazed with 3/16 in. (5 mm) clear glass.

.2 Model No.: CE-950-3-2 by National Fire Equipment Ltd. or approved alternate.

.3 Size: to accommodate specified extinguisher.

2.6 Wall hooks and brackets

.1 Wall Hooks

.1 5.0 lb (2.3 kg) BC extinguisher: Model No. SF5WH by National Fire Equipment Ltd. or approved alternate.

.2 10.0 lb (4.5 kg) BC extinguisher: Model No. SF1015WH by National Fire Equipment Ltd. or approved alternate.

.2 Brackets

.1 Standard Duty: 5.0 lb (2.3 kg) ABC extinguisher, Model No. UB5 by National Fire Equipment Ltd. or approved alternate.

.2 Medium Duty: 10.0 lb (4.5 kg) ABC extinguisher, Model No. UP10-MD by National Fire Equipment Ltd. or approved alternate.

2.7 Identification

.1 Identify extinguishers in accordance with the recommendations of NFPA No. 10 and CAN/ULC-S508.

.2 Attach a tag or label to the extinguisher indicating the month and year of installation. Provide space for service dates.

3 Execution

3.1 Installation

.1 Install to manufacturer's instructions.

.2 Conform to NFPA 10

.3 Do not install extinguishers until after wall finishing work is complete. Contractor shall be responsible for all extinguishers until receipt of a Certificate of Substantial Performance of the Work.

.4 Locate and secure cabinets plumb and level. Establish top of cabinet (inside horizontal surface) 65 in. (1,675 mm) above finished floor.

.5 Fire extinguishers having a gross weight not exceeding 18.14 kg (40.0 lb) shall be installed so that the top of the fire extinguisher is not more than 1.53 m (5.0 ft.) above the floor.

.6 In no case shall the clearance between the bottom of the fire extinguisher and the floor be less than 102 mm. (4 in.).

.7 Unless otherwise shown or specified, locate cabinets so that the centerline is approximately 1,200 mm (48 in.) above the finished floor.

.8 Locate fire extinguisher in cabinet as indicated.

.9 Install with wall mounting bracket where not installed in cabinets.

3.2 Applications

.1 Provide fire extinguishers where indicated and in conformance with the Ontario Fire Code and NFPA 10.

.2 Provide 10 lb. (4.54 kg) multi-purpose extinguishers in areas other than kitchen/kitchenette, as shown on drawings.

.3 Provide 10 lb. (4.54 kg) carbon dioxide extinguishers in electrical rooms and server rooms.

.4 Provide 5 lb. (2.27 kg) multi-purpose extinguishers in each kitchen/kitchenette.

End of section

1 General

1.1 Section includes

.1 This Section includes requirements for supply and installation of commercial metal lockers and accessories required for a complete and functioning installation.

1.2 Related work

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 06 40 23 – Interior Architectural Woodwork

.3 Section 09 21 16 – Gypsum Wallboard

.4 Section 09 90 00 – Painting

1.3 References

.1 American Society for Testing and Materials (ASTM) A1008 - Standard Specification for Steel Sheet, Carbon, Cold-Rolled, Commercial Quality.

.2 ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 ADAAG - American with Disabilities Act, Accessibility Guidelines.

.4 ANSI A117.1 - Accessible and Usable Buildings and Facilities

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Action Submittals: Provide the following submittals before starting work of this section:

.1 Product Data: Submit product data from manufacturer indicating proposed components and installation requirements.

.2 Shop Drawings: Show and describe in detail materials, finishes, dimensions, details of connections and fastenings elevations, plans, sections, metal thicknesses, hardware and any other pertinent information.

.3 Samples:

.1 Submit duplicate 12 in. x 12 in. samples of panel showing finish on both sides, two finished edges and core construction.

.2 Submit duplicate representative samples of each hardware item, including brackets, fastenings and trim.

.4 Submit necessary templates and instructions where supports or anchors have to be built-in by others.

.4 Provide maintenance data for maintenance of metal finishes work for incorporation into Maintenance Manual.

1.5 Administration requirements

.1 Coordination: Coordinate site dimensions affecting work of other Sections and provide data, dimensions and components, anchors and assemblies installed by other Sections in sufficient time for installation of products specified in this Section.

1.6 Delivery, storage and handling

.1 Delivery and Acceptance Requirements: Deliver, handle and store prefabricated units in accordance with manufacturer's directions.

.2 Store units at site on raised wood pallets protected from the elements and corrosive materials, and Do not remove from crates or other protective covering until ready for installation.

2 Products

2.1 Approved products and manufacturers

.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the

named products and provided they submit requests for substitution in accordance with Section 01 25 00 – Substitution Procedures.

.2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 ASI Storage Solutions Inc.;

.2 GSS (General Storage Systems);

.3 Hadrian Manufacturing Inc.; or

.4 Approved alternate.

.3 Commercial Lockers:

.1 Size: 380 mm wide x 535 mm deep x 1,525 mm high.

.2 Construction:

.1 Doors: Double wall envelope construction, minimum 16 gauge thick outer door pane, and 24 gauge inner wall panel, with sound deadening core adhered between outer and inner door sheet steel, welded construction, complete with recessed handle box.

.2 Frame: Minimum 16 gauge steel channel, welded construction complete with 11 gauge padlock hasp.

.3 Body: Minimum gauge requirements:

.1 Bottoms: 16 gauge

.2 Sides, Backs, and Shelves: 24 gauge.

.3 Bolt Spacing: 9 in. o.c. maximum spacing.

.4 Handle: Recessed lock pocket, one piece construction, 20 gauge.

.5 Tops: Sloped, continuous overtop of a bank of lockers, 18 gauge.

.6 Hinge: Continuous, full length 16 gauge piano hinge riveted to both door and frame.

.3 Configuration: Single tier.

.4 Basis of Design Product:

.1 Décor Tri-Lok Eclipse II Metal Locker by General Storage Systems Ltd; or

.2 Approved alternate.

.4 Benches:

.1 Stationary Bench: Steel tube pedestal, 1½ in. diameter steel tubing with 10 gauge steel flanges welded to each end.

.2 Length: As indicated on Drawings.

.3 Pedestal Spacing: Minimum 4 ft. o.c.

.4 Wood Tops: 1¼ in. thick laminated maple hardwood strip bench top with bullnosed edges and two (2) coats clear polyurethane finish.

.5 Manufacturer: To match manufacturer of Metal Lockers specified above.

2.2 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.3 Materials

.1 Sheet Steel: Cold rolled carbon steel, commercial quality stretcher levelled or temper rolled to stretcher levelled standard of flatness free from surface imperfections and conforming to ASTM A366/A336M-91.

.2 Locker Paint: Electrostatically applied, thermo-setting, high performance primer and powder coating.

.3 Welding Materials: Conforming to CSA W59.

.4 Fasteners: Non-corrosive type.

.5 Hardwood: AWMAC premium grade, "Maple species”.

.6 Hardwood Laminating Adhesive: Water resistant urea-formaldehyde resin type conforming to CSA 0112 Series-M, Type 1.

.7 Steel Tube: Conforming to ASTM A53-906.

.8 Steel Plate: Conforming to CAN/CSA-G40.20/G40.21, Grade 44W.

.9 Chromeplating: Chrome plating on steel by "electroplating" method, with plating sequence as follows; 0.00035 in. thickness of Copper, followed by

0.00039 in. thickness of Nickel, followed by 0.00064 in. thickness of Chromium.

.10 Polyurethane Coating: Oil modified, clear gloss or stain interior type conforming to CAN/CGSB-1.175-M.

2.4 Finishes

.1 Lockers:

.1 Specially treat metal locker surfaces by phosphate conversion process conforming to CGSB 31-GP-105a, ready to receive locker paint finish.

.2 Electrostatically apply locker paint to all metal locker surfaces. Colours as selected by Consultant from manufacturer's standard product range.

.2 Bench Tops:

.1 Two (2) coats of clear polyurethane coating. Lightly sand surfaces and wipe with tack rag before applying second coat.

.3 Bench Frames:

.1 Chromeplated after fabrication.

2.5 Fabrication

.1 General: Make work square, plumb, straight and true. Make joints and intersections tightly fitted and securely fastened.

.2 Finish: All parts to be thoroughly degreased, cleaned and given a bonding, rust-retarding phosphate coat and two (2) finish coats of powder coating. Material then to be baked to produce a hard durable finish.

.3 Body: End sides to have double bend at front edge to add stiffness. Front edge of shelf to be bent to prevent small items from rolling off.

.4 Sloping Tops: Constructed in long lengths, not less than 12 ft. 0 in. Provide all angle and channel framing required. All fastenings to be concealed. Panels shall be accurately formed free of waves and buckles and set true to line horizontally and vertically.

.5 Filler Panels: Minimum 20 gauge sheet steel, powder coated to match locker colour. Extend filler panels from finished floor to top of sloping top.

Top of panel to be same slope as sloping top. Secure panels from inside of lockers.

.6 Door Frames: Vertical members to have three right angle bends to reduce the danger of exposed edges and add strength. Horizontal members to be bent to channel shape of ¾ in. x 2½ in. x ¾ in. Weld parts together to form a strong, rigid unit. Provide two rubber bumpers on lock side of frame approximately 1½ in. from top and bottom of door.

.7 Doors: Fully enclosed at rear with a flush minimum 27 gauge thick reinforcing sheet to form a closed box and make a rigid, whip-free unit. Face of door to be free from protruding handles, locks, louvers, etc.

.8 Bases (where concrete bases are not indicated): Coordinate with Section 06 40 23 – Interior Architectural Woodwork for Millwork Base for locker cabinets.

.9 Commercial Locker Ventilation: Cut slots at top and bottom of each locker to allow air to flow freely in and out of entire locker from bottom to top.

.10 Locking and Latching: Make provision for locking with a standard combination padlock arrangement with no moving parts. Entire lock pocket recess shall be nickel plated with durable black nylon-coated pull and nylon type No. 6 friction catch permanently fixed in door with hidden fastener and aligned to accept plunger and hold door in closed position. Padlock: Supplied by Owner.

.11 Number Plates: Black with bright contrasting block numerals on polished aluminum plate, riveted to door face, recessed into door. Numerals shall not less than ¾ in. high and non-erasable. Lockers shall be numbered as indicated later by the Consultant.

.12 Interior Equipment: One hat shelf, two wall hooks, three (3) wall mounted die cast zinc plated finish ceiling hook attached to centre of locker shelf.

.13 Hardware: Vandal resistant cadmium plated nuts, bolts, lock washers, nut covers, angle clips and fastenings.

3 Execution

3.1 Examination

.1 Do not begin installation until substrates and bases have been properly prepared.

.2 Notify Consultant if substrate and bases are of unsatisfactory preparation before proceeding.

3.2 Installation

.1 Install metal lockers and accessories at locations shown in accordance with manufacturer's instructions.

.2 Install lockers level and plumb with flush surfaces and rigid attachment to anchoring surfaces.

.3 Anchor lockers to floor and wall at 48 in. or less, as recommended by the manufacturer.

.4 Bolt adjoining locker units together to provide rigid installation.

.5 Install sloping tops and metal fillers using concealed fasteners. Provide flush hairline joints against adjacent surfaces.

.6 Install front bases between legs without overlap or exposed fasteners. Provide end bases on exposed ends.

.7 Install benches by fastening bench tops to pedestals and securely anchoring to the floor using appropriate anchors for the floor material. Install free standing benches to locations indicated on drawings.

3.3 Adjusting and cleaning

.1 Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.

.2 Touch-up with factory-supplied paint and repair or replace damaged products before Substantial Completion.

3.4 Protection

.1 Protect installed products until completion of project.

End of section

1 General

1.1 Section includes

.1 Adjustable steel shelving units with particleboard shelves.

1.2 References

.1 American Society for Testing and Materials (ASTM):

.2 ASTM A500-10a, Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

1.3 Submittals

.1 Provide the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit shop drawings showing dimensions, layout and assembly methods for shelving, accessory components provided and those available, room plan showing arrangement.

1.4 Delivery, storage and handling

.1 Prevent damage to components during storage, handling and installation.

.2 Time delivery of metal shelving so that it can be installed shortly afterwards, and after finishes have been completed in affected rooms.

1.5 Submittals

.1 Provide the following submittals in accordance with Section 01 33 00 – Submittals Procedures.

.2 Submit shop drawings showing dimensions, layout and assembly methods for shelving, accessory components provided and those available, room plan showing arrangement.

.3 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

1.6 Delivery, storage and handling

.1 Prevent damage to components during storage, handling and installation.

.2 Time delivery of metal shelving so that it can be installed shortly afterwards, and after finishes have been completed in affected rooms.

2 Products

2.1 Materials – general

.1 Sustainable Design: Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Acceptable Products: North American Steel EasyUp 5000 Steel Shelving or approved alternate.

.2 Posts: 25 mm x 3 mm x 1.9 mm thick cold rolled tubular posts with slots at 50 mm /c on two (2) sides to receive adjustable height shelves.

.3 Frame Connectors: Z shaped, manufactured from 1.9 mm thick cold rolled steel with three (3) hooks and locking tab.

.4 Front and back beams: 25 mm high semi-V shaped with two (2) hooks at each end.

.5 Base Plates: 1.9 mm thick steel.

.6 Shelves: 16 mm thick, industrial particleboard meeting ANSI 208.1 Grade M-3, minimum 750 kg/m°; clearly mark panels with grade mark in visible location; extruded particleboard having loose cores with voids will not be permitted; having no added urea formaldehyde.

.7 Endframes: consisting of two (2) posts and two (2) frame connectors, minimum load capacity of 6,000 lbs. per endframe.

.8 Hardware: Post clamps for erection of abutting shelving units, manufacturer's standard.

.9 Accessories: Provide accessories for a complete assembly including but not limited to foot plates, post caps and top and bottom beam safety clips provided on each section.

2.3 Fabrication

.1 Depths: 455 mm deep.

.2 Width: 1,220 mm.

.3 Height: 2,454 mm.

.4 Shelves: five (5) shelves high

2.4 Finishing

.1 Manufacturer's standard powder coat finish; colour light grey.

3 Execution

3.1 Installation

.1 Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, level and rigid.

.2 Employ experienced workers familiar with the material being installed.

.3 Provide all closures, braces, brackets, clips and other accessories necessary for a complete installation.

.4 Set all shelf units plumb. Anchor single face units to the wall, anchor adjacent and back to back units to each other. Where units are ganged back to back to make double face units and provide post clamps.

End of section

1 General

1.1 Section includes

.1 Materials, fabrication and installation for steel, aluminum and fibreglass flagpoles.

1.2 Related sections

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 32 11 16.01 – Granular Sub-base

1.3 References

.1 The Aluminum Association (AA).

.1 Current AA DAF-45, Designation System for Aluminum Finishes - 9th Edition.

.2 American Society for Testing and Materials International, (ASTM).

.1 Current ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 Current ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.3 Current ASTM B241/B241M, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

.3 Canadian Standards Association (CSA International).

.1 Current CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 The Master Painters Institute (MPI).

.1 Current Architectural Painting Specification Manual.

1.4 Design requirements

.1 Flagpole, bases and anchorage devices to resist minimum wind velocity of 152 km/h (95 mph) unflagged, 120 km/h (75 mph) flagged.

.2 Description:

.1 Model: Base mount flagpole.

.2 Exposed Height: 10.7 m (35 ft.).

.3 Butt Diameter: 127 mm (5 in.).

.4 Top Diameter: 76.2 mm (3 in.).

.5 Wall Thickness: 4.8 mm (0.188 in.).

.6 Options and Accessories: Aluminum, satin brushed finish, tapered pole with internal halyard.

.7 Flag Size: 1.14 m x 2.29 m (3 ft. 9 in. x 7 ft. 6 in.).

1.5 Submittals

.1 Submit product data according to Section 01 33 00 – Submittal Procedures.

.2 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled ‘LEED v4 Material Reporting Form- Low Emitting’

.2 APPENDIX-C to Section 01 81 13 titled ‘LEED v4 Material Reporting Form’

.3 Submit manufacturer's technical data and installation instructions for each type of flagpole.

.4 Submit shop drawings according to Section 01 33 00 – Submittal Procedures.

.1 Indicate dimensions, finishes, base jointing, anchoring and support systems, cleats, halyard boxes, trucks, finials and base collar for flagpoles.

.2 Submit three (3) copies of shop drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.

.5 Submit samples according to Section 01 33 00 – Submittal Procedures.

.6 Submit sample of flagpole 600 mm long indicating specified finish.

1.6 Quality assurance

.1 Provide each flagpole as complete unit produced by single manufacturer, including fittings, accessories, bases and anchorage devices.

1.7 Delivery and storage

.1 Deliver, store, handle and protect materials according to Section 01 65 00 – Product Delivery Requirements.

.2 Spiral wrap each flagpole with heavy kraft paper, wood strip and steel band, or polyethylene wrap and pack in tubing for shipment.

.3 Ship flagpole to installation site in one piece.

.4 Deliver flagpole in one (1) piece.

1.8 Waste management and disposal

.1 Separate waste materials for reuse and recycling according to Section 01 74 19 - Construction and Demolition Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material in appropriate on-site bins for recycling according to Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, and Plastic waste according to Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Materials

.1 Concrete base:

.1 Cast-in-place concrete, 25 MPa, air-entrained, according to CAN/CSA-A23.1, formed and reinforced as detailed on the drawings.

.2 Base:

.1 B5 fixed shoe base, 200 mm (7.88 in.) bolt circle diameter c/w 19.05 mm (¾ in.) diameter steel anchor bolts supplied by Ewing Flagpole Co. Inc. or approved alternate.

.3 Aluminum:

.1 Aluminum Association alloy AA 6063-T5 seamless extruded aluminum tubing.

.2 Fabricated from seamless extruded tubing according to ASTM B241, alloy 6063 T6, having minimum tensile strength not less than 207 MPa (30,000 psi) and a yield point of 172 MPa (25,000 psi). Heat treated and age hardened after fabrication to comply with ASTM B597, temper T6.

.3 Flagpole: STA35N 10.7 m (35 ft.) Econoline Internal Commercial Aluminum Flagpole, 127 mm (5 in.) butt diameter supplied by Ewing Flagpole Co. Inc.; or approved alternate. Contact: (905) 666-5600.

.4 Isolation coating: alkali-resistant bituminous paint or epoxy resin solution.

2.3 Fabrication

.1 Supply 10.7 m (35 ft.) long flagpole as complete unit including base, mounting brackets, anchorage and fittings.

.2 Cone tapered flagpole:

.1 Seamless, uniform, straight line tapered section above cylindrical butt section.

.2 Taper: 4.3 m (14 ft.) of run.

.3 Do welding to appropriate CSA Standard, by welders certified by Canadian Welding Bureau. Finish exposed welds flush and smooth.

2.4 Accessories

.1 Finial: 152.4 mm (6 in.) diameter ball of 1.6 mm minimum thick, aluminum, anodized colour to match flagpole finish.

.2 Internal revolving truck assembly: cast aluminum, with stainless steel ball-bearing, non-fouling, revolving double truck assembly, finish to match flagpole.

.1 Single aluminum pulley mounted inside hood, stainless steel roller bearings, brass exit bushing for wire cable and threaded aluminum spindle for attachment to top of pole.

.3 Halyard: internal, continuous halyard; plastic chain and stainless steel cable. Retaining loop and weights for internal halyard, stainless steel.

.4 Swivel snaps: two (2) per halyard; aluminum with neoprene or vinyl covers.

.5 Flashing collar: standard, spun aluminum collar to match flagpole.

2.5 Finishes

.1 Aluminum.

.1 Comply with National Association of Architectural Manufacturers (NAAMM) ‘Metal Finishes Manual for Architectural and Metal Products’ for recommendations for designating and applying finishes.

.1 Directional-sanded satin finish (AA-M33), buff, complying with

.1 AA-M20.

.2 Appearance and properties of anodized finishes designated by the Aluminum Association as Architectural Class 1, Architectural Class 2, and Protective and Decorative.

3 Execution

3.1 Installation

.1 Excavate to neat and clean lines for foundations in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

.2 Provide minimum 300 mm thick crushed Granular A base compacted to 98 % SPMDD.

.3 Ensure forms are securely placed, plumb and true to line and to the correct depth. Place reinforcing steel as indicated on the drawings.

.4 Place concrete immediately after mixing according to CAN/CSA-A23.1. Compact concrete in place using vibrators. Moist-cure exposed concrete for not less than seven (7) days or use a non-staining curing compound. Cast template base, lightning spike and anchors into concrete according to manufacturer's recommendations and as required to ensure that the poles are plumb.

.5 Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks and uniform in texture and appearance. Provide positive slope for water runoff to base perimeter.

.6 Backfill around base using excavated material and compact to 98 % Standard Proctor Maximum Dry Density.

.7 Shop apply isolation coating to metal surfaces of flagpole and base that will be encased in concrete below grade level.

.8 Install flagpoles, base assemblies and fittings to shop drawings and manufacturer's instructions.

.9 Check and adjust installed fittings for smooth operation of halyards.

End of section

1 General

1.1 Section includes

.1 Provide manually operated, sunscreen and blackout roller shades as follows:

.1 Roller window shade, manual operated (RWS)

.2 Roller window blackout blinds, manual operated (RWBB)

.2 Extruded aluminum shade fascia:

.1 Prefinished extruded aluminum fascia within exposed locations as indicated on drawings.

.2 Recessed pocket locations indicated on drawings complete with anodized aluminum closer panels.

.3 Aluminum side (and bottom) channels for blackout blinds.

.3 Accessories and brackets.

1.2 Related requirements

.1 Section 08 44 13 – Glazed Aluminum Curtain Wall

.2 Section 09 21 16 – Gypsum Wallboard

.3 Section 09 51 13 – Acoustic Ceilings

.4 Section 09 90 00 – Painting

1.3 Reference standards

.1 US Green Building Council (USGBC);

.1 Reference guide for Building Design and Construction

.2 LEED v4 Project Scorecard

1.4 Submittals

.1 Submit according to Section 01 33 00 – Submittal Procedures.

.2 Product Data: Manufacturer’s data sheets on each product to be used, including:

.1 Preparation instructions and recommendations.

.2 Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.

.3 Storage and handling requirements and recommendations.

.4 Mounting details and installation methods.

.5 Typical wiring diagrams including integration of EDU controllers with building management system, audiovisual and lighting control systems as applicable.

.3 Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, power and control wiring diagrams, and relationship to adjacent work.

.1 Prepare control, wiring diagrams based on, switching and operational requirements provided by the Consultant in electronic format.

.2 Include one-line diagrams, wire counts, coverage patterns, and physical dimensions of each item.

.4 Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

.5 Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade cloth samples and aluminum finish sample as selected. Mark face of material to indicate interior faces.

.6 Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

.7 Warranty: Provide manufacturer’s warranty documents as specified in this Section.

1.5 Sustainable design submittals

.1 Comply with requirements specified in Section 01 81 13 – Sustainable Design Criteria.

.1 Number of Copies: Submit one (1) electronic copy of LEED submittals, unless otherwise indicated.

.2 Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 LEED v4 Materials Reporting Form - BPDO

.2 LEED v4 Materials Reporting Form – Low Emitting

1.6 Quality assurance

.1 Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten (10) years experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section. This includes but is not limited to all required extrusions, accessories, controls and fabricated roller shades or else all stated and published warranties may be void.

.2 Installer Qualifications: Engage an installer, which shall assume responsibility for installation of all system components, with the following qualifications.

.1 Installer for roller shade system shall be trained and certified by the manufacturer with a minimum of ten (10) years' experience in installing products comparable to those specified in this section.

.3 Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing. Where applicable, system components shall be FCC compliant.

.4 Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645.

.5 Requirements for Electronic Hardware, Controls, and Switches:

.1 Roller shade hardware, shade fabric, EDU, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.

.6 Mock-Up: Provide a mock-up, if Consultant requires, of one roller shade assembly for evaluation of mounting, appearance and accessories.

.1 Locate mock-up in window designated by Consultant.

.2 Do not proceed with remaining work until, mock-up is accepted by Consultant.

.3 Once accepted, mock-up shall form the basis of the work of this Section, and shall become part of the work.

1.7 Delivery, storage, and handling

.1 Deliver components in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.8 Project conditions

.1 Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

.2 Power and control wiring shall be complete and certified, fully operational with uninterrupted communication on the lines and minimal noise certified by a commissioning agent (engaged by others).

1.9 Warranty

.1 Warranty: Provide the following warranty, commencing from date of Substantial Performance:

.1 Roller Shade Hardware, controls, metal finish, and Shadecloth: Manufacturer’s standard non-depreciating Ten (10) year warranty.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements.

2.2 Manufacturers

.1 Subject to conformance to the requirements of this Section provide basis of design system as listed below for each roller window shade type:

.1 Roller window shade, manual operated (RWS)

.1 'FlexShade XD' by Draper;

.2 'Mecho®/5 & SlimLine' by MechoSystems; or

.3 Approved alternate.

.2 Dual roller window shades and blackout shades, manual operated (RWBB)

.1 'Dual Roller FlexShade XD' by Draper;

.2 'Mecho®/5 DoubleShades® Bracket # 15' by MechoSystems; or

.3 Approved alternate.

.2 Or approved alternate product by one of the following manufacturers:

.1 Solarfective Products Ltd;

.2 ALTEX Roller Shades;

.3 Elite Solar Shading Systems;

.4 Hunter Douglas Contract;

.5 Sun Glow; or

.6 Other approved alternate.

2.3 Shade bands

.1 Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

.1 Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:

.1 Hembar shall be heat sealed on all sides.

.2 Open ends shall not be accepted.

.2 Shade Band and Shade Roller Attachment:

.1 Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.

.2 Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable /

replaceable with a “snap-on” snap-off” spline mounting, without having to remove shade roller from shade brackets.

.3 Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.

.4 Any method of attaching shade band to roller tube that requires the use of adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

2.4 Roller shade fabrication

.1 Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 3 mm (⅛ in.) in either direction per 2,440 mm (8 ft.) of shade height due to warp distortion or weave design.

.2 Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer’s standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

.3 Blackout shade bands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 115 mm (3 ft.) on center extending fully into the side channels. Battens shall be concealed in an integrally coloured fabric to match the inside and outside colours of the shade band, in accordance with manufacturer’s published standards for spacing and requirements.

.1 Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.

2.5 Roller shade components

.1 Access and Material Requirements:

.1 Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.

.2 Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

.2 Manual Operated Chain Drive Hardware and Brackets:

.1 Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

.2 Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.

.3 Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.

.4 Provide shade hardware system that allows for operation of multiple shade bands (multi- banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.

.5 Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 ° on each side of the plane perpendicular to the radial line of the curve, for a 12 ° total offset.

.6 Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.

.7 Provide shade hardware constructed of minimum 3 mm (⅛ in.) thick plated steel or heavier as required to support 150 % of the full weight of each shade.

.8 Drive Bracket / Brake Assembly:

.1 Drive bracket shall be fully integrated with all accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades; or approved alternate.

.2 Basis of Design Product: MechoShade Drive Bracket model M5 or approved alternate.

.3 Drive sprocket and brake assembly shall rotate and be supported on a welded 9.5 mm (⅜ in.) steel pin.

.4 The brake shall be an over running clutch design which disengages to 90 % during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. in the stopped position.

.5 The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

.6 The entire drive bracket assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

.9 Drive Chain: #10 qualified stainless steel chain rated to 90 lb. minimum breaking strength. Nickel plate chain shall not be accepted.

2.6 Shadecloth

.1 Visually Transparent Single-Fabric Shadecloth: MechoSystems, EuroTwill® “6000” Series or approved alternate: 0.010 diameter (0.254 mm), Opaque, 2-3% open, non-raveling vinyl/polyester yarn, fabric thickness 0.025 inches (0.635 mm)..

.1 Colour: Selected from Manufacturers standard colours.

.2 Room Darkening (PVC Free) Shadecloth with Opaque Acrylic Backing: MechoSystems, “Equinox 0100 series”, .008 in. thick (.19 mm) blackout material and weighing .94 lbs. per square yard, comprising of 53 % fiberglass, 45 % acrylic, 2 % poly finish; or approved alternate.

.1 Colour: Selected from manufacturer’s standard colours.

2.7 Roller shade accessories

.1 Shade Pocket: For recessed mounting in acoustical tile or drywall ceilings as indicated on the drawings.

.1 Either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

.2 Fascia:

.1 Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.

.2 Fascia shall be able to be installed across two (2) or more shade bands in one (1) piece.

.3 Fascia shall fully conceal brackets, shade roller and fabric on the tube.

.4 Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.

.3 Room Darkening Side and Sill Channels:

.1 Extruded aluminum with polybond edge seals and SnapLoc-mounting brackets and with concealed fastening, or approved alternate. Exposed fasting is not acceptable. Channels shall accept one (1) piece exposed blackout hembar with vinyl seal to assure side light control and sill light control.

.1 Colour: As selected by the Consultant from manufacturer’s standard product line.

3 Execution

3.1 Examination

.1 Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Consultant of unsatisfactory preparation before proceeding.

3.2 Preparation

.1 Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 Installation of roller shades

.1 Contractor Furnish and Install Responsibilities:

.1 Window Covering (WC) Contractor shall provide an on site, Project Manager, and shall be present for all related jobsite scheduling meetings.

.2 WC shall supervise the roller shade installation, and setting of intermediate stops of all shades to assure the alignment of the shade bands within a single EDU group, which shall not exceed +/- 3 mm (0.125 in.), and to assure the alignment between EDU groups, which shall not exceed +/- 6 mm (¼ in.).

.3 WC shall be responsible for field inspection on an area-by- area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.

.4 Verification of Conditions: examine the areas to receive the work and the conditions under which the work would be performed and notify General Contractor and Consultant of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation shall constitute acceptance of substrate conditions by the installer.

.5 WC shall provide accurate to 1.5 mm (0.0625 in.); field measurements for custom shade fabrication on the Roller Shades manufacturers input forms.

.6 WC Installer shall install roller shades level, plumb, square, and true according to manufacturer's written instructions, and as specified here in. Blocking for roller shades shall be installed plumb, level, and fitted to window mullion as per Consultant's design documents and in accordance with industry standard tolerances. The horizontal surface of the shade pocket shall not be out-of-level more than 1.5 mm (0.625 in.) over 6 m (20 ft.).

.7 Shades shall be located so the shade band is not closer than 50 mm (2 in.) to the interior face of the glass. Allow proper clearances for window operation hardware.

.8 Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

.9 The WC shall participate and cooperate with the electrical contractor, the window shade manufacturer and the Commissioning agent to verify and certify the installation is in full conformance with the specifications and is fully operational. This work to occur during the commissioning stage and is in addition to preliminary acceptance required for each floor.

.10 Clean roller shade surfaces after installation, according to manufacturer's written instructions.

.11 WC shall train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

.12 Protect installed products until completion of project.

.13 Touch-up, repair or replace damaged products before Substantial Completion.

3.4 Protection

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

3.5 Roller shade schedule

.1 Roller window shade, manual operated (RWS):

.1 Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.

.1 Shade pockets.

.2 Fascias.

.2 Roller window blackout blinds, manual operated (RWBB):

.1 Independently operating interior, chain drive "double" solar and room darkening blackout roller shades, in all exterior windows of rooms and spaces shown on Drawings, and related mounting systems and accessories.

.1 Shade pockets.

.2 Fascias.

.3 Room darkening side and sill channels (blackout shades only)

.3 Roller Shade Schedule: Refer to the Drawings for locations.

End of section

1 General

1.1 Section includes

.1 This Section includes steel bodied casework following finish as scheduled or indicated on Drawings:

.1 Stainless steel bodied casework systems, with stainless steel cabinet bodies and drawer bodies.

1.2 Definitions

.1 Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors, and interior faces of doors and drawer fronts, bottom of upper cabinets when 1,220 mm of more above finished floor, sides of all modular components regardless of their position in the assembled casework, and any surface visible from above.

.2 Semi-exposed Surfaces of Casework: Surfaces behind opaque doors or drawer fronts, including interiors and sides of drawers and bottoms of wall mounted casework, horizontal surface of toe set back.

.3 Concealed Surfaces of Casework: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, and ends of cabinets installed directly against and completely concealed by walls or other cabinets; tops of wall cabinets and utility cabinets.

1.3 Reference standards

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A167-99(2009), Standard Specification for Stainless and Heat- Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

.2 ASTM A240/A240M-13b, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

.3 ASTM E84-05e1, Standard Test Method for Surface Burning Characteristics of Building Materials

.2 American National Standards Institute (ANSI):

.1 ANSI/BHMA A156.9-1994, Cabinet Hardware

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB 19.13-M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing

.4 Scientific Equipment and Furniture Association (SEFA):

.1 SEFA 8-1999, Laboratory Furniture, Casework, Shelving and Table Recommended Procedures

1.4 Submittals

.1 Provide required information in accordance with Section 01 33 00 — Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Provide product data for casework, work surface materials and cabinet hardware.

.2 Shop Drawings: Provide shop drawings indicating materials, finishes, hardware, fixtures and fittings, methods of joining work surfaces and the following:

.1 Indicate shop fabrication requirements and site installation details.

.2 Include details of fabrication, assembly, installation and fixing of items, including explanatory notes.

.3 Show sizes and spacing of fasteners.

.4 Use site measurements to verify as built dimensions affecting the shop drawings, and revise the drawings to suit the as built dimensions if necessary.

.5 Show the actual dimensions of each filler panel on submitted drawings.

.3 Samples: Provide the following materials in sets showing the full range of colour, texture, and pattern for verification of selected finishes:

.1 Stainless steel material for work surfaces, 150 mm x 150 mm.

.2 One unit of each type of exposed hardware service fixtures and fittings.

.4 Informational Submittals: Provide the following submittals during the course of the work:

.1 Certificates: Provide product certificate, signed by manufacturer of casework certifying that products furnished comply with requirements of the project.

.5 Sustainable Design: Submit the below completed forms demonstrating compliance with Section 01 81 13 – Sustainable Design Criteria:

.1 APPENDIX-B to Section 01 81 13 titled 'LEED v4 Material Reporting Form- Low Emitting'

.2 APPENDIX-C to Section 01 81 13 titled 'LEED v4 Material Reporting Form'

1.5 Quality assurance

.1 Standards referenced in this Section indicate a minimum acceptable level of quality; additional provisions of this Specification take precedence over any standard usually followed by the manufacturer, regardless of manufacturer.

.2 Fabricate framing in a well equipped facility capable of producing the highest grade of manufactured metal casework. Fabricator to have minimum ten (10) years experience in fabrication of metal casework.

.3 Install manufactured metal casework under full time supervision of an experienced foreman familiar with manufactured metal casework system who is in the full time employ of the manufactured metal casework manufacturer, or a contracted installer regularly used by the manufacturer.

1.6 Site conditions

.1 Do not deliver or install manufactured metal casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

.2 Where manufactured metal casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit; coordinate construction to ensure that actual dimensions correspond to

established dimensions and provide fillers and scribes to allow for trimming and fitting.

1.7 Warranty

.1 Provide a manufacturer's labour and material warranty of five (5) years from Substantial Performance of the Work.

.2 Warranty shall cover repair or replacement for components having defects or nonconforming materials and workmanship including, but not limited to, the following:

.1 Ruptured, cracked, or stained coating materials; discolouration or lack of finish integrity; cracking or peeling of finish; delamination of plastic laminate or edge banding.

.2 Weld or structural failure; visible weld marks or discolouration.

.3 Slippage, shifts, or failures of connected components, including attachments to wall, floor, ceiling, or building structure that are not caused by building movement; warping or unloaded deflection of components.

.4 Sealant deterioration, shrinkage, or failure.

1.8 Coordination

.1 Coordinate layout and installation of blocking and reinforcement in partitions for support of casework with Section 09 21 16 – Gypsum Wallboard.

2 Products

2.1 Materials – sustainable design

.1 Refer to Section 01 81 13 – Sustainable Design Criteria for LEED material requirements

2.2 Materials

.1 Metal Materials:

.1 Stainless Steel: Type 316, conforming to ASTM A167, with #4 satin finish.

.2 Bolts and anchor bolts to ASTM A307.

.3 Steel sections and plates to CAN/CSA-G40.21, Grade 300W.

.2 Miscellaneous Materials:

.1 Silicone sealant: One (1) part silicone conforming to CAN/CGSB 19.13; colours to match casework colours, and as follows:

.1 Acceptable Materials:

.1 CGE Silpruf;

.2 Dow 790; or

.3 Approved alternate.

.2 Asphalt coating: Fibrates emulsified asphalt conforming to

.1 CAN/CGSB 37.28.

.3 Acceptable Materials:

.1 The following manufacturers for stainless steel bodied casework are acceptable for work on this project:

.1 Bedcolab Ltd.;

.2 CiF Furniture Ltd.;

.3 H. H. Hawkins Ltd.;

.4 Mott Manufacturing Inc.; or

.5 Approved alternate.

2.3 Hardware

.1 Heavy duty cabinet hardware meeting or exceeding the requirements of ANSI 156.9, or greater standard as indicated by named acceptable materials.

.2 Door/Drawer Pulls:

.1 Minimum 98 mm (3-7/8 in.) wide D-Style Pull; stainless steel, projecting minimum 25 mm (1 in.) from face, to manufacturer’s standard.

.3 Hinges:

.1 Stainless steel, 1.897 mm core metal thickness five knuckle type, to manufacturer's standard.

.4 Drawer Slides:

.1 Rail mounted, all ball bearing, full extension drawer slides with progressive movement and over travel; soft close, clear zinc finish:

.1 Acceptable manufacturer: Accuride or approved alternate.

.5 Shelf Clips: Die formed steel, and zinc plated; fully engage in adjustment holes in metal case work, located on 13 mm (½ in.) centres, to manufacturer's standard.

.6 Cabinet Locks: Heavy duty type; provide two (2) keys with each lock keyed differently, and two (2) keys for each master key group, keyed alike for each room, and as follows:

.1 Drawer and Door Lock: Disc tumbler lock with cam, removable core system; bright chrome finish; stacks of drawers ganged to single lock; pairs of doors locked individually, to manufacturer's standard.

.7 Screws, for use at site in assembly of tops and for securing cabinets, shelving, and other components:

.1 Cadmium plated round-head machine screws (to suit application), Robertson head, 4 mm (5/32 in.) minimum shank diameter, all one size.

.2 Use captive star washers, compression inserts or similar locking devices for all screwed connections using machine screws or bolts.

.8 Other Hardware: To manufacturer's standard.

2.4 Cabinets

.1 Base Cabinets: Fabricated from stainless steel as indicated on the drawings and having suspension system compatible with leg frame assemblies, removable back panels for access to service space; provide a partial 230 mm (9 in.) high back panel as indicated.

.2 Drawers: Fully interchangeable, reinforced to suit loads and having integral stops to prevent accidental pull-out and drawer slides as indicated above, and equipped with rubber mutes and other hardware as listed on drawings.

.3 Doors: Fully interchangeable, one piece construction stainless steel, metal doors reinforced and sound deadened and equipped with hinges and

catches as listed above, rubber mutes and other hardware as listed on drawings.

.4 Shelves: Adjustable in 13 mm (½ in.) increments, pull-out shelves suspended on same as standard drawers stainless steel shelves formed with 25 mm (1 in.) edges turned down and back.

2.5 Work surfaces

.1 Provide work surfaces and ledges as indicated on the drawings with required clips, screws and parts for fastening top to leg frame or cabinet.

.2 Stainless Steel (SS): 1.519 mm (0.0598 in.), type 316 stainless steel having satin #4 finish, with straight finished edges, 200 mm (8 in.) backsplash on back and edges, and as follows:

.1 Form edges of exposed tops into a 25 mm (1 in.) thick channel shape to facilitate anchoring to base units.

.2 Backsplash and curbs formed from the same sheet as the top; top edges of curbs and backsplash formed into a channel shape.

.3 Form tops having built-in sinks with a raised 25 mm (1 in.) wide rim on all edges; weld stainless steel sinks supplied separate from top to form an integral part of top, welds ground smooth and polished to a uniform satin finish over the entire top and sink assembly; coat underside of tops and sinks with plastic sound deadener.

.4 Welds shall be made without discoloration and shall be ground, polished, and passivated to blend harmoniously with the work surface finish.

.5 Soldering curbs or splash rails to the top will not be permitted.

.6 Form mechanical or field joints to tight butt joint to top surfaces, reinforced and held in alignment with steel reinforcements.

.7 Protect surfaces of the tops with strippable plastic coating to protect the tops during shipment and installation.

2.6 Fabrication

.1 Fabricate work of this Section in accordance with the reviewed submittals.

.2 Make welds smooth and remove flux and splatter; welding shall be performed by properly licensed welders in accordance with CSA W59.

.3 Steel Casework Bodies: Stainless steel having the following minimum thicknesses:

.1 0.912 mm for drawer bodies, shelves, door and drawer liners, and removable backs.

.2 1.214 mm for cabinet gables, tops and bottoms, toe kicks, outer door and drawer front panels, table frames, filler panels, and sloping tops.

.3 1.519 mm for top and intermediate channels and table legs, leg frames, posts and shelf brackets.

.4 1.897 mm for drawer suspension and hinge plates and leg frame support rails.

.5 2.657 mm for shelf brackets.

.6 3.02 mm for Cabinet leveller supports and leg frame structural supports.

.4 Fabricate cabinets as fully enclosed, self-contained units, factory assembled and finished, with each unit rigid and self supporting, suitable for individual removal for relocation or access to services, without disturbance or modification of adjacent units.

.5 Control variations in size of units in relation to method of support and attachment so that units of the same nominal size are fully interchangeable, and make all cabinet sub-assemblies (doors, drawers, track and back panels), which are nominally identical units interchangeable in the field without modification.

.6 Make shelves and drawers as deep as the cabinet depth permits, with adjustable supports for shelving within cabinets.

.7 Position handles on cabinet doors in the corner away from the hinge and nearest the work surface.

.8 Minimize the extent of exposed mechanical fastenings.

3 Execution

3.1 Examination

.1 Verify that building conditions are ready for installation of finished goods and that critical dimensions and conditions affecting work of this Section are correct.

.2 Confirm in writing to the Consultant any deviations from these tolerances. Do not proceed until these conditions are made good.

.3 Verify that metal reinforcing built into walls to receive vertical wall channels and casework has been installed correctly and matches pre-drilled holes in wall channels.

.4 Verify that mechanical and electrical rough-in work coordinates with casework dimensions and design.

3.2 Installation

.1 Fabricate and install casework to meet or exceed the following tolerances:

.1 Fabricated width, depth and height: +0 mm; -1.5 mm (1/16 in.)

.2 Casework and work surface level and plumb: 3 mm (1/8 in.) in 3050 mm (10 ft.).

.3 Work surface joints: hairline and level to adjacent surfaces.

.4 Alignment with other components: -0; +1.5 mm (1/16 in.)

.2 Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, level and rigid:

.1 Use pilot holes, properly sized for the screw size, and screwdrivers (not hammers) to install all screws.

.2 Use boring jigs, mortising tools and other special equipment and appliances as required to install work properly and maintain tolerances required for inter-changeability of components.

.3 Finish cut edges to match factory applied finish in appearance and serviceability if any site cutting is required.

.3 Install casework with no variations in flushness of adjoining surfaces; use concealed shims, scribe and cut for accurate fit where casework abuts other finished work:

.1 Provide filler strips, scribe strips, and mouldings in finish to match casework face.

.2 Install casework without distortion so doors and drawers fit openings and are aligned.

.3 Complete installation of hardware and accessories as indicated.

.4 Leg Frame Casework Installation:

.1 Commence framing installation with wall channels; then install service strip framing and framing required to support tops with sinks.

.2 Seal along base/floor of service space with a bead of silicone sealant to prevent liquids or water from entering service space or wall behind.

.3 Install the remaining framing after installation of service pipes and conduits.

.4 Install wall channels at each modular leg frame location or as shown on the drawings.

.5 Provide double wall channels at internal corners.

.6 Suspend casework in leg frame system in accordance with reviewed shop drawings.

.5 Work Surfaces:

.1 Scribe to abutting surfaces where required due to field conditions.

.2 Only factory prepared field joints, located in accordance with reviewed shop drawings are permitted.

.3 Secure field joints in the same manner as in the factory.

.4 Secure work surfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

.5 Centre end joints in service strips and work surfaces over frames.

.6 Align joints in work surfaces and backsplashes with joints of service strip.

.7 Align joints in work surfaces and service strips with splines, seal with silicone sealant applied before the joint is closed and draw together with joint fasteners; do not glue splines, remove excess sealant promptly, correct joints that are not hairline width and flush.

.8 Connect service strip panels and work surfaces to intermediate frames using screws.

.9 Place a bead of silicone sealant on the edge prior to placing work surface in position, to seal the joint with the service strip when the top is in position and secured.

3.3 Adjusting and cleaning

.1 Repair or remove and replace defective work, as directed by Consultant upon completion of installation.

.2 Adjust casework and hardware so doors and drawers are centred in openings and operate smoothly without warp or bind.

.3 Lubricate operating hardware as recommended by manufacturer.

.4 Clean casework on exposed and semi-exposed surfaces.

.5 Touch up factory applied finishes to restore damaged or soiled areas.

3.4 Protection

.1 Provide reasonable protective measures to prevent casework and equipment from being exposed to damage from on-going construction activity.

End of section

1 General

1.1 Section includes

.1 Work of this section includes entrance floor mats (FG)

1.2 Related work specified elsewhere

.1 Section 03 30 00 – Cast-in-Place Concrete

.2 Section 03 35 00 – Concrete Finishing

.3 Section 08 70 00 – Hardware

.4 Section 09 06 00 – Finish Schedule

1.3 Quality assurance

.1 The Contractor executing work of this Section shall have a minimum five (5) years continuous Canadian experience in successful manufacture and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

1.4 Submittals

.1 Submit submittals in accordance with the General Conditions and Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings:

.1 Submit shop drawings showing and describing in detail, materials, finishes, dimensions, details of connections and fastenings, plans, sections, metal gauges, hardware and any other pertinent information.

.3 Samples:

.1 Submit 12 in. x 12 in. samples of entrance mats and 12 in. long corner samples of entrance mat frames for approval of Consultant.

1.5 Delivery, storage, handling and protection

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location. Do not load any area beyond the design limits.

.2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.

.3 Store materials in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

.4 Unsatisfactory materials shall be removed from the site.

.5 Adequately protect the structure and work of other Sections during delivery, storage, handling and execution of the work of this Section.

.6 Provide tools, plant and other equipment required for the proper execution of the work of this Section.

1.6 Warranty

.1 Warrant work of this Section against defects in materials and workmanship in accordance with the General Conditions for a period of five (5) years starting from date of Substantial Performance and agree to promptly make good defects which become evident during warranty period without cost to the Owner.

2 Products

2.1 Entrance floor mat

.1 Subject to compliance with requirements of this section provide:

.1 Construction Specialties, M1 Pedimat or approved alternate by K. N. Crowder or other approved alternate.

.2 Rails; Manufactured from 6063-T6 aluminum, design to retain carpet insert, tapered extrude aluminum, continuously hinge connected to permit rollback for easy cleaning. Colour: Mill finish.

.3 Threshold Frame shall be supplied in 6063-T6 aluminum alloy. For surface installations to provide a flush transition from the entryway door threshold to the mat surface. Finish: to match threshold. Coordinate with Section 08 70 00 for Door hardware and thresholds.

.4 Carpet inserts: shall meet CRI standard for good indoor air quality. Fibers shall include a minimum of 100, 12 mil monofilament fibers per square

inch. Carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths. Anti-static carpet fibers containing antimicrobial additive and be treated with Scotchgard® to reduce soiling. Carpet weight shall be 33-oz./yd².

.1 Basis of design: HD – MonoTuft HD™ by Construction Specialties or approved alternate.

.2 Colour: 9332 Anthracite.

2.2 Fabrication

.1 Verify site dimensions prior to fabrication. Fabricate work of this Section square, true, straight, level and free of distortion with joints closely fitted and properly secured. Provide adequate reinforcing and anchorage.

.2 Fabricate mats in largest practical sized units to fit floor recess.

.3 Fit and assemble work of this Section in shop.

.4 Workmanship shall be best grade of modern shop practice known to recognized manufacturers specializing in this work. Joints and intersecting members shall be accurately fitted, made in true planes with adequate fastening. Wherever possible fastenings shall be concealed.

.5 Isolate where necessary to prevent electrolysis between metal to metal or metal to masonry or concrete contact. Apply two (2) coats of bituminous paint.

.6 Drilling shall be reamed and exposed edges left clean and smooth.

.7 Include anchors and fastenings necessary to anchor work.

3 Execution

3.1 Examination and preparation

.1 Inspect surfaces over which the work of this Section is dependent for any irregularities detrimental to the application and performance of the work. Notify Consultant in writing of all conditions which are at variance with those in the contract documents and/or detrimental to the proper and timely installation of the work of this Section. The decision regarding

corrective measures shall be obtained from the Consultant prior to proceeding with the affected work.

.2 Commencement of work implies acceptance of surfaces and conditions.

.3 Make thorough examination of drawings and details, determine the intent, extent, materials, conditions of interfacing with other work and be fully cognizant of requirements.

.4 Co-ordinate the work of this Section with the work of other Sections to provide the necessary recesses, edge conditions for the accessories as required.

.5 Upon completion of entrance mat, provide temporary plywood filler protection in entrance mat recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended.

.6 Vacuum clean floor recesses prior to installing entrance mats.

3.2 Installation

.1 Install entrance mats when no further wheeled construction traffic will occur and all "wet" trades including painting and decorating have been completed.

.2 Unroll entrance matting to allow matting to "relax" and store in room/area to be installed for minimum of twenty four (24) hours to "climatize" matting.

.3 Install entrance mats in strict accordance with the manufacturer's written instructions with the "slip resistant" rib surface perpendicular to traffic flow.

.4 Avoid excessive stretching of mats while installing and/or repositioning mats in floor recesses.

.5 When installing multiple mats (side by side), always match "factory edge" to "factory edge".

End of section