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Document Identification

DR

VOLUME 1

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 01	Project Manual Title Page	A
00 01 05	Document Responsibility and Project Directory	A
00 01 10	Table of Contents	A
00 30 00	Information Available for Review	A

DIVISION 01 - GENERAL REQUIREMENTS

01 10 00	General Instructions	A
01 10 00.1	CAD Data Disclaimer	A
01 21 00	Cash Allowances	A
01 25 00	Product Substitution Procedures	A
01 25 01	Request for Substitution Form	A
01 26 00	Contract Modification and Requests for Interpretation	A
01 29 73	Schedule of Values	A
01 31 13	Coordination	A
01 31 19	Project Meetings	A
01 31 46	Field Engineering	A
01 32 00	Construction Progress Documentation	A
01 33 00	Submittals Procedures	A
01 35 18	General Requirements for Energy Efficiency	A
01 35 29	Health, Safety, and Emergency Response	A
01 35 63	General LEED v4 Requirements	A
01 35 66	LEED v4 Project Management and Coordination	A
01 35 90	Indoor Air Quality Management	A
01 35 90.1	Indoor Air Quality Management Schedules	A
01 41 00	Regulatory Requirements	A
01 42 13	Abbreviations and Acronyms	A
01 45 00	Quality Control	A
01 50 00	Temporary Work	A
01 56 39	Temporary Tree and Plant Protection and Trimming	A
01 53 13	Construction Activity Pollution Prevention	A
01 57 20	Temporary Indoor Air Quality Control	A
01 60 00	Products and Workmanship	A
01 60 13	LEED v4 Product Requirements	A
01 73 29	Cutting and Patching	A
01 74 13	Progressive Cleaning	A
01 74 19	Waste Management for LEED v4	A
01 76 00	Protecting Installed Construction	A
01 77 00	Contract Closeout Procedures and Submittals	A
01 78 23	Operations and Maintenance Manuals	A
01 78 36	Warranties	A

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<u>Document Identification</u>	<u>DR</u>
01 78 39 As-Built Documents	A
01 81 14 Indoor Air Quality Testing and Flush-out for LEED v4	A
01 81 19 Indoor Air Quality Management LEED v4	A
01 91 00 Commissioning Requirements	Cx
01 91 19 Building Envelope Commissioning	Cx

DIVISION 02 - EXISTING CONDITIONS

02 27 00 Erosion and Sediment Control	C
02 52 30 Concrete Curb and Toe Walls	C
02 83 20 Retaining Walls	C

DIVISION 03 – CONCRETE

03 30 53 Cast-In-Place Concrete	S
---------------------------------	---

DIVISION 04 – MASONRY

04 05 00 Masonry Procedures	A
04 05 13 Mortar and Grout for Masonry	A
04 05 19 Masonry Reinforcement and Connectors	A
04 05 23 Masonry Accessories	A
04 21 00 Brick Masonry Units	A
04 21 10 Stone Masonry Units	A
04 22 00 Concrete Masonry Units	A

DIVISION 05 – METALS

05 04 00 Hot-Dip Galvanizing	A
05 12 13 Architecturally Exposed Structural Steel	S
05 21 19 Structural Steel and Open Web Steel Joist Framing	S
05 31 00 Steel Roof and Floor Decking	S
05 41 00 Cold-Formed Metal Structural Stud Framing	S
05 50 00 Metal Fabrications	A
05 50 01 Post Guard Bollard Covers	A

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 10 53 Rough Carpentry	A
06 40 00 Architectural Woodwork	A

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 05 43 Thermal Clips	A
07 11 13 Damp proofing	A
07 13 26 Sheet Waterproofing	A
07 21 00 Thermal Insulation	A

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<u>Document Identification</u>	<u>DR</u>
07 72 23 Roof Hatch	A
07 26 13 Above-Grade Vapour Barrier	A
07 26 16 Below-Grade Vapour Barrier	A
07 27 00 Air Barrier Systems	A
07 46 50 Preformed Metal Cladding	A
07 52 16 Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing	A
07 61 00 Sheet Metal Roofing	A
07 62 00 Metal Flashing	A
07 81 00 Sprayed Fire-Resistive Materials (SFRM)	A
07 84 00 Firestopping and Smoke Seals	A
07 92 00 Joint Sealants	A

DIVISION 08 – OPENINGS

08 11 13 Steel Doors and Frames	A
08 35 13 Four-Fold Metal Doors	A
08 36 13 Sectional Overhead Metal Doors	A
08 41 00 Aluminum Framed Glazing Systems	A
08 52 13 Aluminum Clad Windows	
08 71 00 Door Hardware	H
Hardware Schedule	H
08 71 13 Automatic Door Operators	A
08 80 00 Glass and Glazing	A
08 91 19 Louvres	A

DIVISION 09 – FINISHES

09 22 00 Metal Supports for Gypsum and Cement Board	A
09 29 00 Gypsum and Cement Board	A
09 31 00 Tiling	A
09 51 23 Acoustical Tile Ceiling Systems	A
09 65 13 Resilient Base	A
09 65 20 Rubber Tile Flooring	A
09 67 23 Epoxy Flooring – ORANGE PEEL	A
09 68 13 Carpet Tile	A
09 91 00 Painting	A

DIVISION 10 – SPECIALTIES

10 11 00 Visual Display Surfaces	A
10 14 01 Interior Signage	A
10 14 53 Traffic Signage	A

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<u>Document Identification</u>	<u>DR</u>
10 26 13 Corner Guards	A
10 28 00 Washroom Accessories and Janitor Accessories	A
10 50 30 Turnout Gear Lockers – Wall Mounted	A
10 51 13 Prefinished Metal Lockers	A
10 75 16 Flagpoles	A

DIVISION 11 – EQUIPMENT

DIVISION 12 – FURNISHINGS

12 24 13 Roller Window Shades	A
12 36 61 Solid Surfaces	A
12 48 13 Entrance Floor Mats	A
12 58 29 Murphy Beds	A

DIVISION 31 – EARTHWORK

31 05 17 Aggregates	C
31 11 00 Clearing and Grubbing	A
31 23 10 Excavating, Trenching, Backfilling	C
31 23 13 Site Grading	C
31 25 00 Erosion and Sedimentation Control	C
31 32 19 Geotextiles	A

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 01 90 Exterior Landscape Maintenance	A
32 01 90 Temporary Tree and Plant Protection and Trimming	A
32 11 19 Granular Sub-base	C
32 11 23 Granular Base	C
32 12 16 Asphalt Paving	A
32 13 13 Concrete Sitework	A
32 13 15 Concrete Curbs	L
32 13 16 Concrete Sidewalks	C
32 17 23 Traffic Markings	A
32 17 26 Tactile Warning Surfacing	A
32 31 00 Fences and Gates	A
32 31 13 Chain Link Fences	A
32 31 25 Wood Composite Fences and Gates	A
32 33 00 Site Furnishings	L
32 91 19 Topsoil Placement and Grading	L
32 92 23 Sod	L
32 93 00 Trees-Shrubs, and Ground Cover Planting	L

DIVISION 33 – UTILITIES

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<u>Document Identification</u>		<u>DR</u>
33 05 14	Manholes and Catch basins	C
33 11 17	Water System	C
33 31 13	Sanitary Sewers	C
33 44 00	Storm Sewers	C
33 44 01	Subdrains	C
33 44 16	Precast Trench Drain Systems	A

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Document Identification

DR

VOLUME 2

INTRODUCTORY INFORMATION

00 01 01	Project Manual Title Page	A
00 01 10	Table of Contents	A

DIVISION 22 – PLUMBING

22 01 01	General Requirements	M
22 08 00	Plumbing System Commissioning	Cx
22 09 00	Plumbing Piping	M
22 42 01	Plumbing Specialties	M
22 42 02	Plumbing Fixtures & Trim	M
22 47 00	Plumbing Equipment	M
22 60 00	Fuel Gas Piping	M

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

23 01 01	General Requirements	M
23 08 00	HVAC System Commissioning	Cx
23 05 29	Supports and Anchors	M
23 05 48	Vibration Controls	M
23 05 93	Testing, Adjusting, Balancing	M
23 07 13	Duct Insulation	M
23 07 13	Piping Insulation	M
23 20 00	Furnace & Condensing Unit	M
23 21 00	Hydronic Piping	M
23 21 10	Hydronic Specialties	M
23 21 17	Hydronic Expansion Tank	M
23 23 00	Refrigerant Piping	M
23 25 00	HVAC Water Treatment	M
23 25 10	Energy Recovery Ventilator	M
23 31 00	Duct Work	M
23 34 00	HVAC Fans	M
23 36 00	Air Terminal Units	M
23 37 00	Air Outlets and Inlets	M
23 40 00	Hydronic Pumps	M
23 45 00	Variable Frequency Drives	M
23 52 13	Boiler	M
23 73 00	Roof Top Air-conditioning Unit	M
23 82 00	Terminal Heat Transfer Units	M

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<u>Document Identification</u>		<u>DR</u>
23 82 10	IR Heaters	M
23 84 16	Humidification System	M

DIVISION 25 – INTEGRATED AUTOMATION

25 01 01	General Requirements	M
25 08 00	Integrated Automation Commissioning	Cx
25 90 00	Control Specifications	M
25 90 10	Sequence of Operations	M
25 90 30	Integrated Lighting System Controls	M

DIVISION 26 – ELECTRICAL

26 05 00	Electrical Work General Instructions	E
26 05 05	Basic Electrical Materials and Methods	E
26 05 06	Seismic Control and Restraint	E
26 05 07	Fire Stopping and Smoke Seal System	E
26 05 09	Electrical Work Testing	E
26 05 10	Mounting Heights	E
26 05 21	Conductors (0-1000 Volts)	E
26 05 28	Grounding and Bonding	E
26 05 31	Splitters, Junction and Pull Boxes	E
26 05 32	Outlet Boxes, Conduit Boxes and Fittings	E
26 05 34	Conduit Systems	E
26 05 37	Wireways and Auxiliary Gutters	E
26 05 40	Wiring Devices	E
26 08 00	Electrical System Commissioning	Cx
26 09 13	Electrical Power Monitoring	E
26 09 23	Occupancy Sensors	E
26 24 01	Service Entrance Equipment	E
26 24 16	Distribution Panelboards	E
26 24 18	Branch Circuit Panelboards	E
26 28 18	Ground Fault Protection Equipment	E
26 32 13	Natural Gas Generator	E
26 36 23	Automatic Transfer Switch	E
26 50 10	Building Interior Lighting	E
26 50 15	Building Exterior Lighting	E
26 52 00	Emergency Lighting	
26 53 00	Exit Lighting	

DIVISION 27 – COMMUNICATIONS

27 00 00	Telecommunication Raceway System	E
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<u>Document Identification</u>	<u>DR</u>
27 05 00 Grounding & Bonding for Communication Systems	E
27 05 28 Pathways for Communication Systems	E
27 05 53 Identifications for Communications Systems	E
27 08 00 Commissioning of Communications Systems	E
27 11 00 Communications Equipment Room Fittings	E
27 11 19 Terminal Blocks, Patch Panels & Connectors	E
27 15 00 Horizontal Cabling	E
27 16 00 Communications connecting cords devices and adapters	E

DIVISIONS 28 AND 29 – ELECTRONIC SAFETY AND SECURITY

28 13 00 Access Control	E
28 13 10 Fire Alarm Systems	E
28 13 10 EMS Security System	E
28 20 00 Portable Fire Extinguishers	E

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL INSTRUCTIONS

Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

1.2 SECTION INCLUDES

PART 1 – GENERAL	1
1.1 GENERAL INSTRUCTIONS	1
1.2 SECTION INCLUDES	1
1.3 REQUIREMENTS	1
1.4 SUBMITTALS	1
PART 2 – PRODUCTS	1
2.1 MANUFACTURED UNITS	1
2.2 INSTALLATION	2
2.3 CLEANING	2

1.3 REQUIREMENTS

- .1 Comply with the General Conditions, the Supplementary Conditions, and all of Division 1 General Requirements.

1.4 SUBMITTALS

- .1 Submit all required submittals in accordance with Section.
- .2 Product Data: Submit manufacturer's product data sheets and installation instructions.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

- .1 Masonry Stone - Finesse, by Brampton Brick.
 - .1 Type 1: 90 x 190 x 590, Iceland White, standard finish.
 - .2 Type 2: 90 x 90 x 590, Iceland White, standard finish.
 - .1 Used as an ashlar course to match 800mm coursing
 - .3 Type 3: Corner Stone 90 x 190 x 190 (R) x 390 (F), Iceland White, standard finish.
 - .1 Used at outside corners.
 - .4 Type 4: 90 x 190 x 590, Iceland White, standard finish.
 - .1 Laid flat to create sill. Cut drip edge at bottom edge of exposed downward facing edge..

.2 Or approved equivalent.

2.2 INSTALLATION

Lay masonry in accordance with good practice, CAN/CSA A371-04 and as accepted in mock-up sample wall and as specified in Section 04 05 00 – Masonry Procedures.

Review locations of coursing alignment and layout with the *Consultant*, and seek approval, prior to commencement of the work of this Section.

Clean brick masonry units as work progresses.

2.3 CLEANING

Follow procedures for cleaning in accordance with Section 04 05 10.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

1.2 SECTION INCLUDES

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 2.1 Materials
- .5 3.1 Workmanship
- .6 3.2 General Erection Tolerances

1.3 SUMMARY

- .1 Related Work
 - .1 Section 04051 Masonry Procedures
 - .2 Section 06100 Rough Carpentry
 - .3 Section 07212 Rigid Insulation
 - .4 Section 07213 Batt and Blanket Insulation
 - .5 Section 07531 Ethylene Propylene Diene Monomer (EPDM) Roofing and Waterproofing.
 - .6 Section 07620 Metal Flashing and Trim
 - .7 Section 07900 Joint Sealers
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01300 Submittals.
 - .2 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.
- .3 Qualifications
 - .1 The work of this section shall be performed by a member in good standing of the Canadian Roofing Contractors Association who shall also:
 - .1 Have a minimum of 5 years' proven satisfactory experience.**
 - .2 Have adequate equipment and skilled personnel to complete this work in an efficient and workmanlike manner.**
- .4 Guarantee / Warranty
 - .1 This Contractor shall, and hereby does, warrant, and the General Contractor does guarantee, that the metal panels and related closures, fixings, and the like, supplied and installed under this section, shall be free from defects for a period of 1 (one) year. Defective work shall be corrected expeditiously and at no expense to the Owner.

- .2 Furnish said Guarantee/Warranty in writing on a form acceptable to the Consultant, signed and countersigned by the General Contractor and Sub-Contractor.
- .3 Guarantee/Warranty period shall commence from the date of issuance of the Final Certificate of Acceptance of the Building.
- .5 Inspection
 - .1 All roofing and sheet metal work shall be done under the supervision of the Independent Inspection and Testing Company. Work shall not be considered complete until a certificate is issued by the Inspection Company.
 - .2 Notify the Independent Inspection and Testing Company at least 48 hours prior to starting the work.
 - .3 The cost for this inspection shall be part of the Cash Allowance.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Prefinished Metal Cladding and Canopy Soffit

- .1 Prefinished sheet steel to CSSBI Bulletin B16-94 Prefinished Sheet Steel for Building Construction.
- .2 Base Metal: galvanized sheet steel to ASTM A446, grade A zinc coat Z275, nominal thickness of 0.76 mm.
- .3 Profiles:
 - .1 Tradition 150, as manufactured by VicWest Steel, for exterior wall cladding and canopy soffit.
 - .2 Or equivalent
- .4 Colours:

56082 – Regent Grey

.2 Metal Flashing and Trim

- .1 Form all metal flashings, cap flashings, cant flashings, copings, and fascias, to profiles indicated of same prefinished sheet metal as cladding and soffits, colour to match adjacent material unless indicated otherwise.
- .2 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same material, colour and finish as cladding, with fastener holes pre-punched.

.3 Accessories

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CGSB 37-GP-5M89.
- .3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

- .4 Cleats: of same material and temper as sheet metal, minimum 50 mm wide. Thickness and colour to be same as the sheet metal being secured.
- .5 Nails: to CSA B111, 16 ga, of sufficient length to adequately secure work in place and have a head of at least 12.7 mm dia. Material shall be compatible with sheet metal being secured.
- .6 Screws, Bolts, Expansion Shields: to ANSI B18.6.4 of metal compatible with adjacent surfaces. Exposed fastenings shall be made of the same material as the metal surface on which they occur.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.4 Sealant

- .1 Type 1 (see Section 07900 Joint Sealers) with primer and backer rods as recommended by manufacturer.

PART 3- EXECUTION

3.1 INSTALLATION OF METAL CLADDING AND CANOPY SOFFIT

- .1 Install cladding in accordance with CGSB 93-GP-5M, and manufacturer's written instructions
- .2 Work shall be done as shown on the drawings to provide a neat, plumb and square installation.
- .3 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.
- .4 Install outside corners, fillers and closure strips with carefully formed and profiled work.
- .5 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.
- .6 Attach components in manner not restricting thermal movement. S-lock seams shall be used for joints, shall permit thermal movement and shall be fitted with caulking compound. Space joints on fascias evenly. Dovetail and mitre all corners. Make joints square, plumb, straight and true.
- .7 Caulk junctions with adjoining work with sealant.

3.2 .2 INSTALLATION OF METAL FLASHING AND TRIM

- .1 Install sheet metal work as detailed. Do not cover felt flashings or roofing materials with sheet metal until inspected and approved.
- .2 Sheet metal work required over all roofing membrane flashings, roof curbs, equipment support curbs, wall flashings, fascia boards, and miscellaneous trim around roof edges, and as indicated.
- .3 Make allowance for thermal movement when forming and installing interlocking sheet metal work to avoid buckling fullness of metal and straining of joints or seams.
- .4 Double-back exposed edges at least 12 mm for appearance and stiffness.
- .5 Provide continuous starter strips to present a true, non-waving leading edge. Anchor back-up in approved manner to provide rigid, secure, permanent installation. Stagger joints with flashing joints.
- .6 Use concealed fastenings except where approved before installation.

- .7 Provide underlay under all sheet metal installed directly over masonry, concrete, or construction grade wood, and elsewhere as necessary to prevent electrolysis. Lay the underlay as sheet metal work is installed. Secure in place and lap joints 100 mm.
- .8 S-lock seams shall be used for joints, shall permit thermal movement, and shall be filled with sealant. Space exposed joints of flashings uniformly. Dovetail and mitre all corners. make joints square, plumb, straight and true.
- .9 Lock end joints and caulk with sealant.

3.3 .3 CLEANING OF THE WORK

- .1 On completion of the Work, remove all bitumen or foreign matter from metal cladding, and wash with soap and hot water, or a suitable washing powder, rinse with cold water and wipe dry with a clean cloth. Leave work in a first class condition to the satisfaction of the Consultant.
- .2 Remove excess materials form the site.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL INSTRUCTIONS

Read and be governed by the conditions of the *Contract Documents*, including sections of Division 1.

1.2 SECTION INCLUDES

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 2.1 MATERIALS
- 3.1 WORKMANSHIP
- 3.2 GENERAL ERECTION TOLERANCES

1.3 SUMMARY

- .1 Section includes:
 - 1. Solid core doors with wood veneer.

1.4 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00.
 - 1. Product data sheets:
 - 2. Submit manufacturer's Product data sheets for Products proposed for use in the work of this section.
 - 3. Shop drawings:
 - 1. Indicate door location using numbering system per door schedule, size, and hand of each door, elevation of each door type; undercuts, bevelling, construction type core and edge construction not covered in product data; and special blocking requirements.
 - 2. Indicate dimensions and locations of factory machining criteria for hardware, extent of hardware blocking.
 - 3. Indicate dimensions and locations of cut-outs including trim for openings.
 - 4. Indicate door face finish requirements including veneer matching.
 - 5. Indicate doors to be factory finished and finish requirements.
 - 4. Verification samples:
 - .1 Submit 3 sets of samples minimum 300 mm (12") x 300 mm (12") of veneers showing full range of grain variation, finish and patterns proposed for wood specified.
 - 1. Submit samples as many times as required until approved by *Consultant*. First submission to include one set of samples per *Consultant* request plus one set lighter in tone and one set darker in tone.

5. Submit cut-away sample of each type of door, to show stile and rail construction, core, cross banding, door face finish and edges.
6. Submit solid lumber frames for light openings, minimum 150 mm (6") long, for each material, type and finish required Section includes:

1.5 QUALITY ASSURANCE

.1 Qualifications:

1. Manufacturer shall be a member in good standing of the Architectural Woodwork Institute or the Architectural Woodwork Manufacturers Association of Canada or the Woodwork Institute.

.2 Quality standard:

1. Work shall be in accordance with the North American Architectural Woodwork Standards 3.1, Premium Grade.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Door numbers shall be marked with door numbers used on shop drawings in the top hinge cavity created by the machining for hinges.
- .2 Identify doors with labels. Package with resilient packaging.
- .3 Store doors flat at the *Place of the Work* in piles with bottom face on bottom of pile. Protect from moisture by placing water resistant material under skids supporting piles. Cover top of piles and provide air at sides of piles.
- .4 Deliver the wood doors only after the building is closed and dry and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period. Do not receive the doors in a damp area. Do not drag the doors on the ground, floor or across one another.

PART 2 – PRODUCTS

2.1 MANUFACTURER

.1 The following manufacturers are approved for work of this section:

1. Lambton Doors.
2. Masonite Architectural.
3. VT Industries.
4. Requests for substitution will be considered in accordance with Section 01 25 00.

2.2 GENERAL

- .1 Single-source manufacturing and fabrication responsibility: Engage a qualified Manufacturer to assume undivided responsibility for wood doors and frames specified in this section, including fabrication and finishing.

2.3 2.3 FABRICATION - DOOR CONSTRUCTION

- .1 Performance duty level:

- .1 Doors shall meet the requirements of ANSI/WDMA I.S. 1A-13 for Extra Heavy Duty Performance Level unless otherwise indicated or scheduled.
- .2 Solid particleboard core, veneer faced, non fire rated and 20 minute fire rated wood door construction to Architectural Woodwork Standards Manual, Section 9 and as follows:
 - .1 Type PC-5, particle board core to ANSI A208.1-2009 LD-2 (minimum 529 kg/m³ (33 lbs/ft³) density).
- .3 Bonding:
 - .1 Bond stiles and rails to core; abrasive sand core assembly to achieve uniform thickness prior to lamination of door faces.
- .4 Panel edge types:
 - .1 Wood veneer faced doors for transparent finish:
 - .1 For vertical edges (stiles) and exposed horizontal edges (rails). (Exposed horizontal edges are those edges that can be viewed from floors above.):
 - .1 Edge Type A: Minimum 11 mm (7/16") thick solid hardwood, species to match face veneer, and referenced quality standard.
 - .2 Inset solid wood edging shall have consistent moisture content as panel core material, be glued securely, and calibrated with panel core thickness prior to being laminated with wood veneer on both sides.
 - .3 Non rated or 20 minute fire rated doors: Solid hardwood edge to be laminated to minimum 25.4 mm (1") structural composite lumber backer.
 - .5 For unexposed horizontal edges (rails):
 - .1 Non rated or 20 minute fire rated doors: Minimum 25 mm (1") structural composite lumber.
- .6 Blocking:
 - .1 *Provide* hardware blocking for doors as follows:
 - .1 Non-rated or 20 minute fire rated doors: Structural composite lumber for hardware blocking.
- .7 Thickness:
 - .1 45 mm (1-3/4") minimum unless otherwise indicated or scheduled.

2.4 VENEER FACED DOORS FOR TRANSPARENT FINISH

- .1 Species:
 - .1 White Oak as specified in Section 06 40 00.
 - .2 Veneer thickness: Minimum 1.02 mm (0.040") thick after sanding.
 - .3 Veneer cut:
 - .1 Plain/Flat.
 - .4 Veneer leaf matching:

- .1 Book.
- .5 Veneer assembly matching:
 - .1 Balance.

2.5 ACCESSORIES

- .2 Finishing hardware: Sliding Door System in accordance with Section 08 71 00.

2.6 FABRICATION

- .1 Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - .1 Clearances: Refer to Part 3 for clearance tolerances.
 - .2 Fit doors for automatic door bottoms.
 - .3 Bevel non-fire-rated doors 3-1/2 degrees (1/8 inch in 2 inches) at lock and hinge edges.
- .2 Fabricate doors with hardware blocking as specified in Part 2 of this Section.
- .3 Factory machine doors for finish hardware that is not surface applied. Do not machine for surface hardware. Locate hardware to comply with Door and Hardware Institute (DHI) "Recommended Locations for Architectural Hardware for Flush Wood Doors (latest edition). Comply with final reviewed hardware schedules, door and frame shop drawings and hardware templates.
- .4 Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2.7 FACTORY FINISHING

- .1 Finish work in factory in accordance with Architectural Woodwork Standards Manual, Section 9 and referenced quality standard.
- .2 Prior to finishing, handling marks or effects of exposure to moisture removed with a thorough final sanding over surfaces of the exposed portions, using appropriate grit sandpaper, and shall be cleaned prior to applying sealer or finish. Sanding shall be completed just prior to stain or finishing application.
- .3 Comply with requirements indicated below for finish system, staining, and sheen.
 - .1 Sheen: As selected by Consultant.
 - .2 Factory finish with transparent, Post Catalyzed Lacquer in accordance with the North American Architectural Woodwork Standards 3.1, Section 5.
 - .1 Transparent finish: Clear (natural).
- .4 Seal top and bottom door edges.

2.8 SITE FINISHING

- .1 Paint: in accordance with Section 09 91 00.
- .2 Seal top and bottom door edges.

PART 3 – EXECUTION

3.1 EXAMINATION

- .1 *Provide* necessary grounds, bracing and strapping for fitting and adequate for securing of the work.
- .2 Cooperate with work of other sections to ensure fastenings set by others are provided and located, their work is installed to their specifications and that those responsible for back priming are notified in sufficient time for them to schedule work.

3.2 3.2 INSTALLATION – GENERAL

- .1 Execute installation and assembly at the *Place of the Work* using skilled forces under supervision of a competent joinery foreperson.
- .2 Install work plumb, level and straight, and fasten it securely to backing to support itself and anticipated superimposed loads.
- .3 Build into construction as indicated, or specified in other sections of this specification, or both.
- .4 Adequately fasten units and secure in place with concealed fixings wherever possible. Include grounds and furring where required.

3.3 INSTALLATION

- .1 Install wood doors after finishing of walls.
- .2 Align and fit doors in sliding door system with uniform clearances as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - .1 Clearances: Provide 3.2 mm (1/8") maximum at heads, jambs, and between pairs of doors. Provide 3.2 mm (1/8") maximum from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, 6.4 mm (1/4") minimum from bottom of door to top of threshold unless otherwise indicated and a maximum of 12.7 mm (1/2").
- .3 Seal top and bottom edges of wood doors are re-sealed if they are cut to fit, in accordance with door manufacturer's warranty requirements.
- .4 Pilot drill screw and bolt holes.

3.4 INSTALLATION - FINISHING HARDWARE

- .1 Install finishing hardware in accordance with Section 08 71 00.

3.5 ADJUSTING AND CLEANING

- .1 Adjust doors to swing freely, smoothly and easily, to remain stationary at any point, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.
- .2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by *Supplier's* requirements.

- .3 Ensure that doors equipped with closers operate to close doors firmly against anticipated wind and building air pressure, and to enable doors to be readily opened as suitable for function, location and traffic.
- .4 Clean hardware after installation in accordance with *Supplier's* requirements.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Aluminum Clad Wood Windows.

1.2 SUBMITTALS

.1 Submit required submittals in accordance with Section 01 33 00.

.2 Product data sheets:

.1 Submit manufacturer's Product data sheets for Products proposed for use in the work of this section.

.3 Shop drawings:

.1 Further to requirements of Section 01 33 00, indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anticipated deflection under load, affected related work, weep drainage network, expansion and contraction joint location and details, field welding, coordination with hardware and electrical requirements.

.2 Identify and describe material types being supplied, wall thicknesses of extrusions, and shapes including connections and grades, dimensions and tolerances (minimum and maximum), attachments, reinforcing, anchorage and locations of fastenings, and provisions for thermal and structural movement between components of this section and adjacent materials.

.3 Include description of materials, metal finishing specifications, and other pertinent information.

.4 Design loads, typical reactions and support movement allowances, both vertical and horizontal, shall be placed on the shop drawings.

.5 Shop drawings shall clearly indicate the specification of materials and, where applicable, indicate installation methods and coordination with other sections.

.6 Submit framing member structural and physical characteristics, calculations, dimensional limitations, special installation requirements.

.4 Samples:

.1 Submit samples of frame, sill and mullion sections, sill flashing and accessories, fasteners for connection of frame to opening, glazing tape, glass retainers, glazing gaskets, screening and frame, spandrel panels and each finish material and any other material, as requested.

.2 Samples of colour and finish prepared as specified on respective metal components for both extrusion and sheet.

.3 Identify samples as to treatment, thickness, alloy, framing composition, colour, manufacture, performance standard and portion of the work to which they apply.

.4 Fabrication shall not proceed without written acceptance of samples from Consultant.

.5 Test reports:

- .1 Submit valid laboratory test reports, prepared by an independent laboratory, verifying that proposed system has been tested by an independent laboratory and achieved performance values that meet the specified performance criteria.

.6 LEED submittals:

- .1 Submit documentation to verify compliance with LEED objectives and requirements.

1.3 CLOSEOUT SUBMITTALS

.1 Operation and maintenance data:

- .1 Submit manufacturer's operation and maintenance instructions for incorporation into the operation and maintenance manuals in accordance with Section 01 77 00.

1.4 QUALITY ASSURANCE

.1 Qualifications:

- .1 Installers / applicators / erectors:
 - a. Insulating Glass – two certification programs: IGCC and IGMAC. Possible IGMA Certification (harmonized IGMAC & SIGMA).
 - b. NFRC Certification Program for Energy Rating of Fenestration.
 - c. WDMA Hallmark Program. Be sure to check the Air-Water-Structural Test Reports Manual on our website at <http://www.kolbewindows.com> for air, water, structural and impact ratings.
 - d. IGMAC-Insulating Glass Manufacturer's Association Canada.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Store parts in a dry place and permit natural ventilation over their finished surfaces.
- .2 Store materials in locations protected from damage of other trades.
- .3 Under conditions of high humidity or cold temperatures, supply heating or forced air ventilation to prevent accumulation of surface moisture.
- .4 Mark components to show location on building and on drawings.
- .5 Protect finishes with strippable coating that will not mar, nor deface finish on removal, or a similar method designed to afford an equivalent amount of protection. Leave protected coating intact until damage risk is past or immediately prior to final cleaning.
- .6 Stacking should be done to prevent bending pressure or abrasion of finished surfaces.
- .7 Brace and protect frame units to prevent distortion and damage in shipment and handling.
- .8 Provide methods for lifting or hoisting units into place without causing damage.

1.6 FIELD CONDITIONS

- .1 Comply with requirements of Product manufacturers.

1.7 WARRANTY

- .1 This section shall assume responsibility for warranties of glass and glazing included in the work of this section, in accordance with Section 08 80 00.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- .1 Work of this section shall be provided by one of the following:
 - .1 Ridley Windows and Doors: Extruded Aluminum/Wood Kolbe Ultra
 - .2 Substitutions: Refer to Section 01 25 00.

2.2 LEED REQUIREMENTS

- .1 Material and products under work of this section are to comply with Sustainable Design Requirements provided in Division 1 Section 01 35 20, 01 35 50, 01 35 90 and 01 6110.
- .2 Waste management and disposal:
 - .1 Comply with the waste management plan developed by the Contractor for the Work in accordance with Section 01 35 21 and Section 01 35 50. Comply with the directions of the Contractor's LEED coordinator with regard to waste management and disposal activities.
- .3 Construction indoor air quality (IAQ) management:
 - .2 Comply with the IAQ management plan developed by the Contractor for the Work in accordance with Section 01 35 21 and Section 01 35 90. Comply with the directions of the Contractor's LEED coordinator with regard to IAQ management activities.

2.3 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Air Leakage; except entrance doors: Air leakage through the work shall not exceed 0.3 L/s/m² (0.06 cfm/ft²) of glazing area when tested in accordance with ASTM E283- 04(2012) at test pressure of 300 Pa (6.24 psf).
- .2 Water Penetration (other than entrance doors): No water penetration shall occur when the work is tested in accordance with ASTM E331-00 (2009), amended to prohibit water from passing through interior glazing seals or frame joints, at a test pressure of 300 Pa (6.24 psf).
- .3 Fabricate mullions to ensure under specified loads a maximum deflection of 1/175 of mullion span or 19 mm (3/4"), whichever is less.
- .4 Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with code.
- .5 Design and size components to withstand seismic loads and sway displacement as calculated in accordance with code.
- .6 Provide system to accommodate, without damage to components or deterioration of seals:
 - .1 Movement within system,
 - .2 Movement between system and perimeter framing components,
 - .3 Dynamic loading and release of loads,
 - .4 Deflection of structural support framing,
- .7 Maintain continuous air barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound, in accordance with Section 01 83 00 – General Requirements for Building Envelope.
- .8 Position thermal insulation to exterior of air barrier, in accordance with Section 01 83 00.

- .9 Ensure no 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 occur.
- .10 Provide anchors sufficiently rigid to resist wind and snow loads caused by aluminum shades and brackets, without damage to wall system.
- .11 Design windows in accordance with the following Climatic Design Data:
 - a. Design Temperature: January 1%, July 2%
 - b. Wind (Hourly Wind Pressures): 1 in 30 year occurrence
- .12 Design windows to accommodate the following without detrimental
 - a. Cyclic 40 degrees Celcius daily, thermal swing of components
 - b. Cyclic, dynamic loading and release of loads such as wind loads
 - c. 13mm vertical deflection in the supporting structure due to live, dead load, and creep or deflection, seismic load sway displacement and similar items.

2.4 MATERIALS

- .1 Insulation glass units: Conforming to CAN/CGSB-12.8-M and IGMA requirements
 - a. Outer pane: tempered glass conforming to CAN/CGSB-12.1-M, Type 2, Class B, category 11, clear, minimum 6 mm thick.
 - b. Provide Insulating Glass units with low-E coating edge deletion and low-E coating. Apply low-E coating to the second surface unless otherwise indicated in the contract documents. 'LoE2 272' clear by Cardinal Corp. or an approved alternative.
 - c. Interior space: Argon gas: 90% Pure.
 - d. Inner pane: float glass conforming to CAN/CGSB-12.3-M; clear, glazing quality, clear, minimum 6 mm thick.
- .2 Provide minimum 0.57 mm thick aluminum panels as manufactured by Gentek Building products, Inc. in accordance with the manufacturer's written instructions. Colour shall be selected by *Consultant*.
- .3 Fabricate argon filled thermal units with air space filled a minimum of 90% with argon gas.
- .4 Design anchorage inserts for installation as part of other sections of the work. Design anchorage assemblies to accommodate construction and installation tolerances.
- .5 Finger jointed wood frames are non-acceptable
- .6 Exterior Surface finish - Aluminum, Coal Black
- .7 Interior Surface Finish, shall be Selected by *Consultant*.

2.5 FABRICATION

- .1 Sills: extruded aluminum, finished to match window frames, 15 mm (5/8") minimum projection beyond wall surface. Provide preformed end caps wherever sill terminates. Butt joint sill and provide preformed splice connector and sealant to prevent water penetration. Locate splice connectors (joint covers) at center line of mullions when required. Trim and detail corners neatly.

- .2 Prevent deflection and permanent or progressive glazing displacement. restrict horizontal and vertical mullion deflection to $L/175$ Maximum under uniformly distributed positive load and 10 mm maximum regardless of span.
- .3 Provide structural steel reinforcement for strength, stiffness and connections.
- .4 Fit intersecting members to flush hairline weathertight joints and mechanically fasten together, except where indicated otherwise.
- .5 Conceal fastenings from view. Exposed fastenings where indicated.
- .6 Form cut-outs, recesses, mortising or milling for finishing hardware to templates supplied. Reinforce with aluminum or galvanized steel plates.
- .7 Field apply isolation coating to aluminum in contact with dissimilar metals and/or cementitious materials.
- .8 Fabricated assemblies shall make required clearances other assemblies and for deflection of structure.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install work of this section plumb, square, level, free from warp, twist and superimposed loads.
- .2 Secure work in required position. Do not restrict thermal movement.
- .3 Install hardware in accordance with templates.
- .4 Adjust operable parts for correct function.
- .5 Isolate from cementitious materials.

3.2 AIR VAPOUR BARRIER CLOSURES

- .1 It is the responsibility of this section to give complete cooperation in providing and maintaining the continuity of air/vapour seal to adjacent materials to which the windows and frames abut. Fit flexible seals, tapes, sealants and gaskets at locations required to achieve air/vapour/water resistant and weathertight junctions. Ensure continuity of seal at end joints between lengths of material by overlapping and cementing. Caulk junctions of system components to themselves and other work with sealant to maintain effective vapour, air and water barrier and fix in place with an aluminum flat to the air/vapour seal line at the adjacent material and to the glazing rebate.
- .2 Where deflection of structure will cause dynamic joint movement between aluminum work and dissimilar materials, install flexible seals of sufficient width to allow formation of bellows to take up any torsional and shear stresses.

3.3 GLAZING

- .1 Glaze aluminum framed windows and doors at exterior using insulating glazing units in accordance with Section 08 80 00.

- .2 Glaze interior windows and doors in accordance using glass types given in the glazing schedule and in accordance with section 08 80 00.

3.4 SEALANTS

- .1 Seal between frame members, sills and adjacent construction as a part of the work of this section and in accordance with Section 07 92 00.

3.5 HARDWARE

- .1 Install in accordance with manufacturer's installation instructions.
- .2 Accurately locate and adjust hardware to meet manufacturer's instructions. Use special tools and jigs as recommended.
- .3 Set, fit and adjust hardware according to manufacturer's directions, at heights as agreed by *Consultant*. Hardware shall operate freely. Protect installed hardware from damage and paint spotting.
- .4 Powered hardware:
 - .1 Power wiring will be supplied and installed by electrical work installer including conduit, boxes and other electrical appurtenances, including connections and terminations. Be responsible for ensuring that all wiring work is done in accordance with the Suppliers wiring diagrams and directions.
 - .2 Arrange for testing and commissioning of system by the distributor of the system. Submit a copy of reports to the Consultant.

3.6 ADJUSTING AND CLEANING

- .1 Cleaning on completion of installation:
 - .1 Remove deposits which affect appearance or operation of units.
 - .2 Remove protective materials.
 - .3 Clean interior and exterior surfaces by washing with clear water; or with water, and soap or detergent; followed by a clear water rinse.
 - .4 Clean and restore stained metal surfaces in accordance with manufacturer's recommendations. Replace if cleaning is impossible.
 - .5 Final cleaning is specified in Section 01 77 00.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

1.2 SECTION INCLUDES

- 1.1 General Instructions
- 1.2 Section Includes
- 1.3 SUMMARY
- 1.4 REFERENCES
- 1.5 SUBMITTALS
- 1.6 QUALITY ASSURANCE
- 1.7 DELIVERY, STORAGE AND HANDLING
- 1.8 COORDINATION
- 1.9 WARRANTY
- 2.1 MANUFACTURERS
- 2.2 MATERIALS
- 2.3 HANGING DEVICES
- 2.4 FLUSH BOLTS AND ACCESSORIES
- 2.5 CYLINDERS AND KEYING
- 2.6 LOCKING DEVICES
- 2.7 ELECTRIC STRIKES
- 2.8 EXIT DEVICES
- 2.9 AUTOMATIC DOOR OPERATORS
- 2.10 DOOR CLOSERS
- 2.11 DOOR TRIM AND PROTECTIVE PLATES
- 2.12 DOOR STOPS AND HOLDERS
- 2.13 GASKETING AND THRESHOLDS
- 2.14 SILENCERS
- 2.15 SLIDING DOOR TRACK
- 2.16 ELECTRONIC PRODUCTS AND ACCESSORIES
- 2.17 FINISHES
- 3.1 EXAMINATION
- 3.2 PREPARATION
- 3.3 INSTALLATION
- 3.4 FIELD QUALITY CONTROL
- 3.5 ADJUSTING
- 3.6 CLEANING AND PROTECTION
- 3.7 DEMONSTRATION

1.3 SUMMARY

- .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 includes
 - .1 Furnishing of all items of finish hardware as hereinafter specified or obviously necessary for all swinging, sliding, folding and other doors as indicated in the Contract Documents. Except, items which are specifically excluded from this Section of the specification or are of unique hardware specified in the same Sections as the doors and frames on which they are installed.
- .3 Related sections
 - .1 06 40 00 – Architectural Woodwork
 - .2 08 11 13 – Steel Doors and Frames
 - .3 08 35 13 – Four-Fold Metal Doors
 - .4 08 36 13 – Sectional Overhead Metal Doors
 - .5 08 41 00 – Aluminum Framed Glazing
 - .6 08 71 13 – Automatic Door Operators
 - .7 28 00 00 – Security System

1.4 REFERENCES

- .1 Codes and standards
 - .1 ANSI A117.1 – Accessible and Usable Buildings and Facilities
 - .2 ANSI A156.1 – Butts and Hinges
 - .3 ANSI A156.3 – Exit Devices
 - .4 ANSI A156.4 – Door Controls – Closers
 - .5 ANSI A156.5 – Cylinders and Input Devices for Locks
 - .6 ANSI A156.6 – Architectural Door Trim
 - .7 ANSI A156.7 – Template Hinge Dimensions
 - .8 ANSI A156.8 – Door Controls – Overhead Stops and Holders
 - .9 ANSI A156.9 – Cabinet Hardware
 - .10 ANSI A156-10 – Power Operated Pedestrian Doors
 - .11 ANSI A156.11 – Cabinet Locks
 - .12 ANSI A156.12 – Interconnected Locks
 - .13 ANSI A156.13 – Mortise Locks and Latches Series 1000
 - .14 ANSI A156.16 – Auxiliary Hardware

- .15 ANSI A156.18 – Materials 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 A156.28 – Recommended Practices for Mechanical Keying Systems
- .22 ANSI A156.29 – Exit Locks, Exit Alarms, Alarms for Exit Devices
- .23 ANSI A156.30 – High Security Cylinders
- .24 ANSI A156.31 – Electric Strikes and Frame Mounted Actuators
- .25 ANSI A156.32 – Integrated Door Opening Assemblies
- .26 ANSI A156.36 – Auxiliary Locks
- .27 ANSI A250.4 – Steel Doors and Frames Physical Endurance
- .28 NFPA 80 – Standard for Fire Doors and Other Opening Protectives
- .29 NFPA 101 – Life Safety Code
- .30 OBC 2006 – Ontario Building Code
- .31 SDI 122-07 – Installation and Troubleshooting Guide for Standard Steel Doors and Frames
- .32 Door and Hardware Institute Publication – Sequence and Format for the Hardware Schedule (1996)
- .33 Door and Hardware Institute Publication – Keying Systems and Nomenclature (1989)

1.5 SUBMITTALS

- .1 General requirements
 - .1 Submit all documentation and samples in accordance with Division 01, General Requirements.
- .2 Schedules and data
 - .1 *Product Data*: Manufacturer's *Product* data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
 - .2 Door Hardware Schedule: Prepared and submitted within 14 Working *Days* of receipt of purchase order by or under the supervision of supplier and coordinated with all *Drawings* and related documents to ensure; size, thickness, hand, function, finish and application of hardware. All approved hardware changes shall be incorporated in the hardware schedule and kept current throughout the duration of the *Project*.
 - .1 Format: Vertical format and sequence as detailed in the Door and Hardware Institute (DHI) publication "Sequence and Format for the Hardware Schedule".

- .2 Content: Include the following information for each opening:
 - .1 Location of each hardware set cross-referenced to identifying mark(s) on Architectural floor plans and in door and frame schedule included in the Contract Drawings.
 - .2 Handing and degree of swing of each door.
 - .3 Keying information.
 - .4 Quantity, type, style, function, size and finish of each hardware item.
 - .5 Complete methods of operation for all openings containing electronic components with detailed operational descriptions of each items function(s) during all typical conditions and ingress/egress situations.
 - .6 Elevation drawings of all openings with electronic hardware systems identifying locations of components, conduit, back boxes, junction boxes and miscellaneous system requirements.
 - .7 Name and manufacturer of each hardware item.
 - .8 Fastenings and other pertinent installation information.
 - .9 Hardware mounting locations when different from standard.
- .3 Samples: *Provide* each type of hardware in finish indicated in the *Contract Drawings* as requested. Items will be returned in original packaging and working order to the *Contractor* to be incorporated into the *Project* scope of *Work*.
- .4 Templates: Furnish a complete, indexed list with templates and finish hardware schedule to the Contractor for each trade supplying materials requiring hardware preparations.
- .5 Electronic hardware systems:
 - .1 Wiring Diagrams: Prepared and submitted within 10 *Working Days* of receipt of purchase order by or under the supervision of *Supplier* and coordinated with all *Drawings* and related documents to ensure accurate function and coordination.
 - .1 Elevations: *Provide* diagrams for each unique opening with electronic hardware components identifying individual item locations, conduits, back boxes, junction boxes and miscellaneous system requirements and devices.
 - .2 Risers: *Provide* diagrams detailing locations and infrastructure between door openings, power supplies, access control panels and system components.
 - .3 Point to Points: *Provide* diagrams detailing wiring terminations at all electrified devices as applicable to function of all openings. (inclusion depending on installation)
 - .4 Responsibility matrix: *Provide* documentation for approval detailing basic responsibilities inclusive of all related Sections involved in the preparation for, installation and commissioning of electrified systems.
- .6 Keying Schedule: Prepare a separate schedule, in accordance with DHI publication "Keying Systems and Nomenclature", detailing final keying instructions for all locksets and cylinders. Include; keying system explanation, door numbers, keyset symbols, hardware set numbers, and special instructions. The *Owner* to approve submitted keying schedule prior to the ordering of permanent cylinders.

- .7 Operations and Maintenance Manuals: *Provide* operating and maintenance manuals in accordance with Division 01, Section 01 77 00 - Contract Closeout Procedures and Submittals and 01 78 23 Operation and Maintenance Manuals. Manuals must include; complete manufacturer and distributor contact information, manufacturers documentation for care and maintenance of all *Products* and finishes, manufacturers *Product* parts lists, manufacturers installation and adjustment instructions, manufacturers/service representatives warranty documentation, and 'as built' copies of all submittal documentation.
- .8 Warranties and Maintenance Agreements; *Provide* manufacturers/service representatives special warranties and maintenance agreements specified in this Section.

1.6 QUALITY ASSURANCE

- .1 Substitutions
 - .1 Refer to Section 01 25 00 – Product Substitution Procedures.
- .2 *Supplier* qualifications
 - .1 A recognized Architectural door hardware *Supplier* who has maintained an office and has minimum of five years' documented experience in providing consulting services and supplying mechanical and electromechanical hardware comparable in material, design and extent to that required for this *Project*.
 - .2 Have an office and warehouse facilities to accommodate this *Project*.
 - .3 Authorized factory distributor in good standing of all *Products* specified in this Section.
 - .4 Have in their employment a minimum of one Architectural Hardware *Consultant* (AHC) as administered and certified by The Door and Hardware Institute, Chantilly VA or *Equivalent* certification. AHC shall be responsible for preparation of finish hardware/keying schedules.
- .3 Installer qualifications
 - .1 Trained by the primary *Product* manufacturers with a minimum of five years' documented experience in the installation of both mechanical and electromechanical hardware comparable in material, design and extent to that required for this *Project*.
- .4 Source limitations
 - .1 Electrified modifications and enhancements made to a source manufacturer's *Product* line by a secondary or third party source will not be accepted.
 - .2 *Provide* electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated in the *Contract Documents*.
- .5 Fire-rated openings
 - .1 *Provide* door hardware for fire-rated openings that complies with NFPA 80 and requirements of the *Authorities Having Jurisdiction*. *Provide* only items that are listed/labelled by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.
- .6 Keying conference
 - .1 Conduct conference to comply with requirements in Division 01, Section 01 31 19 - Project Meetings. Keying conference to incorporate the following criteria into the final keying schedule document:

- .1 Function of building, purpose of each area and degree of security required.
- .2 Plans for existing and future key system expansion.
- .3 Requirements for key control storage and software.
- .4 Installation of permanent keys, cylinder cores and software.
- .5 Address and requirements for delivery of keys.
- .7 Pre-submittal conference
 - .1 Conduct conference to comply with requirements in Division 01, Section 01 31 19 -Project Meetings, with attendance by representatives of *Supplier(s)*, installer(s) and *Subcontractor(s)* to review proper methods and the procedures for receiving, handling and installing door hardware.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Marking and packaging
 - .1 Mark items according to the approved hardware schedule indicating hardware set and door number.
 - .2 Items to be sorted, verified and repackaged in manufacturer's original packaging complete with necessary screws, accessories, templates, installation instructions and any specialized tools required for installation.
- .2 Delivery
 - .1 The *Contractor* shall ensure that delivery times for receipt of door hardware are acceptable to the *Consultant*. The *Contractor* shall check deliveries against accepted list and *Provide* written acceptance assuming responsibility for storage and care. Immediately identify any shortages or damaged items in writing.
 - .2 The *Contractor* shall ensure that hardware items are jointly inventoried on *Site* by representatives from hardware *Supplier*, installer and relevant *Subcontractor*.
 - .3 Deliver permanent keys, cylinders, cores, access control credentials, software and related accessories directly to the *Owner* via registered mail or as established at the 'Keying Conference'.
 - .4 Do not store electronic access control hardware, software or accessories at the *Site* without prior authorization.
 - .5 Construction master keys to be separately packaged from all other items and delivered to *Owner* as previously coordinated.
- .3 Storage
 - .1 The *Contractor* shall *Provide* a clean, dry and secure hardware storage room with adequate shelving to layout each item by door number and hardware set number. Room size, location and layout to be jointly coordinated with hardware *Supplier*, installer and *Subcontractor*.

1.8 COORDINATION

- .1 Obtain and distribute templates for doors, frames and other work specified to be factory prepared for installing standard and electrified hardware. Review *Shop Drawings* of related Sections to ensure that adequate provisions and modifications are made for locating and installing hardware.

- .2 Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required power connections, conduit, fire alarm connections, junction boxes, back boxes, reinforcing and mounting locations for low voltage power supplies, detection/monitoring hardware, power transfer devices and all other listed components.
- .3 Coordination meetings:
 - .1 The *Contractor* shall ensure that hardware *Supplier* meets with the *Owner*, the *Consultant*, the electrical *Subcontractor*, security contractor and Access Control *Subcontractor* to review, coordinate and implement all details relating to the proper operation and location of all electronic hardware prior to start of construction. Review methods of operation for each unique opening with electrified components.
 - .2 Conduct a *Project* specific training meeting to instruct the installation *Subcontractor's* personnel on the proper installation and adjustment of all *Products*. *Product* training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates, physical *Product* samples as required and review of method of operation for electrified openings.
 - .3 Inspect and review electrical rough-ins, power supply connections and all other applicable work by related trades.
 - .4 Review and finalize construction schedule and verify material availability.
 - .5 Review the required inspection, testing, commissioning and demonstration procedures.
- .4 Upon completion of installation, *Provide* written documentation that components were applied as per manufacturer's instructions and recommendations according to the approved hardware schedule. Identify any defective or damaged materials.

1.9 WARRANTY

- .1 General Warranty in accordance with Division 01, General Requirements and Article A-15 of the Agreement Between *Owner* and *Contractor*. Special warranties specified in this article shall not deprive the *Owner* of other rights under other provisions of the *Contract Documents* and shall be in addition to, and run concurrent with other warranties made by the *Contractor* under requirements of the *Contract Documents*.
- .2 Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period of two years as specified in Article A-15 of the Agreement Between *Owner* and *Contractor*. Failures include, but are not limited to:
 - .1 Structural failures including excessive deflection, cracking, or breakage.
 - .2 Faulty operation of hardware.
 - .3 Deterioration of metals, finishes and other materials beyond normal weathering.
 - .4 Electrical component defects and failures within system operation.
- .3 Extended warranty periods:
 - .1 Hinges - Lifetime
 - .2 Mortise Locksets – Seven (7) years

- .3 Exit Devices – Five (5) years
- .4 Door Closers – Ten (10) years
- .5 Electric Strikes – Five (5) years
- .6 Electromechanical Locksets – Two (2) years
- .7 Electromagnetic Locks – Lifetime
- .8 Power Supplies - Lifetime

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers as listed below have been determined as the acceptable standard. Obtain each type of finish hardware (hinges, latch and locksets, exit devices, door closers, etc.) From a single manufacturer.

2.2 MATERIALS

- .1 Screws and fasteners
 - .1 All required screws shall be supplied as necessary for securing finish hardware in the appropriate manner. Thru-bolts shall be supplied for exit devices and door closers where required by code and the appropriate blocking or reinforcing is not present in the door to preclude their use.

2.3 HANGING DEVICES

- .1 Hinges
 - .1 Hinges shall conform to ANSI A156.1 and have the number of knuckles as specified, oil-impregnated bearings as specified with NRP (non-removable pin) feature, at all exterior and interior locked reverse bevel doors. Unless otherwise scheduled, supply 2 hinges for doors up to 60" (1520mm) in height and supply one (1) additional hinge for every 30" (760mm) of door height or part thereof. Hinges shall be sized per the manufacturer's recommendations. Hinges shall be a minimum of 4 1/2" high and 4" wide; heavy weight hinges (.180) shall be supplied at all doors where specified in the *Contract Documents*.
 - .2 Provide hinge size to comply with the following:

Door Width	Hinge Height	Hinge Width
Up to 36"	4-1/2"	4"
Over 36"	5"	4-1/2"
Up to 48"	5"	5"
Over 48"	6"	6"

- .1 Specified Manufacturer: McKinney TA/T4A Series or *Equivalent*
- .2 Electric hinges
 - .1 Electric hinges shall be provided with Molex standardized plug connectors to accommodate up to 12 wires. Plug connectors shall plug directly into Molex through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Provide a mortar guard for each electric hinge specified in Contract Documents.

- .1 Specified Manufacturer: Assa Abloy McKinney or Markar - QC Series or *Equivalent*
- .3 Continuous geared hinges
 - .1 All hinges to be non-handed and completely reversible. Hinge line to be available in concealed flush mount with or without inset, full surface and half surface types as specified in the hardware sets. All hinges to be made of extruded 6060 T6 aluminum alloy with polyacetal thrust bearings, anodized after cutouts are made for bearings. All concealed hinges to be fire-rated for 20, 45 and 90 minutes when incorporated into proper door and frame labeled installations, without necessitating the use of fusible-link pins. All concealed hinges to be available in standard, heavy, and extra heavy duty weights; all full surface and half surface hinges in standard and heavy duty weights as specified in the hardware sets. All hinges to be factory cut for door size.
 - .1 Specified Manufacturers: Assa Abloy McKinney
 - .2 Or *Equivalent*. Refer to Section 01 25 00 – Product Substitution Procedures.

2.4 FLUSH BOLTS AND ACCESSORIES

- .1 All manual and automatic flush bolts to be furnished as specified.
 - .1 Specified Manufacturer: Assa Abloy Rockwood
 - .2 Or *Equivalent*. Refer to Section 01 25 00 – Product Substitution Procedures

2.5 CYLINDERS AND KEYING

- .1 Cylinders
 - .1 All Permanent Cylinders are to be Schlage Large Format Interchangeable Core.
 - .1 Specified Manufacturer: Schlage IFIC C keyway
 - .2 Or *Equivalent*. Refer to Section 01 25 00 – Product Substitution Procedures
- .2 Keying
 - .1 Permanent Cores to be Master keyed & keyed Different at the factory.
 - .2 Furnish the Cylinders directly to the *Owner*. The *Owner* will rekey the cylinders to their requirement.
 - .3 The *Contractor* shall remove all construction cores and install all permanent cores, unless otherwise directed by the *Owner*.
 - .4 Pack all permanent cylinders and keys separately from locksets. Identify door number and keyset symbol on each envelope.
 - .5 Ship the control keys directly to the *Owner* unless directed otherwise.
 - .6 Furnish the following:
 - .7 Two change keys per lock.
 - .8 I/C Core – four construction control keys and four permanent control keys.
 - .9 15 construction keys.

- .10 The construction keys are to be shipped separate from the locksets, directly to the *Contractor*.

- .3 Key cabinet

- .1 *Provide* a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall expansion capacity of 150% of the number of locks required for the project. The *Contractor* shall ensure that the hardware *Supplier* assists the *Owner* with the set up of the key cabinet.

- .1 Specified Manufacturer: Telkee AWC Series or *Equivalent*.

2.6 LOCKING DEVICES

- .1 Mortise locksets

- .1 All locksets shall be ANSI 156.13 Series 1000, Grade 1 Certified. All functions shall be manufactured in a single sized case formed from 12 gauge steel minimum. The lockset shall have a field-adjustable, beveled armored front, with a .125" minimum thickness and shall be reversible without opening the lock body. The lockset shall be 2 3/4" backset with a two-piece 3/4" anti-friction stainless steel latchbolt. The deadbolt shall be a full 1" throw made of stainless steel and have 2 hardened steel roller inserts. All strikes shall be non-handed with a straight lip. To ensure proper alignment, all trim, shall be thru-bolted and fully interchangeable between rose and escutcheon designs and shall be the product of one manufacturer.

- .1 Specified Manufacturer: Corbin Russwin Inc. ML2000 Series or *Equivalent*.

- .2 Electrified locksets

- .1 Mechanical features of locksets shall conform to standards as specified above. Locksets shall be fail-secure unless otherwise specified. Where specified electrified locksets shall be provided with a switch to monitor inside or outside lever handle or signal remote location. *Provide* an in-line power controller with all electrified locksets.

- .1 Specified Manufacturer: Corbin Russwin Inc. or *Equivalent*.

- .3 Lockset strikes

- .1 Strikes shall be non-handed and straight lip. *Provide* strikes with lip-length required to accommodate jamb and/or trim detail and projection.

2.7 ELECTRIC STRIKES

- .1 Standard strikes

- .1 All standard electric strikes shall meet BHMA standard 501, grade 1 and be UL Listed for Burglary Resistance, category 1034. Strikes shall be all stainless steel construction for corrosion resistance, strength and durability. Strikes shall have been tested to withstand a forcing strength of a minimum 2400 lbs. before releasing and perform with a minimum of one million cycles of operation. Strikes shall be 24VDC fail-secure unless otherwise specified in the *Contract* documents. *Provide* an in-line power controller with all electric strikes.

- .1 Specified Manufacturers: Assa Abloy HES 1006 Series or *Equivalent*.

- .2 Surface mounted strikes

- .1 All surface mounted electric strikes shall meet BHMA standard 501, grade 1 and be UL Listed for Burglary Resistance, category 1034. Strikes shall have two heavy-duty, stainless steel locking mechanisms operating independently to *Provide* tamper resistance. Optional latchbolt and latchbolt strike monitoring that indicates position of the latchbolt and locked condition of the strike shall be available. Strikes shall have been tested for a minimum of 500,000 operating cycles. *Provide* an in-line power controller with all electric strikes.
- .1 Specified Manufacturers: Assa Abloy HES 9500(Fire Rated) HES 9600(non-Rated) or *Equivalent*.

2.8 EXIT DEVICES

- .1 Conventional devices – push rail
 - .1 All exit devices shall be ANSI A156.3, Grade 1 Certified and shall be listed by Underwriters Laboratories and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101. Mounting rails shall be formed from a solid single piece of stainless steel, brass or bronze no less than 0.072" thick. Push rails shall be constructed of 0.062" thick material. Painted or anodized aluminum shall not be considered heavy duty and is not acceptable. Lever trim shall be available in finishes and designs to match that of the specified locksets.
 - .1 Specified Manufacturer: Von Duprin 99/33 Series or *Equivalent*.
- .2 Electrified devices
 - .1 Electrified exit devices shall conform to all traditional exit device standards. All power requirements for exit devices used must utilize a continuous circuit electric hinge for clean design and no visible means of interrupting power to device.
 - .2 All exit devices, both fire labeled and non-labeled devices, requiring electric dogging shall be held in the "dogged" or retracted position. All exit devices with electric latch retraction shall *Provide* for a remote means of unlocking for momentary or maintained periods of time.
 - .3 Where specified exit devices shall be provided with a switch to monitor push rail or signal remote location and latchbolt monitoring.
 - .4 *Provide* a 782 Series Controller from Corbin Russwin Inc. with all Electric Latch Retraction devices or *Equivalent*.

2.9 AUTOMATIC DOOR OPERATORS

- .1 Section removed under Addendum #4, refer to Section 08 71 13 and Door Hardware Schedule.

2.10 DOOR CLOSERS

- .1 Surface mounted closers – heavy duty
 - .1 All door closers shall be ANSI 156.4, Grade 1 Certified. All closers shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to *Provide* up to 50% increase in spring power. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

- .1 Specified Manufacturer: Yale Security Inc. Norton 7500 Series or *Equivalent*.
- .2 Surface mounted closers – standard duty
 - .1 All door closers shall be ANSI 156.4, Grade 1 Certified. All closers shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to *Provide* up to 50% increase in spring power. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 - .1 Specified Manufacturer: Yale Security Inc. Norton 8500 Series or *Equivalent*.

2.11 DOOR TRIM AND PROTECTIVE PLATES

- .1 Door Pulls/Push/Kick/Armour Plates: to be 0.050 inches thick and 1.5 inches less full width of door, or as specified. Furnish all push/kick and armour plates with 'B4E' beveled edges. Where door pulls and push plates are specified countersink door pull throughbolts in door for flush fit and apply push plates over top of throughbolts. Follow specific mounting instructions where push plate, door pull and deadlock applications occur. Fasteners for push plates, pull plates, door pulls and miscellaneous door trim shall be as shown in the hardware schedule. Where full height door pulls are specified supply units less 150mm from the top of door and 300mm from bottom of door. Submit shop drawing of pulls for review.
- .1 Specified Manufacturer: Assa Abloy Rockwood or *Equivalent*.

2.12 DOOR STOPS AND HOLDERS

- .1 Wall mounted door stops
 - .1 Where a door is indicated in the *Contract Drawings* to strike flush against a wall, wall bumpers shall be provided. *Provide* convex or concave design as indicated.
 - .1 Specified Manufacturers: Assa Abloy Rockwood or *Equivalent*.
- .2 Overhead stops/holders
 - .1 Where specified, overhead stops/holders as shown in the hardware sets are to be provided. Track, slide, arm and jamb bracket shall be constructed of extruded bronze and shock absorber spring shall be of heavy tempered steel. Overhead stops shall be of non-handed design.
 - .1 Specified Manufacturers: Assa Abloy Rixson 1/2/9/10 Series or *Equivalent*.

2.13 GASKETING AND THRESHOLDS

- .1 On exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. *Provide* seals as required to meet UL10C. *Provide* only those units where silicon seal strip is easily replaceable and readily available from stocks maintained by manufacturer. *Provide* head seal as solid aluminum extrusion suitable for stop applied hardware i.e. P/A closers or surface overhead door stops.
- .2 Door Sweeps: House nylon brush seal in extruded aluminum case. Surface applied and adjusted to suit gap at bottom of door, complete with snap cover.

- .3 Auto Door Bottoms: Surface or semi mortise automatic door bottoms housed in aluminum case and equipped with nylon brush inserts. Each unit sized to suit the door width and meets the requirements of ANSI/BHMA 156.22-2003 for latching force and air infiltration.
- .4 Astragal Seal: House nylon brush seal in extruded aluminum case. Surface applied, meeting stile astragal, consisting of two pieces attached to pull side face of door. Adjust during installation for proper seal prior to attaching snap cover.
- .5 *Provide* threshold units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames. All threshold units shall comply with the *Accessibility for Ontarians with Disabilities Act* (AODA).
- .1 Specified Manufacturers: Assa Abloy Pemko or *Equivalent*.

2.14 SILENCERS

- .1 Furnish rubber door silencers all hollow metal frames; two per pair and three per single door frame.

2.15 SLIDING DOOR TRACK

- .1 Supply sliding door track and hardware for doors weighing up to 200lbs for standard applications. *Provide* needle bearing rollers and aluminum track. Where noted *Provide* sliding door hardware in kit form consisting of hangers, nylon guide, stops and adjustable wrench and mounting hardware. For applications of heavy sliding doors use individual components designed to carry required load capacities, as noted in the hardware schedule.
- .1 Specified Manufacturer: Assa Abloy Pemko or *Equivalent*.

2.16 ELECTRONIC PRODUCTS AND ACCESSORIES

- .1 Keypads
 - .1 Keypads shall be 24VDC and operate a 5-amp Double Pole double Throw (DPDT) relay to switch any type of fail-safe or fail-secure electric lock or strike and be weather proof, vandal resistant and suitable for mounting on a narrow mullion. The keypad system circuit board shall be a remote unit to allow for increased security. Release time shall be programmable from 1 to 99 seconds. Keypads shall support 2-to-7-digit codes for a minimum of 59 users and shall be locked out for 30 seconds when 16 wrong digits are entered. System shall have user/installer programmable options such as anti-tailgate, anti-door prop, and duress code alarm.
 - .1 Specified Manufacturer: Assa Abloy Securitron DK26 Series or *Equivalent*.
- .2 Keyswitches
 - .1 Keyswitches shall be furnished on a stainless steel single gang face plate with a 12/24VDC bi-color LED and an integral backing bracket that shall permit integration with any 1.25" or 1.125" mortise cylinder. Keyswitches shall be available for momentary or maintained action and in narrow stile designs.
 - .1 Specified Manufacturers: Assa Abloy Securitron MK Series or *Equivalent*.
- .3 In-line power controller
 - .1 Where specified, electrified *Products* shall be supplied with an in-line power controller that enables the hardware to operate from 12 to 32 volts. On board safety features shall include an in-line fuse to protect the hardware and host system from any possible reverse current

surges. The controller shall regulate current to *Provide* continuous duty operation without the typical head build up.

.1 Specified Manufacturers: Assa Abloy HES 2005 Smart-Pac III or *Equivalent*.

.4 Power supplies

.1 Power supplies shall furnish regulated 24VDC and shall be UL class 2 listed. LED's shall monitor zone status (voltage/no voltage) and slide switches shall be provided to connect or disconnect the load from power; 1, 4 or 8 separate output circuit breakers shall be provided to divide the load. Power supplies shall have the internal capability of charging optional 24VDC sealed lead acid batteries in addition to operating the DC load. Power supplies shall be supplied complete requiring only 120VAC to the fused input and shall be supplied in an enclosure. Power supplies shall be provided with emergency release terminals that allow the release of all devices upon activation of the fire alarm system.

.1 Specified Manufacturer: Assa Abloy Securitron BPS or *Equivalent*.

.5 Elynx cables

.1 All power transfer hinges, electrified locksets, electric exit device trim and electric exit devices are to be equipped with Molex plug connectors. Door and Frame Elynx cables have been specified at a provisional length at each of these locations. The *Contractor* shall ensure that the finishing hardware *Supplier* supplies these cables, prior to door/frame manufacture, in appropriate lengths required by the various manufacturers. The Contractor shall ensure that the hardware *Supplier* contacts the door manufacturers to determine the cabling route and supply the correct length. Where the door manufacturer requires flying ends on Elynx cables the hardware installer will be responsible to map and pin Molex connectors.

.1 Specified Manufacturer: Assa Abloy McKinney or *Equivalent*.

2.17 FINISHES

- .1 The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 or traditional U.S. finishes shown by certain manufacturers for their *Products*.
- .2 *Provide* quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine scheduled openings, with installer present, for compliance with requirements for; installation tolerances, labelled fire door assembly construction, wall and floor conditions, and other *Site* conditions affecting performance. Notify the *Consultant* in writing of any discrepancies or conflicts between the door schedule, door types, *Drawings* or scheduled hardware. Discrepancies and conflicts to be resolved in writing prior to installation of hardware.
- .2 Examine hardware to ensure it is free from defects prior to installation.
- .3 Ensure that building is secured and free from weather elements prior to installation of interior door hardware.

3.2 PREPARATION

- .1 Door and Frame Preparation: Field prepare doors and frames for all function holes and fasteners under 25.4mm (1") as per the manufacturer(s) templates and installation instructions provided. Drill and tap as required.

3.3 INSTALLATION

- .1 *Install* each item of mechanical and electromechanical hardware and access control equipment to comply with the manufacturer's written instructions and according to specifications. All items to be installed with fasteners identified by manufacturer's installation instructions unless otherwise noted in the *Contract Documents*.
- .2 Mounting Heights: Install door hardware at heights indicated in the following applicable publications unless; specifically indicated or required by Authorities Having Jurisdiction , requirements to match existing conditions, special templates, necessary coordination with door elevations, and or to ensure consistency with pairs of doors.
 - .1 DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames"
 - .2 DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors"
 - .3 ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities"
 - .4 NWWDA
- .3 Power door operator *Products* and accessories are required to be installed by an AAADM certified technician or equivalent certification acceptable to the *Consultant*, as approved by the manufacturer. Adjust for proper opening and closing operation after final balancing of HVAC system.
- .4 Wall stops: Locate wall stops to contact door pulls/levers at mounting post connecting to door. Ensure existence of necessary wall reinforcing where specified for installation on drywall, plaster or clad wall conditions prior to installation.
- .5 Closers: Size closers as per manufacturer's installation instructions. Adjust all closers after final balancing of HVAC system to ensure; proper latching of doors, proper closing/latch speed, adequate backcheck and opening force in accordance with referenced accessibility requirements.
- .6 Protection plates – Install on clean surface, and in temperature range of 5-25 degrees Celsius where tape applied. Pre-drill pilot holes doors when using mechanical fasteners.
- .7 Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Section 07 92 00 -Joint Sealants.
- .8 Architectural Seals – Install prior to other soffit mounted door hardware as indicated in hardware schedule. Ensure continuous seal of gasketing to door without impeding latching.
- .9 Door Bottoms – Ensure continuous seal to threshold or finished floor.
- .10 Electronic hardware systems: Install all electronic hardware as per electrical elevations and point-to-point drawings furnished under 01 33 00 Submittals & Procedures.

3.4 FIELD QUALITY CONTROL

- .1 The *Contractor* shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures for coordinating all portions of work under the *Contract*, unless the *Contract Documents* give other specific instructions.
- .2 The *Contractor* shall conduct periodic inspections to ensure that door frames are installed plumb, level and square with verification by installer prior to installation of doors and door hardware.
- .3 The *Contractor* shall ensure that the hardware *Supplier* attends *Site* meetings as required to ensure proper execution of the guidelines set forth in this Section.
- .4 The *Contractor* shall ensure that the hardware *Supplier* performs a final field inspection of installed door hardware after final adjustment of all *Products* and documents and reports any deficiencies or omissions for correction and written acceptance by the *Consultant*.

3.5 ADJUSTING

- .1 Adjust and verify proper operation and function of each operating item of hardware (including electromechanical) on all doors prior to acceptance and occupancy. Replace units that cannot be adjusted to operate freely and as intended for the application made, without any additional cost to the Owner.

3.6 CLEANING AND PROTECTION

- .1 The *Contractor* shall protect all hardware, as it is stored on construction *Site* in a covered, dry and secure place. Protect exposed hardware installed on doors and frames during the construction phase. Install any and all hardware at the latest possible time frame.
- .2 Remove manufacturer's protective coating from items after written acceptance of installation by the *Consultant*.
- .3 Clean operating items as necessary to restore to proper function and finish of hardware and doors.
- .4 Clean adjacent surfaces soiled by door hardware installation.

3.7 DEMONSTRATION

- .1 Instruct the *Owner's* maintenance personnel in the proper adjustment, operation and maintenance of mechanical and electromechanical door hardware, electronic devices and maintenance of finishes.

END OF SECTION

HARDWARE SCHEDULE FOR
TOWN OF WS FIRE STATION & YORK REGION
PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Consultant: **Shaun Craig, DHC**

Submittal Date: **SEP 08, 2025**

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

HOLLOW METAL - GENERAL NOTES

- MATERIAL SHOWN ON THESE DRAWINGS WILL BE FABRICATED ONLY AFTER FORMAL APPROVAL BY THE ARCHITECT AND CONTRACTOR, RECEIPT OF APPROVED FINISH HARDWARE SCHEDULE AND ALL NECESSARY TEMPLATES.
- DOORS AND FRAMES WILL BE REINFORCED FOR SURFACE MOUNTED HARDWARE AS REQUIRED. DRILLING AND TAPPING FOR ATTACHING OF HARDWARE BY OTHERS.
- ALL WELDED FRAMES WILL BE SUPPLIED WITH TWO TEMPORARY SHIPPING BARS TO MAINTAIN PROPER ALIGNMENT DURING SHIPPING AND MUST BE REMOVED PRIOR TO INSTALLATION.
- SUPPLY AND INSTALLATION OF GLASS AND GLAZING MATERIALS BY OTHERS.
- ALL DOORS AND FRAMES WILL BE MARKED WITH ARCHITECTS OPENING NUMBERS.
- ALL PLANT ON TYPE MOULDINGS BY OTHERS.
- ALL FRAME INSULATION BY OTHERS.
- PAINT BY OTHERS.

FRAME INSTALLATION VIDEO - <https://www.youtube.com/watch?v=vWFJ1OK00dU>

HARDWARE - GENERAL NOTES

- GENERAL CONTRACTOR TO INSURE ALL WOOD DOORS , FRAMES AND WALLS WHERE REQUIRED TO HAVE FULL WOOD BLOCKING FOR HARDWARE ITEMS SUCH DOOR CLOSERS , OPERATORS, EXIT DEVICES , TRACK HARDWARE ETC.
- ALL HOLD OPEN DOOR CLOSERS TO BE INSTALLED TO THE MAXIMUM OPENING DEGREE POSSIBLE WITHOUT HITTING THE WALL .
- DOOR CLOSERS TO BE MOUNTED OUT OF THE CORRIDOR WHERE EVER POSSIBLE.

WOOD DOORS - GENERAL NOTES

- IF DOORS ARE UNFINISHED, ALL EDGES MUST BE SEALED WITHIN 24 HOURS OF DELIVERY TO SITE TO MAINTAIN WARRANTY.
- DOORS MUST BE STORED FLAT ON A SKID INSIDE FOR 24 HOURS TO ACCLIMATIZE, AVOID WARPAGE AND MAINTAIN WARRANTY.
- NO GLASS OR LOUVRES ARE INCLUDED, ALL BY OTHERS.
- DOORS ARE PREPARED FOR STANDARD HARDWARE ONLY, ANY HARDWARE PREPS OTHER THAN ON HARDWARE LIST AT TIME OF TENDER ARE EXTRA.
- SHOP DRAWINGS RETURNED WITH "REVIEWED" OR "REVIEWED AS NOTED" INDICATES ACCEPTANCE OF MATERIALS AS LISTED.
- ELITE DOOR & HARDWARE WILL NOT TAKE RESPONSIBILITY FOR AN INCOMPLETE REVIEW THAT RESULTS IN UNWANTED MATERIALS ON SITE.
- ANY CHANGES WILL RESULT IN ADDITIONAL CHARGES.

PLEASE NOTE

**SCHEDULES (HARDWARE, HOLLOW METAL & WOOD) MUST BE REVIEWED IN DETAIL FOR DESIGN, FUNCTION AND MANUFACTURER, JAMB DEPTH, GAUGE AND ALL OTHER INFORMATION LISTED IN SCHEDULE.
SCHEDULES RETURNED WITH REVIEWED OR REVIEWED AS NOTED INDICATES ACCEPTANCE OF ALL HARDWARE AND MATERIALS AS INDICATED.**

**IF SCHEDULES ARE NOT REVIEWED IN COMPLETE DETAIL ELITE DOOR & HARDWARE INC WILL NOT TAKE ANY RESPONSIBILITY.
ANY CHANGES COULD RESULT IN ADDITIONAL CHARGES.**

SIGNED BY _____ PRINT _____ DATE _____

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
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Submittal Date: SEP 08, 2025

Manufacturers & Finishes

Manufacturers

Adams Rite Manufacturing Co.
Camden Door Controls
CorbinRusswin
DORMA
dormakaba
HES
K.N. Crowder
McKinney
MEDECO
Norton Rixson Door Control Products
Pemko
Rockwood Manufacturing
Sargent
Standard Metal
User Hardware

Finishes

626 - Satin chromium plated over
nickel
628 - Satin aluminum, clear
anodized
630 - Satin stainless steel
689 - Aluminum painted
C26D - Satin chromium plated over
nickel
C32D - Satin stainless steel

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Openings Schedule

Opening Number(s)	Qty	Heading Num.	Location 1	To/ From	Location 2	Nominal Width	Nominal Height	Door Thickness	Hand	Label	Frame Mat'l	Door Mat'l
FIRE STATION												
1F-A	1	1	EXTERIOR	From	VESTIBULE 1-F	1078	2292	51	RHR		AL	AL
1F-B	1	2	VESTIBULE 1-F	From	CORRIDOR A-F	1085	2134	51	LHR		AL	AL
1F-D	1	3	SCBA AIR FILL 29-F	To	COMPRESSOR 25-F	965	2150	44	RH		HM	HM
1F-I	1	4	APPARATUS BAY 34-F	From	SCBA AIR FILL 29-F	965	2150	44	RHR		HM	HM
2F	1	5	CORRIDOR A-F	To	BARRIER-FREE WASHROOM 2-F	965	2150	44	RH		HM	HM
3F	1	6	CORRIDOR A-F	To	MEETING ROOM 3-F	1075	2134	51	LH		AL	AL
4F	1	7	CORRIDOR A-F	To	STORAGE ROOM 4-F	965	2150	44	LH		HM	HM
5-F	1	8	CORRIDOR A-F	From	FIRE PREVENTION 5-F	1085	2123	51	LHR		AL	AL
6F	1	9	CORRIDOR A-F	To	TRAINING OFFICE 6-F	965	2150	44	LH		HM	HM
7F	1	10	CORRIDOR A-F	To	MECHANICAL / JANITOR ROOM 7-F	965	2150	44	LH	45 MIN	HM	HM
8F	1	11	CORRIDOR A-F	To	STORAGE / FUTURE OFFICE 8-F	965	2150	44	RH		HM	HM
9F	1	12	CORRIDOR C-F	To/From	DORM ROOM 9-F	1300	2760	44	BARN		GYP	WD
10F	1	12	CORRIDOR C-F	To/From	DORM ROOM 10-F	1300	2760	44	BARN		GYP	WD
11F	1	12	CORRIDOR C-F	To/From	DORM ROOM 11-F	1300	2760	44	BARN		GYP	WD
12F	1	12	CORRIDOR C-F	To/From	DORM ROOM 12-F	1300	2760	44	BARN		GYP	WD
13F	1	12	CORRIDOR C-F	To/From	DORM ROOM 13-F	1300	2760	44	BARN		GYP	WD
14F	1	12	CORRIDOR C-F	To/From	DORM ROOM 14-F	1300	2760	44	BARN		GYP	WD
16F	1	13	CORRIDOR B-F	To	CAPTAIN'S OFFICE 16-F	965	2150	44	LH		HM	HM
17F	1	14	CORRIDOR B-F	To	LOCKER ROOM 17-F	965	2150	44	RH		HM	HM
18F	1	15	LOCKER ROOM 17-F	To	GN WASHROOM 18-F	965	2150	44	LH		HM	HM
19F	1	15	LOCKER ROOM 17-F	To	GN WASHROOM 19-F	965	2150	44	RH		HM	HM

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Opening Number(s)	Qty	Heading Num.	Location 1	To/ From	Location 2	Nominal Width	Nominal Height	Door Thickness	Hand	Label	Frame Mat'l	Door Mat'l
20F	1	15	LOCKER ROOM 17-F	To	GN WASHROOM 20-F	965	2150	44	LH		HM	HM
21F	1	16	CORRIDOR B-F	To	EXERCISE ROOM 21-F	1174	2697	51	RH		AL	AL
22F	1	17	EXTERIOR	From	DINING ROOM 22-F	1098	2136	51	RHR		AL	AL
23F	1	18	EXTERIOR	From	KITCHEN / DAY ROOM 23-F	1098	2136	51	LHR		AL	AL
24F	1	19	APPARATUS BAY 34-F	To	BUNKER GEAR WASH & LAUNDRY 24-F	965	2150	44	RH		HM	HM
26-F	1	20	APPARATUS BAY 34-F	To	TOOL ROOM 26-F	965	2150	44	RH		HM	HM
27F-A	1	21	APPARATUS BAY 34-F	From	BUNKER GEAR ROOM 27-F	965	2150	44	RHR		HM	HM
27F-B	1	21	APPARATUS BAY 34-F	From	BUNKER GEAR ROOM 27-F	965	2150	44	RHR		HM	HM
27F-C	1	19	BUNKER GEAR WASH & LAUNDRY 24-F	To	BUNKER GEAR ROOM 27-F	965	2150	44	RH		HM	HM
28F	1	22	APPARATUS BAY 34-F	To	SCBA AIR FILL 28-F	965	2150	44	RH		HM	HM
30F-A	1	23	APPARATUS BAY 34-F	To	OUTDOOR STORAGE 30-F	965	2150	44	LH		HM	HM
30F-B	1	24	EXTERIOR	From	OUTDOOR STORAGE 30-F	900, 900	2150	44	RHRA	90 MIN	HM	HM
30F-C	1	25	OUTDOOR STORAGE 30-F	From	MECHANICAL / ELECTRICAL 14-P	965	2150	44	LHR	60 MIN	HM	HM
31F-A	1	26	EXTERIOR	From	HOSE TOWER 31-F	965	2150	44	LHR		HM	HM
31F-B	1	27	CORRIDOR	From	HOSE TOWER 1	965	2150	44	RHR		HM	HM
32F-A	1	28	EXTERIOR	From	AREA OF REFUGE 32-F	1096	2096	44	LHR		AL	AL
32F-B	1	29	AREA OF REFUGE 32-F	From	VEHICLE BAY 10-P	965	2150	44	RHR	60 MIN	HM	HM
32F-C	1	30	AREA OF REFUGE 32-F	From	APPARATUS BAY 34-F	965	2150	44	LHR	60 MIN	HM	HM
33F	1	31	AREA OF REFUGE 32-F	To	SHARED INCOMING WATER 33-F	965	2150	44	LH	60 MIN	HM	HM
34F-A	1	32	APPARATUS BAY 34-F	From	CORRIDOR B-F	965	2150	44	LHR	60 MIN	HM	HM
34F-B	1	32	APPARATUS BAY 34-F	From	CORRIDOR B-F	965	2150	44	RHR	60 MIN	HM	HM
34F-C	1	33	EXTERIOR	To/From	APPARATUS BAY 34-F	4200	5000		OVH		-	-
34F-D	1	33	EXTERIOR	To/From	APPARATUS BAY 34-F	4200	5000		OVH		-	-

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Opening Number(s)	Qty	Heading Num.	Location 1	To/ From	Location 2	Nominal Width	Nominal Height	Door Thickness	Hand	Label	Frame Mat'l	Door Mat'l
34F-E	1	33	EXTERIOR	To/From	APPARATUS BAY 34-F	4200	5000		OVH		-	-
34F-F	1	33	EXTERIOR	To/From	APPARATUS BAY 34-F	4200	5000		OVH		-	-
34F-G	1	33	EXTERIOR	To/From	APPARATUS BAY 34-F	4200	5000		OVH		-	-
A-F	1	34	CORRIDOR A-F	From	CORRIDOR B-F	1085	2134	51	LHR		AL	AL
DF	1	35	CORRIDOR B-F	From	CORRIDOR C-F	965	2150	44	LHR		HM	HM
PARAMEDIC												
1P-A	1	36	EXTERIOR	From	VESTIBULE 1-P	1123	2302	51	RHR		AL	AL
1P-B	1	37	VESTIBULE 1-P	From	CORRIDOR A-P	1085	2125	51	LHR		AL	AL
2P	1	38	CORRIDOR A-P	To	SUPERVISOR OFFICE 2-P	965	2150	44	LH		HM	HM
3P	1	39	CORRIDOR A-P	To	I.T. CLOSET 3-P	965	2150	44	RH		HM	HM
4P	1	40	CORRIDOR A-P	To	WASHROOM 4-P	965	2150	44	LH		HM	HM
5P	1	40	CORRIDOR A-P	To	WASHROOM 5-P	965	2150	44	RH		HM	HM
8P-A	1	41	WRITE UP ROOM 8P	To/From	KITCHEN/ CREW LOUNGE 7-P	1300	2760	44	BARN		GYP	WD
8P-B	1	42	EXTERIOR	From	WRITE UP ROOM 8-P	1090	2085	51	RHR		AL	AL
9P	1	43	VEHICLE BAY 10-P	From	ACCESS CORRIDOR 9-P	965	2150	44	LHR	60 MIN	HM	HM
10P-A	1	44	EXTERIOR	From	VEHICLE BAY 10-P	965	2150	44	LHR		HM	HM
10P-B	1	33	EXTERIOR	To/From	VEHICLE BAY 10-P	4200	5000		OVH		-	-
10P-C	1	33	EXTERIOR	To/From	VEHICLE BAY 10-P	4200	5000		OVH		-	-
11P	1	45	VEHICLE BAY 10-P	To	OXYGEN ROOM 11-P	965	2150	44	LH		HM	HM
12P	1	45	VEHICLE BAY 10-P	To	JANITOR CLOSET 12-P	965	2150	44	RH		HM	HM
13-P	1	46	VEHICLE BAY 10-P	To	MEDICAL STORAGE 13-P	965	2150	44	RH		HM	HM
14P	1	47	EXTERIOR	From	MECHANICAL / ELECTRICAL 14-P	965	2150	44	LHR		HM	HM

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Hardware Schedule

Heading #1

Item #1	1 Single door 1F-A, EXTERIOR From VESTIBULE 1-F		RHR
	1078 x 2292 x 51 - AL DR x AL FR		
1	Continuous Hinge	CFM95-HD1	C
1	Exit Device	ED4200 630 (K157ET/626) RHR 1078 x 2292 Door W048 D200 M52	630
1	Rim Cylinder Housing	32-0475H LFIC -Rim	
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Cylinder Ring	K24A -CYLINER RING	
2	Construction Core	32-0201-CC	
2	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	9400-630	630
1	Door Pull	BF158 C32D Type 12 HD Mounting	C32D
1	Electronic Closer	ED250-SA-FC-PRO-SGL-PUSH-NH-CL-43-19	
2	Push Plate Switch	CM-45/4	
2	Mounting Box	CM-43CBL	
1	Overhead Door Stop	6-436 689	689
1	Threshold	252X2AFG43.5 (1100mm)	AFG
1	Door Sweep	29326CNB 43 1/2" (1100mm)	C
1	Door Contact	3287	
1	REX	REX BY SECURITY PROVIDER	
1	Door Bell	DOOR BELL BY OTHERS	

* NOTE: BALANCE OF GASKETING BY DOOR SUPPLIER

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING BY OTHERS.

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Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #2

Item #2 1 Single door 1F-B, VESTIBULE 1-F From CORRIDOR A-F LHR

1085 x 2134 x 51 - AL DR x AL FR

1	Continuous Hinge	CFM83-HD1	C
1	Exit Device	ED4200 630 (K157ET/626) LHR 1085 x 2134 Door W048 D200 M52	630
1	Rim Cylinder Housing	32-0475H LFIC -Rim	
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Cylinder Ring	K24A -CYLINER RING	
2	Construction Core	32-0201-CC	
2	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	9400-630	630
1	Door Pull	BF158 C32D Type 12 HD Mounting	C32D
1	Electronic Closer	ED250-SA-FC-PRO-SGL-PUSH-NH-CL-43-19	
2	Push Plate Switch	CM-45/4	
2	Mounting Box	CM-43CBL	
1	Overhead Door Stop	6-436 689	689
1	Threshold (Half Saddle)	279A43 1/2" (1100mm)	A
1	Door Contact	3287	

* NOTE: WAVE THE ACTUATORS BUTTON CYCLES THE OPERATOR. MANUAL OPERATION WITH EXIT DEVICE FROM INSIDE.

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING BY OTHERS.

* NOTE: BALANCE OF GASKETING BY DOOR SUPPLIER

Heading #3

Item #3 1 Single door 1F-D, SCBA AIR FILL 29-F To COMPRESSOR 25-F RH

965 x 2150 x 44 - HM DR x HM FR

3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 RH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Cylinder Ring	K24A -CYLINER RING	
1	Permanent Core	320201(P)- LFIC CORE	
1	Surface Closer	7500-REG 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
1	Door Sweep	29326CNB 38" (965mm)	C
1	Wall Door Stop	406 C26D	C26D

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #4

Item #4	1 Single door 1F-I, APPARATUS BAY 34-F From SCBA AIR FILL 29-F		RHR
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Office Lockset	ML2051 LWA 626 RHR LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Cylinder Ring	K24A -CYLINER RING	
1	Permanent Core	320201(P)- LFIC CORE	
1	Surface Closer	CPS7500T 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
1	Door Sweep	29326CNB 38" (965mm)	C
1	Wall Door Stop	406 C26D	C26D

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #5

Item #5 1 Single door 2F, CORRIDOR A-F To BARRIER-FREE WASHROOM 2-F RH

965 x 2150 x 44 - HM DR x HM FR

3	Standard Hinge	T4A3386 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 RH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Electric Strike	1500C-630	630
1	Overhead Door Stop	1-336 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Electronic Closer	ED100-SA-FC-PRO-SGL-PULL-NH-CL-38-19	
1	Flush Mount Combo Illuminated Push Plate Switch	CX-WC13AXFM	
1	Universal Emergency Call Kit	CX-WEC10	
1	Coat Hook	RM821 C32D	C32D

* NOTES:

- DOOR NORMALLY CLOSED AND UNLOCKED VIA FAIL SAFE ELECTRIC STRIKE. WAVE OUTSIDE BUTTON WILL OPEN DOOR. ONCE INSIDE PRESSING THE PUSH TO LOCK BUTTON WILL LOCK THE ELECTRIC STRIKE/LIGHT UP OUTSIDE OCCUPIED LIGHT AND LOCK OUT THE OUTSIDE BUTTON. EGRESS BY PUSHING THE BUTTON OR MANUALLY PULLING OF THE DOOR WILL RESET THE SYSTEM FOR THE NEXT USER.
- EMERGENCY CALL SYSTEM TO SOUND ALARM AND LIGHT UP INSIDE AND OUTSIDE LIGHT AND UNLOCK THE DOOR.
- ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING BY OTHERS.

Heading #6

Item #6 1 Single door 3F, CORRIDOR A-F To MEETING ROOM 3-F LH

1075 x 2134 x 51 - AL DR x AL FR

3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Dead Lock	MS1850S-410-628 (Backset - TBC) - LH	628
1	Mortise Cylinder Housing	32-0275-CT-Z02-LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Door Pull-BTB	BF158 US32D BTB Mounting x 51mm DR. THICK	C32D
1	Surface Closer	8501-REG 689	689
1	Drop Plate	8146 689	689
1	Floor Door Stop	441CU C26D	C26D

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Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #7

Item #7	1 Single door 4F, CORRIDOR A-F To STORAGE ROOM 4-F			LH
	965 x 2150 x 44 - HM DR x HM FR			
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)		C26D
1	Storeroom Lockset	ML2057 LWA 626 LH LC		626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise		
1	Construction Core	32-0201-CC		
1	Permanent Core	320201(P)- LFIC CORE		
1	Cylinder Ring	K24A -CYLINER RING		
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)		C32D
1	Wall Door Stop	406 C26D		C26D

Heading #8

Item #8	1 Single door 5-F, CORRIDOR A-F From FIRE PREVENTION 5-F			LHR
	1085 x 2123 x 51 - AL DR x AL FR			
1	Continuous Hinge	CFM83-HD1		C
1	Exit Device	ED4200 630 (128/855ET/626) LHR 1085 x 2123 Door W048 D200		630
1	Rim Cylinder Housing	32-0475H LFIC -Rim		
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise		
1	Cylinder Ring	K24A -CYLINER RING		
2	Construction Core	32-0201-CC		
2	Permanent Core	320201(P)- LFIC CORE		
1	Door Pull	BF158 C32D Type 12 HD Mounting		C32D
1	Surface Closer	CPS7500 689 6891 7786		689

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Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #9

Item #9	1 Single door 6F, CORRIDOR A-F To TRAINING OFFICE 6-F			LH
	965 x 2150 x 44 - HM DR x HM FR			
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)		C26D
1	Office Lockset	ML2051 LWA 626 LH LC		626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise		
1	Construction Core	32-0201-CC		
1	Permanent Core	320201(P)- LFIC CORE		
1	Cylinder Ring	K24A -CYLINER RING		
1	Surface Closer	7500-REG 689		689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)		C32D
1	Wall Door Stop	406 C26D		C26D

Heading #10

Item #10	1 Single door 7F, CORRIDOR A-F To MECHANICAL / JANITOR ROOM 7-F			LH
	965 x 2150 x 44 - HM DR x HM FR - 45 MIN			
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)		C26D
1	Storeroom Lockset	ML2057 LWA 626 LH LC		626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise		
1	Construction Core	32-0201-CC		
1	Permanent Core	320201(P)- LFIC CORE		
1	Cylinder Ring	K24A -CYLINER RING		
1	Surface Closer	7500-REG 689		689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)		C32D
1	Wall Door Stop	406 C26D		C26D
1	Threshold (Half Saddle)	279A38" (965mm)		A
1	Smoke Seal	S88 BL18		BL

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #11

Item #11	1 Single door 8F, CORRIDOR A-F To STORAGE / FUTURE OFFICE 8-F		RH
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Office Lockset	ML2051 LWA 626 RH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Wall Door Stop	406 C26D	C26D

Heading #12

Item #12	1 Single door 9F, CORRIDOR C-F To/From DORM ROOM 9-F		BARN
Item #13	1 Single door 10F, CORRIDOR C-F To/From DORM ROOM 10-F		BARN
Item #14	1 Single door 11F, CORRIDOR C-F To/From DORM ROOM 11-F		BARN
Item #15	1 Single door 12F, CORRIDOR C-F To/From DORM ROOM 12-F		BARN
Item #16	1 Single door 13F, CORRIDOR C-F To/From DORM ROOM 13-F		BARN
Item #17	1 Single door 14F, CORRIDOR C-F To/From DORM ROOM 14-F		BARN

1300 x 2760 x 44 - WD DR x GYP FR

6	Barn Door Kit	CCSF-1-493 -W-CA x 108" 1DR KIT	W
6	Aluminum Fascia	CC-480-CA x 108"	CA
12	Flush Pull	H403 C26D	C26D

Heading #13

Item #18	1 Single door 16F, CORRIDOR B-F To CAPTAIN'S OFFICE 16-F		LH
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Office Lockset	ML2051 LWA 626 LH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Wall Door Stop	406 C26D	C26D

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #14

Item #19 1 Single door 17F, CORRIDOR B-F To LOCKER ROOM 17-F RH

965 x 2150 x 44 - HM DR x HM FR

3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Door Pull	110 x 70C C32D	C32D
1	Push Plate	70C-RKW C32D	C32D
1	Surface Closer	7500-REG 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Wall Door Stop	406 C26D	C26D

Heading #15

Item #20 1 Single door 18F, LOCKER ROOM 17-F To GN WASHROOM 18-F LH

Item #21 1 Single door 19F, LOCKER ROOM 17-F To GN WASHROOM 19-F RH

Item #22 1 Single door 20F, LOCKER ROOM 17-F To GN WASHROOM 20-F LH

965 x 2150 x 44 - HM DR x HM FR

9	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
2	Privacy Latchset w/Indicator	ML2020 LWA 626 LH V21	626
1	Privacy Latchset w/Indicator	ML2020 LWA 626 RH V21	626
3	Surface Closer	8501-REG 689	689
3	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
3	Wall Door Stop	406 C26D	C26D
3	Coat Hook	RM821 C32D	C32D

Heading #16

Item #23 1 Single door 21F, CORRIDOR B-F To EXERCISE ROOM 21-F RH

1174 x 2697 x 51 - AL DR x AL FR

4	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Pull & Push Bar Set	BF15847-44" T5 Mounting US32D x 51mm DR. THICK	C32D
1	Surface Closer	7500H-REG 689 7786	689
1	Threshold (Half Saddle)	279A38" (965mm)	A
1	Floor Door Stop	441CU C26D	C26D

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #17

Item #24	1 Single door 22F, EXTERIOR From DINING ROOM 22-F		RHR
	1098 x 2136 x 51 - AL DR x AL FR		
1	Continuous Hinge	CFM95-HD1	C
1	Deadlatch	4900-45-101-628 (Backset - TBC)	628
1	Lever Handle	4560-502-130	130
1	Mortise Cylinder Housing	32-0275-CT-Z02-LFIC Mortise	
1	Cylinder Ring	K24A -CYLINER RING	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	5000-630 503-630	630
1	Door Pull	BF158 C32D Type 12 HD Mounting	C32D
1	Surface Closer	CPS7500 689 6891 7786	689
1	Threshold	252X2AFG43.5 (1100mm)	AFG
1	Door Sweep	29326CNB 43 1/2" (1100mm)	C
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	Keypad	CM-120wV2	
1	Transformer (Keypad)	CX-TRX-2012	
1	Door Bell	DOOR BELL BY OTHERS	

* NOTE: BALANCE OF GASKETING BY DOOR SUPPLIER

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING (CONNECT KEYPAD WIRING TO CEILING) BY OTHERS

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #18

Item #25	1 Single door 23F, EXTERIOR From KITCHEN / DAY ROOM 23-F	LHR
	1098 x 2136 x 51 - AL DR x AL FR	
1	Continuous Hinge	CFM95-HD1 C
1	Exit Device	ED4200 630 (K157ET/626) LHR 1098 x 2136 Door W048 D200 M52 630
1	Rim Cylinder Housing	32-0475H LFIC -Rim
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise
1	Cylinder Ring	K24A -CYLINER RING
2	Construction Core	32-0201-CC
2	Permanent Core	320201(P)- LFIC CORE
1	Electric Strike	9400-630 630
1	Door Pull	BF158 C32D Type 12 HD Mounting C32D
1	Surface Closer	CPS7500 689 6891 7786 689
1	Threshold	252X2AFG43.5 (1100mm) AFG
1	Door Sweep	29326CNB 43 1/2" (1100mm) C
1	Door Contact	3287
1	Card Reader	CR BY SECURITY PROVIDER
1	Keypad	CM-120wV2
1	Transformer (Keypad)	CX-TRX-2012
1	Door Bell	DOOR BELL BY OTHERS

* NOTE: BALANCE OF GASKETING BY DOOR SUPPLIER

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING (CONNECT KEYPAD WIRING TO CEILING) BY OTHERS.

Heading #19

Item #26	1 Single door 24F, APPARATUS BAY 34-F To BUNKER GEAR WASH & LAUNDRY 24-F	RH
Item #27	1 Single door 27F-C, BUNKER GEAR WASH & LAUNDRY 24-F To BUNKER GEAR ROOM 27-F	RH
	965 x 2150 x 44 - HM DR x HM FR	
6	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm) C26D
2	Passage Latchset	ML2010 LWA 626 RH 626
2	Surface Closer	CPS7500 689 689
2	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm) C32D
2	Door Sweep	29326CNB 43 1/2" (1100mm) C
2	Threshold	252X2AFG38" (965mm) AFG

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Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #20

Item #28	1 Single door 26-F, APPARATUS BAY 34-F To TOOL ROOM 26-F		RH
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 RH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Surface Closer	7500-REG 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Wall Door Stop	406 C26D	C26D

Heading #21

Item #29	1 Single door 27F-A, APPARATUS BAY 34-F From BUNKER GEAR ROOM 27-F		RHR
Item #30	1 Single door 27F-B, APPARATUS BAY 34-F From BUNKER GEAR ROOM 27-F		RHR
	965 x 2150 x 44 - HM DR x HM FR		
6	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
2	Exit Device (Passage)	ED5200 630 (128/910ET/626) RHR 44 965 W048	630
2	Surface Closer	CPS7500 689	689
2	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
2	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
2	Door Sweep	29326CNB 43 1/2" (1100mm)	C

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #22

Item #31	1 Single door 28F, APPARATUS BAY 34-F To SCBA AIR FILL 28-F		RH
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Office Lockset	ML2051 LWA 626 RH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Surface Closer	7500-REG 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
1	Door Sweep	29326CNB 38" (965mm)	C
1	Floor Door Stop	441CU C26D	C26D

Heading #23

Item #32	1 Single door 30F-A, APPARATUS BAY 34-F To OUTDOOR STORAGE 30-F		LH
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Passage Latchset	ML2010 LWA 626 LH	626
1	Surface Closer	7500-REG 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Wall Door Stop	406 C26D	C26D

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #24

Item #33 1 Pair of doors 30F-B, EXTERIOR From OUTDOOR STORAGE 30-F RHRA

900, 900 x 2150 x 44 - HM DR x HM FR - 90 MIN

6	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Flush Bolt w/ Bottom Fire Bolt	557 x 19BFB C26D	C26D
1	Dust Proof Strike	570 C26D	C26D
1	Storeroom Lockset	ML2057 LWA 626 RHR LC	626
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	1500C-630	630
2	Surface Closer	CPS7500 689	689
1	Weatherstripping	2891AS-71" x 85" (1@1800, 2@2150MM)	A
2	Door Sweep	29326CNB 36" (900mm)	C
1	Threshold	252X226AFG 71" (1800mm)	AFG
2	Door Contact	3287	
1	Keypad	CM-120wV2	
1	Transformer (Keypad)	CX-TRX-2012	

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING (CONNECT KEYPAD WIRING TO CEILING) BY OTHERS.

Heading #25

Item #34 1 Single door 30F-C, OUTDOOR STORAGE 30-F From MECHANICAL / ELECTRICAL 14-P LHR

965 x 2150 x 44 - HM DR x HM FR - 60 MIN

3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 LHR LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Surface Closer	CPS7500 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
1	Door Sweep	29326CNB 38" (965mm)	C
1	Threshold	252X2AFG38" (965mm)	AFG
1	Smoke Seal	S88 BL18	BL
1	Wall Door Stop	406 C26D	C26D

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #26

Item #35 1 Single door 31F-A, EXTERIOR From HOSE TOWER 31-F LHR

965 x 2150 x 44 - HM DR x HM FR

3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 LHR LC	626
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	1500C-630	630
1	Surface Closer	CPS7500 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
1	Door Sweep	29326CNB 38" (965mm)	C
1	Threshold	252X2AFG38" (965mm)	AFG
1	Door Contact	3287	
1	REX	REX BY SECURITY PROVIDER	
1	Keypad	CM-120wV2	
1	Transformer (Keypad)	CX-TRX-2012	

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING (CONNECT KEYPAD WIRING TO CEILING) BY OTHERS.

Heading #27

Item #36 1 Single door 31F-B, CORRIDOR From HOSE TOWER 1 RHR

965 x 2150 x 44 - HM DR x HM FR

3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Keypad Lockset	LL1021M-026-41 - RHR	026
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Surface Closer	CPS7500 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
1	Door Sweep	29326CNB 38" (965mm)	C

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #28

Item #37 1 Single door 32F-A, EXTERIOR From AREA OF REFUGE 32-F LHR

1096 x 2096 x 44 - AL DR x AL FR

1	Continuous Hinge	CFM95-HD1	C
1	Dead Lock	MS1850S-410-628 (Backset - TBC) - RH (LOCKED FROM INTERIOR SIDE)	628
1	Mortise Cylinder Housing	32-0275-CT-Z02-LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Door Pull-BTB	BF158 US32D BTB Mounting x 51mm DR. THICK	C32D
1	Surface Closer	CPS7500 689 6891 7786	689
1	Door Sweep	29326CNB 43 1/2" (1100mm)	C
1	Threshold	252X2AFG43.5 (1100mm)	AFG

* NOTE: WEATHERSTRIPPING BY DOOR SUPPLIER

Heading #29

Item #38 1 Single door 32F-B, AREA OF REFUGE 32-F From VEHICLE BAY 10-P RHR

965 x 2150 x 44 - HM DR x HM FR - 60 MIN

3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Exit Device (Classroom)	ED5200A 630 (128/955ET/626) RHR 44 965 W048	630
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Electric Strike	9500-630	630
1	Surface Closer	7500-REG 689	689
1	Overhead Door Stop	1-336 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	REX	REX BY SECURITY PROVIDER	

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #30

Item #39 1 Single door 32F-C, AREA OF REFUGE 32-F From APPARATUS BAY 34-F LHR

965 x 2150 x 44 - HM DR x HM FR - 60 MIN

3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Exit Device (Classroom)	ED5200A 630 (128/955ET/626) LHR 44 965 W048	630
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Electric Strike	9500-630	630
1	Surface Closer	7500-REG 689	689
1	Overhead Door Stop	1-336 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	Keypad	CM-120wV2	
1	Transformer (Keypad)	CX-TRX-2012	
1	Door Bell	DOOR BELL BY OTHERS	

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING (CONNECT KEYPAD WIRING TO CEILING) BY OTHERS.

Heading #31

Item #40 1 Single door 33F, AREA OF REFUGE 32-F To SHARED INCOMING WATER 33-F LH

965 x 2150 x 44 - HM DR x HM FR - 60 MIN

3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 LH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Surface Closer	7500-REG 689	689
1	Overhead Door Stop	1-336 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Smoke Seal	S88 BL18	BL
1	Door Sweep	29326CNB 38" (965mm)	C
1	Threshold	252X2AFG38" (965mm)	AFG

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #32

Item #41	1 Single door 34F-A, APPARATUS BAY 34-F From CORRIDOR B-F	LHR
Item #42	1 Single door 34F-B, APPARATUS BAY 34-F From CORRIDOR B-F	RHR

965 x 2150 x 44 - HM DR x HM FR - 60 MIN

6	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Exit Device (Passage)	ED5200A 630 (128/910ET/626) LHR 44 965 W048	630
1	Exit Device (Passage)	ED5200A 630 (128/910ET/626) RHR 44 965 W048	630
2	Surface Closer	CPS7500 689	689
2	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
2	Smoke Seal	S88 BL18	BL
2	Auto Door Bottom	420APKL38" (965mm)	

Heading #33

Item #43	1 Single door 34F-C, EXTERIOR To/From APPARATUS BAY 34-F	OVH
Item #44	1 Single door 34F-D, EXTERIOR To/From APPARATUS BAY 34-F	OVH
Item #45	1 Single door 34F-E, EXTERIOR To/From APPARATUS BAY 34-F	OVH
Item #46	1 Single door 34F-F, EXTERIOR To/From APPARATUS BAY 34-F	OVH
Item #47	1 Single door 34F-G, EXTERIOR To/From APPARATUS BAY 34-F	OVH
Item #48	1 Single door 10P-B, EXTERIOR To/From VEHICLE BAY 10-P	OVH
Item #49	1 Single door 10P-C, EXTERIOR To/From VEHICLE BAY 10-P	OVH

4200 x 5000 x ___ - - DR x - FR

* NOTE: ALL HARDWARE BY DOOR SUPPLIER.

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #34

Item #50 1 Single door A-F, CORRIDOR A-F From CORRIDOR B-F LHR

1085 x 2134 x 51 - AL DR x AL FR

1	Continuous Hinge	CFM83-HD1	C
1	Exit Device	ED4200 630 (K157ET/626) LHR 1085 x 2134 Door W048 D200 M52	630
1	Rim Cylinder Housing	32-0475H LFIC -Rim	
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Cylinder Ring	K24A -CYLINER RING	
2	Construction Core	32-0201-CC	
2	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	9400-630	630
1	Door Pull	BF158 C32D Type 12 HD Mounting	C32D
1	Electronic Closer	ED250-SA-FC-PRO-SGL-PUSH-NH-CL-43-19	
2	Push Plate Switch	CM-45/4	
2	Mounting Box	CM-43CBL	
1	Overhead Door Stop	6-436 689	689
1	Threshold	252X2AFG43.5 (1100mm)	AFG
1	Door Sweep	29326CNB 43 1/2" (1100mm)	C
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	

* NOTE: BALANCE OF GASKETING BY DOOR SUPPLIER

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING BY OTHERS.

Heading #35

Item #51 1 Single door DF, CORRIDOR B-F From CORRIDOR C-F LHR

965 x 2150 x 44 - HM DR x HM FR

3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Passage Latchset	ML2010 LWA 626 LHR	626
1	Surface Closer	CPS7500 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #36

Item #52 1 Single door 1P-A, EXTERIOR From VESTIBULE 1-P RHR

1123 x 2302 x 51 - AL DR x AL FR

1	Continuous Hinge	CFM95-HD1	C
1	Exit Device	ED4200 630 (K157ET/626) RHR 1123 x 2302 Door W048 D200 M52	630
1	Rim Cylinder Housing	32-0475H LFIC -Rim	
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Cylinder Ring	K24A -CYLINER RING	
2	Construction Core	32-0201-CC	
2	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	9400-630	630
1	Door Pull	BF158 C32D Type 12 HD Mounting	C32D
1	Electronic Closer	ED250-SA-FC-PRO-SGL-PUSH-NH-CL-43-19	
2	Push Plate Switch	CM-45/4	
2	Mounting Box	CM-43CBL	
1	Overhead Door Stop	6-436 689	689
1	Threshold	252X2AFG43.5 (1100mm)	AFG
1	Door Sweep	29326CNB 43 1/2" (1100mm)	C
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	REX	REX BY SECURITY PROVIDER	
1	Door Bell	DOOR BELL BY OTHERS	
1	Keypad / Controller	KEYPAD / CONTROLLER BY SECURITY	
1	Arm Button	ARM BUTTON BY OTHERS	
1	Arm Card Reader	ARM CARD READEROTHERS	

* NOTE: BALANCE OF WEATHERSTIP BY DOOR SUPPLIER

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING BY OTHERS.

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #37

Item #53 1 Single door 1P-B, VESTIBULE 1-P From CORRIDOR A-P LHR

1085 x 2125 x 51 - AL DR x AL FR

1	Continuous Hinge	CFM83-HD1	C
1	Exit Device	ED4200 630 (K157ET/626) LHR 1085 x 2125 Door W048 D200 M52	630
1	Rim Cylinder Housing	32-0475H LFIC -Rim	
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Cylinder Ring	K24A -CYLINER RING	
2	Construction Core	32-0201-CC	
2	Permanent Core	320201(P)- LFIC CORE	
1	Electric Strike	9400-630	630
1	Door Pull	BF158 C32D Type 12 HD Mounting	C32D
1	Electronic Closer	ED250-SA-FC-PRO-SGL-PUSH-NH-CL-43-19	
2	Push Plate Switch	CM-45/4	
2	Mounting Box	CM-43CBL	
1	Overhead Door Stop	6-436 689	689
1	Door Sweep	29326CNB 43 1/2" (1100mm)	C
1	Door Contact	3287	
1	REX	REX BY SECURITY PROVIDER	

* NOTE: ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING BY OTHERS.

* NOTE: BALANCE OF GASKETING BY DOOR SUPPLIER

Heading #38

Item #54 1 Single door 2P, CORRIDOR A-P To SUPERVISOR OFFICE 2-P LH

965 x 2150 x 44 - HM DR x HM FR

3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 LH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Electric Strike	1500C-630	630
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	REX	REX BY SECURITY PROVIDER	
1	Wall Door Stop	406 C26D	C26D

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #39

Item #55	1 Single door 3P, CORRIDOR A-P To I.T. CLOSET 3-P		RH
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 RH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Electric Strike	1500C-630	630
1	Surface Closer	8501-REG 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Wall Door Stop	406 C26D	C26D
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	REX	REX BY SECURITY PROVIDER	

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TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #40

Item #56	1 Single door 4P, CORRIDOR A-P To WASHROOM 4-P	LH
Item #57	1 Single door 5P, CORRIDOR A-P To WASHROOM 5-P	RH

965 x 2150 x 44 - HM DR x HM FR

6	Standard Hinge	T4A3386 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 LH LC	626
1	Storeroom Lockset	ML2057 LWA 626 RH LC	626
2	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
2	Construction Core	32-0201-CC	
2	Permanent Core	320201(P)- LFIC CORE	
2	Cylinder Ring	K24A -CYLINER RING	
2	Electric Strike	1500C-630	630
2	Overhead Door Stop	1-336 689	689
2	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
2	Electronic Closer	ED100-SA-FC-PRO-SGL-PULL-NH-CL-38-19	
2	Flush Mount Combo Illuminated Push Plate Switch	CX-WC13AXFM	
2	Universal Emergency Call Kit	CX-WEC10	
2	Coat Hook	RM821 C32D	C32D

* NOTES:

- DOOR NORMALLY CLOSED AND UNLOCKED VIA FAIL SAFE ELECTRIC STRIKE. WAVE OUTSIDE BUTTON WILL OPEN DOOR. ONCE INSIDE PRESSING THE PUSH TO LOCK BUTTON WILL LOCK THE ELECTRIC STRIKE/LIGHT UP OUTSIDE OCCUPIED LIGHT AND LOCK OUT THE OUTSIDE BUTTON. EGRESS BY PUSHING THE BUTTON OR MANUALLY PULLING OF THE DOOR WILL RESET THE SYSTEM FOR THE NEXT USER.
 - EMERGENCY CALL SYSTEM TO SOUND ALARM AND LIGHT UP INSIDE AND OUTSIDE LIGHT AND UNLOCK THE DOOR.
 - ALL CONDUIT, BACK BOXES WITH HIGH & LOW VOLTAGE WIRING BY OTHERS.

Heading #41

Item #58	1 Single door 8P-A, WRITE UP ROOM 8P To/From KITCHEN/ CREW LOUNGE 7-P	BARN
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1300 x 2760 x 44 - WD DR x GYP FR

1	Barn Door Kit	CCSF-1-493 -W-CA x 108" 1DR KIT	W
1	Aluminum Fascia	CC-480-CA x 108"	CA
1	Self- Latching Privacy Door LockSet	C-95SL-OIHL-138 LH x 626	x 626

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TOWN OF WS FIRE STATION & YORK REGION PRS
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Submittal Date: SEP 08, 2025

Heading #42

Item #59	1 Single door 8P-B, EXTERIOR From WRITE UP ROOM 8-P	RHR
	1090 x 2085 x 51 - AL DR x AL FR	
1	Continuous Hinge	CFM83-HD1 C
1	Exit Device	ED4200 630 (K157ET/626) RHR 1090 x 2085 Door W048 D200 M52 630
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise
1	Construction Core	32-0201-CC
1	Permanent Core	320201(P)- LFIC CORE
1	Cylinder Ring	K24A -CYLINER RING
1	Electric Strike	9400-630 630
1	Surface Closer	CPS7500 689 6891 7786 689
1	Door Contact	3287
1	Threshold	252X2AFG43.5 (1100mm) AFG
1	Door Sweep	29326CNB 43 1/2" (1100mm) C
1	Card Reader	CR BY SECURITY PROVIDER
1	Door Bell	DOOR BELL BY OTHERS
1	REX	REX BY SECURITY PROVIDER

* NOTE: BALANCE OF WEATERSTRIP BY DOOR SUPPLIER.

Heading #43

Item #60	1 Single door 9P, VEHICLE BAY 10-P From ACCESS CORRIDOR 9-P	LHR
	965 x 2150 x 44 - HM DR x HM FR - 60 MIN	
3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm) C26D
1	Passage Latchset	ML2010 LWA 626 LHR 626
1	Surface Closer	CPS7500 689 689
1	Smoke Seal	S88 BL18 BL
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm) A
1	Door Sweep	29326CNB 38" (965mm) C
1	Threshold	252X2AFG38" (965mm) AFG

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #44

Item #61	1 Single door 10P-A, EXTERIOR From VEHICLE BAY 10-P	LHR
	965 x 2150 x 44 - HM DR x HM FR	
3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm) C26D
1	Storeroom Lockset	ML2057 LWA 626 LHR LC 626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise
1	Construction Core	32-0201-CC
1	Permanent Core	320201(P)- LFIC CORE
1	Cylinder Ring	K24A -CYLINER RING
1	Electric Strike	1500C-630 630
1	Surface Closer	CPS7500 689 689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm) C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm) A
1	Door Sweep	29326CNB 38" (965mm) C
1	Threshold	252X2AFG38" (965mm) AFG
1	Door Contact	3287
1	Card Reader	CR BY SECURITY PROVIDER
1	REX	REX BY SECURITY PROVIDER

Heading #45

Item #62	1 Single door 11P, VEHICLE BAY 10-P To OXYGEN ROOM 11-P	LH
Item #63	1 Single door 12P, VEHICLE BAY 10-P To JANITOR CLOSET 12-P	RH
	965 x 2150 x 44 - HM DR x HM FR	
6	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm) C26D
1	Storeroom Lockset	ML2057 LWA 626 LH LC 626
1	Storeroom Lockset	ML2057 LWA 626 RH LC 626
2	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise
2	Construction Core	32-0201-CC
2	Permanent Core	320201(P)- LFIC CORE
2	Cylinder Ring	K24A -CYLINER RING
2	Surface Closer	7500-REG 689 689
2	Wall Door Stop	406 C26D C26D

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4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

Heading #46

Item #64	1 Single door 13-P, VEHICLE BAY 10-P To MEDICAL STORAGE 13-P		RH
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D (127x114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 RH LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Electric Strike	1500C-630	630
1	Surface Closer	7500-REG 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	REX	REX BY SECURITY PROVIDER	

Heading #47

Item #65	1 Single door 14P, EXTERIOR From MECHANICAL / ELECTRICAL 14-P		LHR
	965 x 2150 x 44 - HM DR x HM FR		
3	Standard Hinge	TA2714 5" x 4 1/2" US26D NRP (127 x 114mm)	C26D
1	Storeroom Lockset	ML2057 LWA 626 LHR LC	626
1	Mortise Cylinder Housing	32-0275 -CT-Z09 - LFIC Mortise	
1	Construction Core	32-0201-CC	
1	Permanent Core	320201(P)- LFIC CORE	
1	Cylinder Ring	K24A -CYLINER RING	
1	Electric Strike	1500C-630	630
1	Surface Closer	CPS7500 689	689
1	Kick Plate	K1050 8" x 36 1/2" US32D 4BE SA (200x927mm)	C32D
1	Weatherstripping	2891AS-38" x 85" (1@965, 2@2150mm)	A
1	Door Sweep	29326CNB 38" (965mm)	C
1	Threshold	252X2AFG38" (965mm)	AFG
1	Door Contact	3287	
1	Card Reader	CR BY SECURITY PROVIDER	
1	REX	REX BY SECURITY PROVIDER	

Elite

Door & Hardware Inc

TOWN OF WS FIRE STATION & YORK REGION PRS
4902 AURORA ROAD, WHITCHURCH-STOUFFVILLE, ON

Submittal Date: SEP 08, 2025

PART 1 – GENERAL

1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

1.2 SECTION INCLUDES

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Closeout Submittals
- .7 1.7 Quality Assurance
- .8 1.8 Delivery, Storage, and Handling
- .9 2.1 Performance/Design Requirements
- .10 2.2 Automatic Door Operators - General
- .11 2.3 Automatic Door Operators - Door Frame/Wall Mounted
- .12 2.4 Finishes
- .13 2.5 Fabrication
- .14 3.1 Examination
- .15 3.2 Preparation
- .16 3.3 Installation
- .17 3.4 Adjusting and Cleaning

1.3 SUMMARY

- .1 Section includes:
 - .1 Automatic door operators.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Check dimensions at the *Place of the Work* before fabrication commences, and report to the *Consultant* in writing all discrepancies.
 - .2 Where dimensions are not available before fabrication commences, the dimension required shall be agreed upon between the Contractor and the Consultant.

1.5 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00. – Submittal Procedures.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.

.3 Shop drawings:

- .1 *Shop Drawings* to be prepared specifically for this *Contract* and to indicate location of components, anchorage details, adjacent construction interface, and dimensions as well as all necessary wiring and electrical requirements.

.4 Samples:

- .1 Submit samples of each finish material proposed for use in the *Work*.

.5 Certificates:

- .1 Submit certificate of conformance to specified standards following procedures for submittal of *Product* data.

.6 Templates:

- .1 Submit templates during construction for use by installers and fabricators as required for proper location and installation of hardware.

1.6 CLOSEOUT SUBMITTALS

.1 Operation and maintenance data:

- .1 Demonstrate, and *Provide* instruction in, the proper operation and maintenance of the *Products Provided* as part of the work of this Section to the *Owner* in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .2 Submit operation data and maintenance data for cleaning and maintenance of hardware for incorporation into the operation and maintenance manual specified in Section 01 77 00 Contract Closeout Procedures and Submittals.

1.7 QUALITY ASSURANCE

.1 Qualifications:

.1 Installers / applicators / erectors:

- .1 Execute the work of this Section only by a *Subcontractor* who has the plant, equipment, and skilled workers 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 years, and with 10 years' satisfactory experience.
- .2 The *Contractor* shall ensure that the installer is approved in writing by the manufacturer of the operators for installation of its *Product*.

- .2 Barrier free door operators shall be certified by the manufacturer to performance design criteria in accordance with CAN/CSA C22.2 No. 247-92(R2014), and ANSI/BHMA A156.19-2013.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Store finishing hardware in locked, clean dry area.
- .2 Package each item of hardware, including fastenings, separately or in like groups of hardware, and label each package as to item definition and location.
- .3 Submit hardware with an easily removable covering to protect against scratches, abrasions, coating with dissimilar finish materials on adjacent surfaces, and tarnishing.

PART 2 - PRODUCTS

2.1 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Use Underwriters Laboratories of Canada (ULC) listed and labelled hardware in fire separations and exit doors.
- .2 The *Contractor* shall be responsible for, and abide by, all requirements and regulations of the Ontario Building Code. Conduct tests and inspections required and pay all charges incidental thereto.

2.2 AUTOMATIC DOOR OPERATORS - GENERAL

- .1 Operation:
 - .1 Activation type:
 - .1 Push-plate.
 - .2 Door to safely stop and reverse if an object is encountered in the opening or closing cycle.
 - .3 Manual opening force: 62 N.
 - .4 Closing force: 26.6 N.
 - .5 Factory-set door hold open voltage.
 - .6 Fail safe: In the event of power failure, door shall operate manually, without damage to operator components.
- .2 Activators; wall-mounted:
 - .1 Push-plate:
 - .1 Formed stainless steel plate, satin finish, approximately 127 mm (5") square, with depressed wheelchair logo marking, two required per opening.
 - .2 Electrical supply: 120 Volt.

2.3 AUTOMATIC DOOR OPERATORS - DOOR FRAME/WALL MOUNTED

- .1 *Provide* adjustment by microprocessor for the following:
 - .1 Opening speed.
 - .2 Back-check.
 - .3 Hold-open, from 5 seconds to 30 seconds.
 - .4 Closing speed.
 - .5 Opening force.
 - .6 Acceleration during opening and recycling, for soft start.
- .2 Controller:
 - .1 Completely electromechanical capable of the following functions:
 - .1 Obstruction detection.
 - .2 Initialization and power on.
 - .3 Door motion learn cycle.

- .4 Manual mode, without spring closer.
- .5 Power open/power close logic.
- .2 Control box and motor/gear box to be contained in aluminum housing finished to match aluminum entrances, precision-machined gears and bearing seats and all- weather lubricant, mounted on vibration isolators.
 - .1 Design for surface-mounted application on surface of door frame/wall, maximum 3 mm (1/8") above top of door.
 - .2 Design for interior application.
- .3 Gears: manufactured by operator manufacturer specifically for operators being provided.
- .4 Motor: Direct Current (DC) permanent magnet motor with shielded ball bearings. Stop motor when door stops or is fully open and when breakaway is operated.
- .5 Door operating arm: forged steel, attached at natural pivot point of door. Do not use side block in top of door. Exposed arms to be factory polished and finished to match operator enclosure.
- .6 Control circuits for actuators and safeties: low-voltage, National Electrical Code (NEC) Class II.
- .7 Service conditions: satisfactory operation between -34°C and 71°C.
- .3 Acceptable Products:
 - .1 Typical: Refer to 08 71 00 Hardware Schedule or *Equivalent*.

2.4 FINISHES

- .1 Finish components to match aluminum framed glazing systems in conjunction with which they are to be provided, in accordance with Section 08 41 00 – Aluminium Framed Glazing Systems.

2.5 FABRICATION

- .1 Fit intersecting members to flush hairline weathertight joints and mechanically fasten together, except where indicated otherwise in the Contract Documents.
- .2 Conceal fastenings from view, except where indicated otherwise in the Contract Documents.
- .3 Form cut-outs, recesses, mortising or milling for finishing hardware to templates supplied. Reinforce with aluminum or galvanized steel plates.
- .4 Field apply isolation coating to aluminum in contact with dissimilar metals or cementitious materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verify that door openings are properly installed and ready to receive the work of this Section.
- .2 Verify that electrical service is available, properly located, and of proper type.

3.2 PREPARATION

- .1 Before furnishing any hardware, carefully check the *Contract Documents*, verify door swings, door and frame materials and operating conditions, and assure that hardware will fit work to be attached.
- .2 Check *Shop Drawings* and frame and door lists affecting hardware type and installation, and verify to correctness thereof, or advise of required revisions. Check that doors, frames and panels requiring additional support are reinforced.
- .3 Point out special requirements to installer. Make final adjustment of hardware, in particular closer arms, valves and locksets, to work properly.

3.3 INSTALLATION

- .1 *Install* in accordance with the manufacturer's instructions and in accordance with CAN/CSA C22.2 No. 247-92(R2014).
- .2 *Provide* operator system complete in all its parts and connected to electrical service provided as part of the work of Divisions 26 and 28. Secure all wiring such that it is concealed from view.

3.4 ADJUSTING AND CLEANING

- .1 Verify that installed hardware and operators function properly and instruct installers accordingly of requirements and procedures for adjustments for operation without binding or scraping, and without excessive noise.
- .2 Clean hardware after installation in accordance with the *Supplier's* instructions.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

1.2 SECTION INCLUDES

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 2.1 Materials
- .6 3.1 Installation
- .7 3.2 Installation Tolerances

1.3 SUMMARY

- .1 Section Includes
 - .1 Prefinished metal lockers.

1.4 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.
- .3 *Shop Drawings*:
 - .1 Indicate thicknesses of metal, fabricating methods, assembled banks of lockers, bases, trim, numbering, filler panels, end panels and sloped tops.
- .4 Samples:
 - .1 Submit sample of colour and finish on actual base metal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Lockers: in accordance with CAN/CGSB 44.40-2001 AMEND.
 - .1 Type: Single tier full-height locker.
 - .2 Size (width x depth x height): 457 mm wide x 610 mm deep x 1830 mm high.
 - .3 Locking system: suitable for padlocks.
 - .4 Metal materials: in accordance with ASTM A1008/A1008M-15, free of imperfections.
 - .5 Frame: 1.6 mm (0.06") thick (16 gauge).

- .6 Door: minimum 2.0 mm (0.07") 20 gauge outer panel and 24 gauge liner, hollow core or honeycomb.
- .7 Shelves: minimum 0.6 mm (0.02") thick (24 gauge)
- .8 Hooks: three single prong coat hooks.
- .9 Coat Rods for each locker
- .10 Jamb Trim: Refer to detail on the *Drawings*. Top trim and side trim.
- .11 Body: minimum 0.6 mm (0.02") thick (24 gauge).
- .12 Filler and end panels: minimum 2.0 mm (0.07") 20 gauge
- .13 Base: manufacturer standard base.
- .14 Number plates shall be inset into the chrome-plated door pull and numbered sequentially, in two sets each starting at "1" for each locker Type as required by the *Consultant*.
- .15 Locker finish; exposed and semi-exposed surfaces: baked on polymer powder or alkyd enamel, custom colour to later selection by the *Consultant*.
- .16 Acceptable manufacturers/*Products*:
 - .1 General Storage Systems Ltd.: 'Decor Tri-Lok'.
 - .2 Hadrian Manufacturing Inc.: 'Emperor Lockers'.
 - .3 Lincora: 'Series 50'.
 - .4 Or *Equivalent*.

PART 3- EXECUTION

3.1 INSTALLATION

- .1 Assemble and *Install* lockers complete with metal base in accordance with manufacturer's printed installation instructions.
- .2 Securely fasten at least every third locker through to wall studs, masonry or concrete substrate.
- .3 *Install* trim and filler panels where required for continuous appearance and where obstructions occur. Specific conditions as indicated in the *Contract Documents*.
- .4 *Install* finished end panels to exposed ends of locker banks.

3.2 INSTALLATION TOLERANCES

- .1 *Install* plumb, level, tight and secured. Comply with the following tolerances:
 - .1 Plumb and level: 3 mm (1/8").
 - .2 Variation from indicated position: plus/minus 3 mm (1/8").

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

1.2 SECTION INCLUDES

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Delivery, Storage, and Handling
- .7 1.7 Extended Warranty
- .8 2.1 Acceptable Manufacturers
- .9 2.2 Foot Grilles
- .10 2.3 Fabrication
- .11 3.1 Preparation
- .12 3.2 Installation
- .13 3.3 Adjusting and Cleaning

1.3 SUMMARY

- .1 Section includes:
 - .1 Entrance floor mats.

1.4 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 -Submittal Procedures.
- .2 Product Data: For each type of product indicated.
 - .1 Include construction details, material descriptions, dimensions of individual components, profiles and finishes.
- .3 Shop Drawings: Show the following:
 - .1 Divisions between mat sections, if applicable.
 - .2 Perimeter floor mat frames.
- .4 Samples for Verification: For each type of product indicated.
 - .1 Floor Mat: 12-inch- square, assembled sections of floor mat.
 - .2 Frame Members: 12-inch- long sample of each type and colour.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.

.2 Operation and maintenance data:

- .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Package or crate, and brace *Products* to prevent damage during shipment and handling. Label packages and crates, and protect finish surfaces from environmental conditions where required.

1.7 EXTENDED WARRANTY

- .1 Warrant work of this Section in accordance with Section 01 78 36 – Warranties for a period of two years from the date of Substantial Performance.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- .1 K.N.Crowder Mfg. Inc.
.2 McGill Architectural Products
.3 Or Equivalent.

2.2 FOOT MATS

- .1 Acceptable *Products*:
- .1 K.N. Crowder Model FM4- Vinyl
.2 Tread rail dimensions: 46 mm x 9.5 mm.
- .1 Assembled with continuous aluminum hinge, providing 4.8 mm spacing between tread rails, allowing for easier installation, and roll-up, for cleaning purposes.
.2 Serrated vinyl insert to be manufactured from PVC material.
.3 Insert: Grey.
.4 Frame: MC - Standard recessed aluminum frame
.5 Aluminum finish: Standard Clear Anodized
- .2 Substitutions: In accordance with Section 01 25 00 – Product Substitution Procedures.

2.3 FABRICATION

- .1 Fabricate *Products* with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that foot grilles will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
- .1 Do not proceed until unsatisfactory conditions have been corrected.

- .2 Field Measurements: Take field measurements before fabrication to the greatest extent practical. Coordinate fabrication schedule with construction so that work can be performed without any delays due to fabrication and delivery.
- .3 The *Contractor* shall coordinate size and location of recesses with installation of finished floors to receive floor mats and frames.
- .4 The *Contractor* shall ensure that the manufacturer offers assistance and guidance to *Provide* a template of irregular shaped grid assemblies where applicable to ensure a proper installation.

3.2 INSTALLATION

- .1 *Install* the work of this Section in accordance with the manufacturer's recommendations.
- .2 After completing frame installation, provide temporary filler of plywood or fibreboard in recess and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.
- .3 Frames in contact with concrete to be primer coated.
- .4 Set frame type at height recommended by manufacturer for most effective cleaning action.
- .5 Coordinate top of frame surfaces with bottom of doors that swing across to *Provide* ample clearance between door and frame.
- .6 *Install* work to meet manufacturer's written specifications and installation instructions, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .7 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .8 Back paint components where contact is made with building finishes to prevent electrolysis.
- .9 Defer installation of floor mats until project is near substantial completion

3.3 ADJUSTING AND CLEANING

- .1 Verify that installed *Products* function properly and adjust them accordingly to ensure satisfactory operation.
- .2 Refinish damaged or defective work, at the *Contractor's* expense, so that no variation in surface appearance is discernible.

END OF SECTION

1. GENERAL

1.1 SUMMARY

- A. This section includes Energy Wheel Air-to-Air Energy Recovery Ventilators for indoor installation.

1.2 SUBMITTALS

- A. Product Data: For each type or model include the following:
1. Complete fan performance curves for both the supply air and exhaust air, with system operating conditions indicated, as tested in an AMCA Certified Chamber.
 2. Energy wheel performance data for both summer and winter operation.
 3. Motor ratings, electrical characteristics, motor, and fan accessories.
 4. Energy wheel performance data in accordance with AHRI Standard 1060-2023 for each model. Data shall include Psychrometric Conditions, Effectiveness, Exhaust Air Transfer Ratio (EATR), Outdoor Air Correction Factor (OACF), pressure drop of the device, Net Supply Airflow, Leaving Exhaust Airflow Psychrometric Conditions, and Enthalpy Recovery Ratio.
 5. Material types and gauges of all component pieces and assemblies.
 6. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
 7. Estimated gross weight of each installed unit.
 8. Installation, Operating and Maintenance manual (IOM) for each model.
 9. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.
 10. Sound performance data for Supply Air and Exhaust Air as tested on an AMCA Certified chamber.

1.3 QUALITY ASSURANCE

- A. Product Options: Drawings must indicate size, profiles and dimensional requirements of Energy Recovery Units and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
- B. End of line test with full report available upon request.
- C. Certifications:
1. Entire unit shall be ETL Certified per U.L. 60335-2-40 and bear an ETL sticker.
 2. Energy wheel performance shall be AHRI Certified per Standard 1060.

1.4 COORDINATION

- A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.
- B. Coordinate sequencing of construction of associated HVAC, electrical supply [roofing contractor].

1.5 EXTRA MATERIALS

-
- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Filters: [(Insert quantity) set(s) of [MERV 8] or [MERV 13] disposable filters for each unit].
 2. One spare energy wheel belt.

2. PRODUCTS

2.1. MANUFACTURERS

- .1 The following manufacturers are approved for use:
1. Base bid: Greenheck
 2. Alternatives: Carrier, Lennox, Lifebreath

2.2. MANUFACTURED UNITS

Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, energy wheel, motorized intake damper, motorized exhaust damper, sensors, frost control, economizer control, electric preheater, filter assembly for intake and exhaust air, supply air blower assembly, exhaust air blower assembly, electronically commutated motors (ECM) and an electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

2.3. CABINET

- A. Materials: Formed double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
1. Unit's exterior shall be supplied from the manufacturer using G60 galvalume steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 70023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours.
 2. Internal assemblies: 24-gauge, pre-painted galvalume (G60) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
- B. Access doors shall be captured access. This access should allow for sliding of access doors and prevent doors from falling or needing to be removed for regular maintenance. Doors should be fully removable if desired.
- C. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
- a. Materials: Rigid urethane injected foam. Foam board not acceptable.
 - .1 Thickness: 1 inch (25 mm)
 - .2 Thermal Resistance: R8
 - .3 Meets UL94HF-1 flame requirements
 - .4 Location and application: Full coverage of entire exterior to include walls, roof of unit, unit base and doors
- D. Energy wheel: Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel

as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned drive belt. The wheel media shall be a polymer film matrix in a stainless-steel framework and be comprised of individual segments that are removable for servicing. Non-segmented energy wheels are not acceptable. Silica gel desiccant shall be permanently bonded to the polymer film and shall be designed and constructed to permit cleaning and servicing. The energy wheel is to have a five-year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.

- E. Control panel/connections: Energy Recovery Ventilator shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections
- F. Frost control: Timed Exhaust. Timed exhaust shall be provided for frost control of the energy wheel. Control system shall include an outdoor air thermostat and pressure sensor on the wheel assembly to initiate frost control sequence.

2.4. BLOWER

- A. Blower section construction, Supply Air and Exhaust Air: Direct drive motor and blower shall be assembled onto a 14-gauge galvanized steel platform.
- B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
- C. Fan: Direct drive, backwards curved, airfoil plenum fan with [aluminum] wheel statically and dynamically balanced. Prop or belt-drive fan not acceptable due to low static capabilities
- D. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.5. MOTORS

- A. General: Blower motors greater than 1/2 horsepower shall be "NEMA Premium™" unless otherwise indicated. Minimum compliance with EPC minimum energy-efficiency standards for single speed ODP and TEFC enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase, and enclosure. Comply with the requirements in Division 23 05 13, matched with fan load.
- B. Motors shall be 60 cycle, 1 phase 208 volt, The designation "NEMA Premium™" applies to electric motors with efficiencies that are "better than EPC". ECM motors are considered premium equivalent. The terms "high efficiency" or "premium efficiency" have no industry definitions.

2.6. UNIT CONTROLS

- A. The unit shall be constructed so that it can be controlled by can be monitored and controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

-
- B. Operating protocol: The microprocessor shall be factory-programmed for BACnet MSTP for monitoring of the unit's status.
 - B. Supply fan shall be configured for CO2 sensor
 - C. Exhaust fan shall be configured for building pressure
 - D. Remote Display: Contractor shall provide and install a remote display that functions as a remote indicator of owner-selected operating parameters and also permits remote inputting of new operating parameters. Each remote display shall have a large LCD user interface screen similar in form and function to the screen on the DDC. Installed location of remote display shall be as indicated on the plans
 - E. A web user-interface (web UI) must be available for the manufacturer installed controls. The interface can be accessed via a web browser when an Ethernet cable is connected to the building network or to a laptop plugged in directly to the controller. Web UI must have the following features available which allow simple access to the unit, improved startup commissioning and provide quick troubleshooting capabilities:
 - i. Graphical overview screen for easy access to current conditions and set point changes
 - ii. All sensor values, set point and control outputs recorded each minute with 1 week of history stored on the controller for simple troubleshooting
 - iii. Refrigeration details screen with compressor status, temperature and pressure readings
 - iv. Access to current alarms and alarm history
 - v. Service override capabilities to manually change I/O and verify proper operation of the unit
 - F. Sensors
 - A. Dirty Filter Sensors
 - B. CO2 Sensor
 - C. Temperature Sensors- OAI, EAD, RAI, OAD Note: OAI and OAD are standard with microprocessors.
 - D. Relative Humidity Sensors – OAH, RAH
- 2.7 FILTERS
- MERV8 disposable pleated filters shall be provided in the intake & exhaust air stream

3. EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with the manufacturer's Installation & Maintenance instructions.

3.2 ENVIRONMENTAL REQUIREMENTS

- .1 Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

End of Section

1 General

1.1 Submittals

- .1 Submit shop drawings/product data sheets for fans and accessories. Include following:
 - .1 Certified fan performance curves at specified operating point with flow, static pressure and HP clearly plotted;
 - .2 Certified sound power data that conforms to specified levels;
 - .3 Product data sheets for all accessories.
 - .4 Product data sheets for fan motors.

1.2 Closeout Submittals

- .1 Submit with delivery of each unit a copy of the factory inspection report and include a copy of each report with O&M Manual project close-out data.
- .2 Submit a site inspection and start-up report from manufacturer's representative as specified in Part 3 of this section.
- .3 Supply reviewed copies of fan/curb assembly shop drawings or product data to trade who will cut roof openings for fans, and ensure openings are properly located.
- .4 Supply reviewed copies of fan assembly shop drawings or product data to trade who will form/prepare wall openings for fans, and ensure openings are properly located.
- .5 Submit a signed copy of destratification fan manufacturer's 5 year extended parts and labour warranty.
- .6 Submit a signed copy of ceiling mounted fan manufacturers extended 3 year warranty.
- .7 Training attendance records.

1.3 Quality Assurance

- .1 Fan manufacturers, as applicable, are to be current members of the Air Movement and Control Association International Inc. (AMCA), and fans are to be rated (capacity and sound performance) and certified in accordance with requirements of following standards:
 - .1 ANSI/AMCA Standard 210, Laboratory Method of Testing Fans for Certified Aerodynamic Performance Rating;
 - .2 AMCA Standard 211, Product Rating Manual for Fan Air Performance;
 - .3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans;
 - .4 AMCA Standard 311, Product Rating Manual for Fan Sound Performance;
 - .5 AMCA Standard 99-2408, Operating Limits for Centrifugal Fans.

2 Products

2.1 Roof Mounted Exhaust Fans

-
- .1 Centrifugal, ULC listed, factory run tested roof mounted exhaust fans in accordance with drawing schedule.
 - .2 Spun aluminium housing with deep venturi inlet, aluminium curb cap with continuously welded corners, pre-punched mounting holes, galvanized steel or aluminium bird screen, and EMT conduit chase to the motor compartment.
 - .3 Centrifugal, non-overloading aluminum wheel with backward inclined blades matched to inlet venturi, statically and dynamically balanced as an assembly.
 - .4 For belt-drive fans only, hot rolled steel shaft, accurately turned, ground, and polished, and sized for a first critical speed of at least 1.25 times maximum rated speed for fan, and one-piece grease lubricated pillow block type bearings selected for an AFBMA L-50 minimum average life in excess of 500,000 hours at maximum catalogue operating speed and equipped with a lubrication fitting, and a heavy-gauge galvanized steel adjustable V-belt drive with guard conforming to requirements of Section 20 05 00 – Common Work Results for Mechanical.
 - .5 Motors are to conform to requirements specified in Section 20 05 00 – Common Work Results for Mechanical, mounted on vibration isolation in a compartment outside of the airstream, and factory pre-wired to a NEMA 4 disconnect switch.
 - .6 Prefabricated, minimum 300 mm (12") high heavy-duty aluminum roof mounting curb with factory installed wood nailer, 40 mm (1-½") thick insulation, continuously welded seams, and damper tray.
 - .7 For fans as scheduled, factory supplied accessories as follows:
 - .1 gravity backdraft damper with #20 gauge galvanized steel frame and #26 gauge aluminum blades with felt edge blade seals;
 - .2 non-corrosive motorized damper with linkage, end switch, and motor with voltage to match fan motor;
 - .3 continuous non-corrosive piano type curb hinge to permit access to fan, damper and connecting duct, complete with retaining chain and a security hasp to prevent removal of unit from curb cap and prevent building entry through connecting ductwork;
 - .4 2-speed switch and 2-speed double winding 1-phase motor in accordance with Section 20 05 00 – Common Work Results for Mechanical;
 - .5 factory secured seismic restraint connection hardware.
 - .8 Manufacturers:
 - .1 Twin City Fan and Blower;
 - .2 Loren Cook Co.;
 - .3 Greenheck Fan Corp.;
 - .4 JencoFan;
 - .5 Carnes Company Inc.

2.2 Centrifugal Inline Fans

- .1 Centrifugal, ULC listed, factory run tested rectangular inline fans in accordance with drawing schedule.
- .2 Heavy-gauge galvanized steel housing with removable side panels to permit removal of power assembly without disturbing duct connections, universal mounting brackets and hardware including spring vibration isolators to

- accommodate horizontal or vertical mounting as required, a flanged inlet panel with inlet venturi, a flanged outlet panel, both with duct connection collars, and galvanized steel wire grid fan inlet/outlet guard(s).
- .3 non-overloading aluminium wheel with backward inclined blades with matching inlet venturi, statically and dynamically balanced as an assembly.
- .4 For belt-drive fans only, hot rolled steel shaft, accurately turned, ground, and polished, and sized for a first critical speed of at least 1.25 times maximum rated speed for fan, and heavy-duty, self-aligning pillow block type bearings selected for an AFBMA L-50 minimum average life in excess of 500,000 hours and equipped with lubrication line and fitting, and an adjustable V-belt drive with guard conforming to requirements of Section 20 05 00 – Common Work Results for Mechanical.
- .5 TEFC motor conforming to requirements specified in Section 20 05 00 – Common Work Results for Mechanical, mounted out of the airstream, complete with a cover, and factory pre-wired to a NEMA 4 disconnect switch.
- .6 For fans as scheduled, factory supplied accessories as follows:
 - .1 for fans as scheduled, housing insulation (lining), consisting of neoprene spray coated glass fibre semi-rigid insulation meeting NFPA 90A requirements and 25/50 flame spread/smoke developed ratings when tested in accordance with CAN/ULC S102, permanently secured in place with no exposed edges;
 - .2 for fans as scheduled, a galvanized steel filter box with frame suitable for 25 mm (2") thick disposable panel type filters;
 - .3 factory secured seismic restraint connection hardware.
- .7 Manufacturers:
 - .1 Twin City Fan and Blower;
 - .2 Loren Cook Co.;
 - .3 Greenheck Fan Corp.;
 - .4 JencoFan;
 - .5 Carnes Company Inc.

2.3 Centrifugal Wall Mounted

- .1 Fan shall be a spun aluminum, wall mounted, direct driven, horizontal centrifugal exhaust ventilator.
- .2 Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- .3 Construction: Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The spun aluminum wall flange shall have pre-punched key slot holes and a mounting template with wall opening location for ease of installation. The windband shall have a rolled bead for added strength. An integral conduit chase shall be provided into the motor compartment to facilitate wiring connections. The motor shall be enclosed in a weathertight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicating design CFM and static pressure.
- .4 Unit shall be shipped in ISTA certified transit tested packaging.
- .5 Wheel: Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. An aerodynamic aluminum inlet cone shall be provided for maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, Balance

- Quality and Vibration Levels for Fans.
- .6 Motor shall be an electronically commutated motor rated for continuous duty and furnished either with internally mounted potentiometer speed controller or with leads for connection to 0-10 VDC external controller.
- .7 Manufacturers:
 - .1 Twin City Fan and Blower;
 - .2 Loren Cook Co.;
 - .3 Greenheck Fan Corp.;
 - .4 JencoFan;
 - .5 Carnes Company Inc.

2.4 Destratification Fans

HIGH VOLUME, LOW SPEED FANS

A. Complete Unit

1. Regulatory Requirements:
 - a. The entire fan assembly (with or without light kit) shall be NRTL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standards 22.2 No. 60335-1 and 22.2 No. 113.
 - b. The controller shall be compliant with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) The device may not cause harmful interference, and (2) The device must accept any interference received, including interference that may cause undesirable operation.
2. Sustainability Characteristics:
 - a. The fan shall be designed to move an effective amount of air for cooling and destratification in a variety of applications (including industrial and agricultural) over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.
 - b. The optional BAFCon controller shall be designed to control Big Ass Fans and lighting systems from a secure, centralized location. The system shall be designed specifically for high volume, low speed Big Ass Fans to ensure maximum control. The system shall include optional SmartSense functionality to maximize energy savings. SmartSense shall provide the capability to automatically control the speed of Big Ass Fans using information from user-determined settings and built-in temperature and humidity sensors.
3. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.

B. Onboard Fan Control

1. The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation. The onboard controller shall be prewired to the motor using a short run of flexible conduit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). A 15-ft incoming power cord shall be pre-wired to the controller with one of the following plugs: NEMA L6-20P Twist-Lock Plug, NEMA L6-30P Twist-Lock Plug, NEMA L15-20P Twist Lock Plug, NEMA L16-20P Twist-Lock Plug.
2. As an option, the architect or owner may upgrade to the "harsh environment package," which includes a seal for the weather-resistant onboard VFD enclosure and a motor with IP55 NEMA classification.
3. For fans with single-phase input, conversion to three-phase output takes place at the VFD.

C. Airfoil System

1. The fan shall be equipped with eight (8) Powerfoil airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
 2. The fan shall be equipped with eight (8) Powerfoil winglets (standard) or eight (8) Powerfoil Plus winglets (optional) on the ends of the airfoils and eight (8) AirFences® positioned on the airfoils at the optimum location for performance. Both the winglets and AirFences shall be molded of a polypropylene blend. The standard color of the winglet and AirFence shall be "BAF Yellow."
 3. Airfoil Restraint System
 - a. All 20- to 24-ft (6- to 7.3-m) diameter fans shall be equipped with a airfoil restraint system to provide redundant safety between the ends of the airfoils and the fan hub. The airfoil restraint system shall be available as an option on smaller diameter fans.
 - b. The airfoil restraint system shall be comprised of durable, lightweight nylon safety straps that shall extend from winglets through the airfoils and secure to the fan hub with 12-gauge stamped steel safety clips.
 - c. The straps shall be made of 1 in. (24 mm) wide heavy-duty nylon webbing rated for 825 lb (374 kg). The loops at the ends of the straps shall be secured in a double-stitch pattern for reinforced durability.
 - d. The straps shall be precisely matched to each fan's diameter, eliminating the need for a tensioning mechanism and reducing opportunity for noise.
 - e. The straps shall run along the inside of the airfoils for an uninterrupted look.
 - f. Safety clips shall secure to each winglet to comprise the outer anchor points and provide tension, while clips on the opposite end shall secure to threaded inserts incorporated in the fan hub.
- D. Motor
1. The fan motor shall be an AC induction type inverter rated at one of the following:
 - a. 3450 RPM, 575–600 VAC, 50/60 Hz, three-phase, 1 hp
 2. The motor shall be totally enclosed, fan cooled (TEFC) with an IP44 NEMA classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in 32°F to 122°F (0°C to 50°C) ambient conditions.
 3. The motor shall have a C-face attachment that shall enable technicians to detach the motor for easy field service. The C-face motor adapter shall be designed to work with the NitroSeal™ gearbox.
 4. As an option, the architect or owner may upgrade to the "harsh environment package," which includes a motor with an IP55 NEMA classification. As part of the "harsh environment package," the onboard VFD enclosure is sealed for weather-resistant operation.
- E. Gearbox
1. The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X series. The gearbox shall include a high-efficiency, hermetically sealed, nitrogen-filled, offset helical gear reducer with two-stage gearing, a hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit. Lubrication shall be high-grade, low-foaming synthetic oil with extreme pressure additives and a wide temperature range and shall be lubricated for the life of the product (no oil changes required).
 2. The gearbox shall be equipped with a hollow shaft threaded to accept a ¾" NPT fitting in which wiring, piping, etc., can be routed to below the fan. A standard junction box can be affixed to this hollow shaft to allow for installing optional features such as lights or cameras. The inclusion of the hollow shaft shall be specified at the time of order.
- F. Mounting Post
1. The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.
- G. Mounting System
1. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The design of the upper mount shall provide two axes of rotation. This design shall allow for adjustments to be made after the mount is installed to the mounting structure to ensure the fan will hang level from the structure.
 2. The upper mount shall be of ASTM A-36 steel, at least 3/16" thick, and powder coated for appearance and corrosion resistance. No mounting hardware or parts substitutions, including cast aluminum, are acceptable.
 3. All mounting hardware shall be SAE Grade 8 or equivalent.
- H. Hub

1. The fan hub shall be 19" (48 cm) in diameter and shall be made of precision cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, eight (8) aluminum spars, and one (1) aluminum spacer fastened with a pin and collar rivet system. The overall design shall provide a flexible assembly such that force loads experienced by the hub assembly shall be distributed over a large area to reduce the fatigue experienced at the attachment point for the fan blade.
2. The hub shall be secured to the output shaft of the gearbox by means of ten (10) high strength bolts. The hub shall incorporate four (4) safety retaining clips made of 1/4" (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

I. Safety Cables

1. The fan shall be equipped with an upper safety cable that provides an additional means of securing the fan assembly to the building structure. The upper safety cable shall have a diameter of $\varnothing 3/8$ " (1 cm).
2. The fan shall be equipped with two lower safety cables pre-attached to the fan hub that shall provide an additional means of securing the fan to the extension tube. The lower safety cables shall have a diameter of 1/4" (0.6 cm).
3. The safety cables shall be fabricated out of 7 x 19 galvanized steel cable. The end loops shall be secured with swaged Nicopress sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
4. Field construction of safety cables is not permitted.

J. Digital Variable Speed Wall Controller

1. The fan shall be equipped with a digital variable speed wall controller. The user interface shall be an intuitive touchscreen interface.
2. The controller shall be mounted to a standard rectangular or square outlet box.
3. A 150-ft (45.7-m) CAT5 cable shall be provided for connecting the controller to the fan's VFD and to provide power to the controller.
4. The controller mounting location shall meet the requirements of OSHA standard 29 CFR 1910.303(g) for accessibility minimum clearances.
5. The controller shall have an IP55 rating.
6. The controller shall provide fan start/stop, speed, and direction control functions.
7. The controller shall provide diagnostic and fault history information for the connected fan, as well as the ability to configure fan parameters with the assistance of Big Ass Fans Customer Service.
8. The controller interface shall be able to be secured with a passcode to prevent unauthorized access to fan controls and settings.
9. The controller shall operate out of the box without setup and upon connection to CAT5 cable.

K. Guy Wires

1. Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.

.2 Manufacturers:

- .1 Big Ass Basic 6
- .2 Continental
- .3 Greenheck

3 Execution

3.1 Installation of Roof Mounted Exhaust Fans

- .1 Provide roof mounted exhaust fans.
- .2 Supply a roof mounting curb with each fan and hand curbs to roofing trade on roof for mounting and flashing into roof construction as part of roofing work. Secure fans in place on curbs.
- .3 Install dampers in curb damper tray and secure in place.

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- .4 For equipment/system manufacturer certification requirements, refer to Section 20 05 00 – Common Work Results for Mechanical.
 - .5 For equipment/system start-up requirements, refer to Section 20 05 00 – Common Work Results for Mechanical.
 - .6 Include for a 4-hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.2 Installation of Centrifugal Inline Fans

- .1 Provide inline centrifugal fans.
- .2 Secure each fan in place from structure with vibration isolation, independent of connecting ductwork and in accordance with fan manufacturer's instructions.
- .3 Brace and secure each unit in accordance with requirements specified in Section 20 05 48.16 - Seismic Controls for Mechanical Systems.
- .4 Ensure duct connections are made using flexible connection material.
- .5 For equipment/system manufacturer certification requirements, refer to Section 20 05 00 – Common Work Results for Mechanical.
- .6 For equipment/system start-up requirements, refer to Section 20 05 00 – Common Work Results for Mechanical.
- .7 Include for a 4-hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.3 Installation of Wall Mounted Fans

- .1 Secure each fan in place with the top of the wall plate in the wall opening, independent of connecting ductwork and in accordance with fan manufacturer's instructions.
- .2 Brace and secure each unit in accordance with requirements specified in Section 20 05 48.16 - Seismic Controls for Mechanical Systems.

3.4 Installation of Ceiling Destratification Fans

- .1 Provide ceiling destratification fans.
- .2 Secure each fan in place at the ceiling from structure in accordance with manufacturer's instructions and drawing details. Confirm exact locations prior to roughing-in. Install safety chains and fan blade guards.
- .3 Plug each fan motor into an adjacent receptacle.
- .4 Supply a fan speed controller for fans as indicated and hand to electrical trade at site for wall mounting and connection to fan motor controllers. Confirm exact speed controller locations prior to installation, and include for identification of each speed controller.
- .5 For equipment/system manufacturer certification requirements, refer to Section 20 05 00 – Common Work Results for Mechanical.
- .6 For equipment/system start-up requirements, refer to Section 20 05 00 – Common Work Results for Mechanical.

- .7 Include for a 1/2 day on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.4 Training

- .1 Include for a 4 hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration.

End of Section

PART 1 - GENERAL

1.1 References

- .1 UL 508
- .2 NEC

1.2 Quality Assurance

- .1 To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.
- .2 All optional features shall be functionally tested at the factory for proper operation.

1.3 Submittals

- .1 Shop drawings must be submitted and reviewed by the Consultant prior to the contractor ordering or shipping any subject equipment. Payments will not be processed for equipment not properly documented and reviewed under the terms of submittal.
- .2 Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFDs FLA rating, certification agency file numbers and catalog information.
- .3 The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.
- .4 Submit a Harmonic Distortion Analysis for the jobsite location.
- .5 Harmonic filtering. The seller shall, with the aid of the buyer's electrical power single line diagram, providing the data required by IEEE-519, perform an analysis to initially demonstrate the supplied equipment will meet the IEEE standards after installation. If, as a result of the analysis, it is determined that additional filter equipment is required to meet the IEEE recommendations, then the cost of such equipment shall be included in the bid. A harmonic analysis shall be submitted with the approval drawings to verify compliance with the latest version of IEEE-519 voltage and current distortion limits as shown in table 10.2 and 10.3 at the point of common coupling (PCC). The PCC shall be defined as the consumer-utility interface or primary side of the main distribution transformer.

1.4 Warranty

- .1 The VFD shall be warranted by the manufacturer for a period of 36 months from date of shipment. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service. The warranty shall be provided by the VFD manufacturer.

1.5 Acceptable Manufacturers

- .1 Danfoss Graham
- .2 Trane TRC Series

PART 2 - PRODUCTS

- 2.1 Furnish complete variable frequency drives as specified herein for the fans and pumps designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 1 enclosure, or other.

NEMA type according to the installation and operating conditions at the job site.

- 2.2 The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to negate the need for motor derating.
- 2.3 With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not be overloaded under operating conditions.
- 2.4 The VFD shall include a fused disconnect where noted in the schedule.
- 2.5 The VFD shall include a full-wave diode bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
- 2.6 The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL-508 certified for the building and assembly of option panels. Local representative panel shop assembly for option panels is not acceptable. The appropriate UL stickers shall be applied to both the drive and option panel, in the case where these are not contained in one panel. When these drives are to be located in Canada, the CSA or C-UL certifications shall apply. Both drive and option panel shall be manufactured in ISO 9001 certified facilities.
- 2.7 The VFD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VFDs without DC link reactors shall provide a minimum 5% impedance line reactor.
- 2.8 The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.
- 2.9 The VFD shall be able to provide full torque at any selected speed up to base speed to allow driving direct drive fans without derating.
- 2.10 An automatic energy optimization selection feature shall be provided standard in the drive. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide a 3% to 10% additional energy savings.
- 2.11 Input and output power circuit switching can be done without interlocks or damage to the VFD.
- 2.12 An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or decouple the motor from the load to run the test.
- 2.13 Galvanic and/or optical isolation shall be provided between the drive's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. Drives not including isolation on both analog I/O and discrete I/O shall include additional isolation modules.
- 2.14 VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted optimizing motor and drive efficiencies while reducing motor noise. Drives not incorporating this feature shall have a fixed carrier frequency above 10 kHz without

output current derating or reduced motor performance.

2.15 Protective Features

- .1 A minimum class 20 I²t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.
- .2 Protection against input transients, loss of AC line phase, short circuit, ground fault, overvoltage, undervoltage, drive overtemperature and motor overtemperature. The VFD shall display all faults in plain English. Codes are not acceptable.
- .3 Protect VFD from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output with an input voltage as low as 164 volts for 208/230 volt units, and 313 volts for 460 volt units.
- .4 The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
- .5 Drive package shall include semi-conductor rated input fuses to protect power components.
- .6 To prevent breakdown of the motor winding insulation, the drive shall be designed to comply with IEC Part 34-17. Otherwise the drive manufacturer must ensure that inverter rated motors are supplied.
- .7 Drive shall include a "signal loss detection" circuit to sense the loss of the control signal, and shall be programmable to react as desired in such instance.
- .8 Drive shall function normally when the keypad is removed while the drive is running and continue to follow remote commands. No warnings or alarms shall be issued.
- .9 Drive shall catch a rotating motor operating forward or reverse up to full speed.
- .10 VFD shall be rated for 100,000 amp interrupting capacity (AIC).
- .11 Drive shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
- .12 Drive shall continue to operate without faulting until input voltage exceeds 300 volts on 208/230 volt drives, and 539 volts on 460 volt drives.

2.16 Interface Features

- .1 Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the drive and determine the speed reference.
- .2 Provide a 24 V DC output signal to indicate that the drive is in Auto/Remote mode.
- .3 Digital manual speed control. Potentiometers are not acceptable.
- .4 Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.
- .5 All keypads shall be identical and interchangeable.
- .6 To setup multiple drives, it shall be possible to upload all setup parameters to the drive's keypad, place that keypad on all other drives in turn and download the setup to each drive.
- .7 Display shall be programmable to display in 9 languages including English, Spanish and French.
- .8 The display shall have four lines, with 20 characters on three lines and eight large characters on one line.
- .9 A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the drive when the keypad is removed.
- .10 A quick setup menu with factory preset typical HVAC parameters shall be provided on the drive eliminating the need for macros.
- .11 The drive shall be fitted with an RS 485 serial communications port and be supplied with
 - a. Windows[®] compatible software to display all monitoring, fault, alarm and status signals. The software shall allow parameter changes to be made to the drive settings, as well as storage of each controller's operating and setup parameters, and remote operation of the drive. The same software shall be used throughout the entire product range.

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- .12 The drive shall have BACnet compatibility.
 - .13 As a minimum, the following points shall be controlled and/or accessible:
 - .1 Drive start/stop
 - .2 Speed reference
 - .3 Fault diagnosis
 - .4 Meter points
 - .5 Motor power in kW
 - .6 Motor power in HP
 - .7 Motor kW/hr
 - .8 Motor current
 - .9 Motor voltage
 - .10 Hours run
 - .11 Feedback signal #1
 - .12 Feedback signal #2
 - .13 DC link voltage
 - .14 Thermal load on motor
 - .15 Thermal load on drive
 - .16 Heatsink temperature
 - .14 Two set-point control interface (PID control) shall be standard in the unit. Drive shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.
 - .15 The sleep mode shall be functional in both follower mode and PID mode.
 - .16 Floating point control interface shall be provided to increase/decrease speed in response to switch closures.
 - .17 Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. Drives unable to show these four displays simultaneously shall provide panel meters.
 - .18 Sleep mode shall be provided to automatically stop the drive when speed drops below set "sleep" level for a specified time. Drive automatically restarts when speed command exceeds set "wake" level.
 - .19 Run permissive circuit shall be provided to accept a "system ready" signal to assure that the drive does not start until dampers or other auxiliary equipment are in the proper state for drive operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
 - .20 An elapsed time meter and kWh meter shall be provided.
 - .21 The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, No Load Warning, DC Bus Voltage, Drive Temperature in degrees, and Motor Speed in engineering units per application (in percent speed, GPM, CFM,...). Drive will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.
 - .22 The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application and temperature (°F) for a cooling tower application.
 - .23 Four meter displays can be shown at once on the display. This allows the actual value of the follower signal to be shown simultaneously with the drive's response to that signal for ease in commissioning.
 - .24 Drive will sense the loss of load and signal a no load/broken belt warning or fault.
 - .25 If the temperature of the drive's heat sink rises to 80°C, the drive shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise, the drive shall automatically reduce its output frequency to the motor. As the drive's heat sink temperature returns to normal, the drive shall automatically increase the output frequency to the
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- motor and return the carrier frequency to it's normal switching speed.
 - .26 The VFD shall have temperature-controlled cooling fans for quiet operation and minimized losses.
 - .27 The VFD shall store in memory the last 20 faults and record all operational data.
 - .28 Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
 - .29 Two programmable relay outputs, one Form C 240 V AC, one Form A 50 V AC, shall be provided for remote indication of drive status.
 - .30 Two programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include 0-10 V dc, 0-20 mA and 4-20 mA.
 - .31 Two programmable 0 to 20 mA analog outputs shall be provided for indication of drive status. These outputs shall be programmable for output speed, voltage, frequency, amps and input kW.
 - .32 Under fire mode conditions the VFD shall automatically default to a preset speed.

2.17 Adjustments

- .1 VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning of drive to motor.
- .2 Sixteen preset speeds shall be provided.
- .3 Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves may be automatically contoured to prevent tripping. Four current limit settings shall be provided.
- .4 If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit, inverter overload and motor overload.
- .5 The number of restart attempts shall be selectable from 0 through 20 and the time between attempts shall be adjustable from 0 through 600 seconds.
- .6 An automatic "on delay" may be selected from 0 to 120 seconds. both drive and bypass mode.

2.18 Bypass

- .1 A 3-contactor bypass shall be provided on all VFD's serving heating pumps or glycol pumps.
- .2 Bypass is not required for air handling unit or rooftop units. Provide a manual 3-contactor bypass consisting of a door interlocked main fused disconnect padlockable in the off position, a built-in motor starter and a four position DRIVE/OFF/LINE/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the drive. In the OFF position, the motor and drive are disconnected. In the LINE position, the motor is operated at full speed from the AC power line and power is disconnected from the drive so that service can be performed. In the TEST position, the motor is operated at full speed from the AC line power. This allows the drive to be given an operational test while continuing to run the motor at full speed in bypass. Customer supplied normally closed dry contact shall be interlocked with the drives safety trip circuitry to stop the motor whether in DRIVE or BYPASS mode in case of an external safety fault.
- .3 Service personnel shall be able to defeat the main power disconnect and open the bypass enclosure without disconnecting power This shall be accomplished through the use of a specially designed tool and mechanism while meeting all local and national code requirements for safety.
- .4 Smoke purge circuitry shall be interconnected such that an external dry contact can be used in both drive and bypass mode.
- .5 A 3-contactor bypass shall be provided on all VFD's serving heating pumps or glycol pumps.
- .6 Bypass is not required for air handling unit or rooftop units.
- .7 Provide a manual 3-contactor bypass consisting of a door interlocked main fused disconnect padlockable in the off position, a built-in motor starter and a four position DRIVE/OFF/LINE/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the drive. In the OFF position, the motor and drive are disconnected. In the LINE position, the motor is operated at full speed from the AC power line and power is disconnected from the drive so that service

can be performed. In the TEST position, the motor is operated at full speed from the AC line power. This allows the drive to be given an operational test while continuing to run the motor at full speed in bypass. Customer supplied normally closed dry contact shall be interlocked with the drives safety trip circuitry to stop the motor whether in

- .8 DRIVE or BYPASS mode in case of an external safety fault.
- .9 Service personnel shall be able to defeat the main power disconnect and open the bypass
- .10 enclosure without disconnecting power This shall be accomplished through the use of a specially designed tool and mechanism while meeting all local and national code requirements for safety.
- .11 Smoke purge circuitry shall be interconnected such that an external dry contact can be used in both drive and bypass mode.

2.19 Service Conditions

- .1 Ambient temperature, -10 to 40°C (14 to 104°F).
- .2 0 to 95% relative humidity, non-condensing.
- .3 Elevation to 3,300 feet without derating.
- .4 AC line voltage variation, -10 to +10% of nominal with full output.
- .5 No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

PART 3 - EXECUTION

3.1 Start-up Service

- .1 The manufacturer shall provide start-up and commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty repairs at the customer's site. Sales personnel and other agents who are not factory certified technicians for VFD field repair shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system. Start-up shall include customer operator training at the time of the equipment commissioning.

3.2 Examination

- .1 Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VFD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendations shall be verified.
- .2 The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Comply with General Requirements of Section 23 01 01.

1.2 SECTION INCLUDES

- .1 Packaged Roof Top Air conditioning units.
- .2 Controls.

1.3 REFERENCES

- .1 ARI 210/240 - Unitary Air-Conditioning Equipment.
- .2 ARI 270 - Sound Rating of Outdoor Unitary Equipment.
- .3 ASHRAE/IESNA 90.1 - Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

1.4 SUBMITTALS FOR REVIEW

- .1 Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

1.5 SUBMITTALS FOR INFORMATION

- .1 Section 23 01 01: Submittals for information.
- .2 Submit manufacturer's installation instructions. Indicate assembly, support details, connection requirements, and include start-up instructions.

1.6 SUBMITTALS FOR CLOSEOUT

- A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation, and Maintenance manual with startup requirements shall be provided.
- B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.
- C. Section 23 01 01: Submittals for project closeout.
- D. Include manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.7 QUALITY ASSURANCE

- A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.
- B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

- C. Unit shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.
- D. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.
- E. Unit shall be certified by ETL and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label. The nameplate, safety labels and warnings will be in English and French.

1.8 REGULATORY REQUIREMENTS

- .1 Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 23 01 01: Transport, handle, store, and protect products.
- .2 Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.10 WARRANTY

- .1 Section 23 01 01: Submittals for project closeout.
- .2 Warranty Period:
 - .1 Refrigeration System: Manufacturer's standard, minimum two years from date of Substantial Completion, including components and labour.
 - .2 Other Parts: Manufacturer's standard, minimum two years from date of Substantial Completion, including only components and excluding labour.

2 PRODUCTS

2.01 Manufacturer

- A. Products shall be provided by the following manufacturers:
 - 1. Base of design is **Daikin**, Roof Top Units meeting specifications by Carrier, Trane & AAon will be treated as equal.
 - 2. The contractor shall furnish and install packaged outdoor rooftop units as shown and scheduled on the contract documents. The units shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

2.02 Rooftop Units

- A. Furnish as shown on plans, Daikin Applied Rebel Single Zone Heating and Cooling Unit(s) model DPS. Unit performance and electrical characteristics shall be per the job schedule.
- B. Configuration: Fabricate as detailed on prints and drawings:
 - 1. Return plenum / economizer section
 - 2. Filter section
 - 3. Cooling coil section
 - 4. Supply fan section
 - 5. Gas heating section.
 - 6. Condensing unit section
- C. The complete unit shall be cETLus listed.
- D. The unit shall be ASHRAE 90.1-2019 compliant and labeled.

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- E. Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Each unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-32 Refrigerant and oil.
 - F. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test and a final unit inspection.
 - G. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
 - H. Performance: All scheduled EER, IEER, capacities and face areas are minimum accepted values. All scheduled amps, kW, and HP are maximum accepted values that allow scheduled capacity to be met.
 - I. Warranty: The manufacturer shall provide 12-month parts only warranty. Defective parts shall be repaired or replaced during the warranty period at no charge. The warranty period shall commence at startup or six months after shipment, whichever occurs first.

2.02 CABINET, CASING, AND FRAME

- A. Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 1" thick with an R-value of 7.0 on sizes 3-17 tons, and shall be 2 part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.
- B. Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-quality polyester resin topcoat. Finished, unabraded panel surfaces shall be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16" at 1,000 hours minimum exposure to an ASTM B117 salt spray environment. Measurements of results shall be quantified using ASTM D1654 in conjunction with ASTM D610 and ASTM D714 to evaluate blister and rust ratings.
- C. Service doors shall be provided on the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless-steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.
- D. The unit base shall overhang the roof curb for positive water runoff and shall seat on the roof curb gasket to provide a positive, weathertight seal.

2.03 OUTDOOR/RETURN AIR SECTION

- A. Unit shall be provided with an outdoor air economizer section. The economizer section shall include outdoor, return, and exhaust air dampers. The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be parallel blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 1.5 cfm / square foot of damper area at 1" differential pressure in according with testing defined in AMCA 500. A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges. Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor

and return air streams to determine if outdoor air is suitable for “free” cooling. If outdoor air is suitable for “free” cooling, the outdoor air dampers shall modulate in response to the unit’s temperature control system.

- B. Daikin Applied UltraSeal low leak dampers shall be provided. Damper blades shall be fully gasketed and side sealed and arranged vertically in the hood. Damper leakage shall be less than 1.5 CFM/Sq. Ft. of damper area at 1.0 inch static pressure differential. Leakage rate to be tested in accordance with AMCA Standard 500. Damper blades shall be operated from multiple sets of linkages mounted on the leaving face of the dampers. Control of the dampers shall be from a factory installed actuator.
- C. Control of the outdoor dampers shall be by a factory installed actuator. Damper actuator shall be of the modulating type. Damper to open when supply fan starts, and close when supply fan stops.

2.04 ENERGY RECOVERY

- A. The rooftop unit shall be provided with an AHRI certified rotary wheel air-to-air heat exchanger in a cassette frame complete with seals, drive motor and drive belt. The energy recovery wheel shall be an integral part of the rooftop unit with unitary construction and does not require field assembly. Bolt-on energy recovery units that require field assembly and section to section gasketing and sealing are not acceptable.
- B. The wheel capacity, air pressure drop and effectiveness shall be AHRI certified per AHRI Standard 1060. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Heat Exchangers For Energy Recovery Ventilation Equipment.
- C. The rooftop unit shall be designed with a track so the entire energy recovery wheel cassette can slide out from the rooftop unit to facilitate cleaning
- D. The unit shall have 2” Merv 8 filters for the outdoor air before the wheel to help keep the wheel clean and reduce maintenance. Filter access shall be by a hinged access door with ¼ turn latches.
- E. The matrix design shall have channels to reduce cross contamination between the outdoor air and the exhaust air. The layers shall be effectively captured in aluminum and stainless-steel segment frames that provide a rigid and self-supporting matrix. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belt(s) of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.
- F. The total energy recovery wheel shall be coated with silica gel desiccant permanently bonded without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.
- G. Wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning.
- H. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel. Wheels shall be connected to the shaft by means of taper lock hubs.
- I. The exhaust air fan shall be a direct drive SWSI plenum fan. The exhaust fan shall be sized for the airflow requirements per the construction schedule. The unit controller shall control the exhaust fan to maintain building pressure. A VFD shall be provided for the exhaust fan motor, or the exhaust fan motor shall be an ECM motor. The rooftop unit shall have single point electrical power connection and shall be ETL listed
- J. The control of the energy recovery wheel shall be an integral part of the rooftop unit’s DDC controller. The DDC controller shall have visibility of the outdoor air temperature, leaving wheel temperature, return air temperature, and exhaust air temperature. These temperatures shall be displayed at the rooftop units DDC controller LCD display. All of these temperatures shall be made available through the BACnet interface.

K. The rooftop unit with the energy recovery wheel shall incorporate the economizer operation. The energy recovery wheel shall have a bypass damper. When the unit is in the economizer mode of operation the energy recovery wheel shall stop and the bypass dampers shall be opened. The outdoor air shall be drawn through the bypass dampers to reduce the pressure drop of the outdoor airstream.

L. The rooftop unit DDC controller shall provide frost control for the energy recovery wheel. When a frost condition is encountered the unit controller shall stop the wheel. When in the frost control mode the wheel shall be jogged periodically and not be allowed to stay in the stationary position.

2.05 EXHAUST FAN

A. Exhaust fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The exhaust fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.

B. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

C. The unit DDC controller shall provide building static pressure control. The unit controller shall provide proportional control of the exhaust fans from 25% to 100% of the supply air fan designed airflow to maintain the adjustable building pressure setpoint. The field shall mount the required sensing tubing from the building to the factory mounted building static pressure sensor.

2.06 FILTERS

A. Unit shall be provided with a draw-through filter section. The filter rack shall be designed to accept a 2" prefilter and a 4" final filter. The unit design shall have a hinged access door for the filter section. The manufacturer shall ship the rooftop unit with 2" MERV 8 construction filters. The contractor shall furnish and install, at building occupancy, the final set of filters per the contract documents.

2.07 COOLING COIL

A. The indoor coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with a factory piped cooling coil and an ASHRAE 62.1 compliant double sloped drain pan.

B. The direct expansion (DX) cooling coils shall be fabricated of seamless high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 3 rows. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face active at all load conditions. All coils shall be factory leak tested with high pressure air under water.

C. The cooling coil shall have an electronic controlled expansion valve. The unit controller shall control the expansion valve to maintain liquid subcooling and the superheat of the refrigerant system.

D. The refrigerant suction lines shall be fully insulated from the expansion valve to the compressors.

E. The drain pan shall be stainless steel and positively sloped. The slope of the drain pan shall be in two directions and comply with ASHRAE Standard 62.1. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall extend beyond the leaving side of the coil. The drain pan shall have a threaded drain connection extending through the unit base.

2.08 SUPPLY FAN

- A. Supply fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with fan blades that are continuously welded to the hub plate and end rim. The supply fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.
- B. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
- C. The supply fan shall be capable of airflow modulation from 30% to 100% of the scheduled designed airflow. The fan shall not operate in a state of surge at any point within the modulation range.

2.09 VARIABLE AIR VOLUME CONTROL

- A. The unit controller shall proportionally control the Electronically Commutated Motors (ECM) on the supply and exhaust fans. The supply fan shall be controlled to maintain an adjustable duct pressure setpoint. A duct static pressure sensor shall be factory mounted in the control panel. The field shall furnish and install the pneumatic tubing for the duct static pressure sensor and the building pressure sensor. The field shall furnish and install the outdoor air pressure sensor.
- B. The supply air fan drive output shall be controlled by the factory installed main unit control system and drive status and operating speed shall be monitored and displayed at the main unit control panel.

2.010 HEATING SECTION

- A. The rooftop unit shall include a natural gas heating section. The gas furnace design shall be one natural gas fired heating module factory installed downstream of the supply air fan in the heat section. The heating module shall be a tubular design with in-shot gas burners.
- B. The module shall be complete with furnace controller and control valve capable of 10:1 modulating operation.
- C. The heat exchanger tubes shall be constructed of stainless steel
- D. The module shall have an induced draft fan that will maintain a negative pressure in the heat exchanger tubes for the removal of the flue gases.
- E. Each burner module shall have two flame roll-out safety protection switches and a high temperature limit switch that will shut the gas valve off upon detection of improper burner manifold operation. The induced draft fan shall have an airflow safety switch that will prevent the heating module from turning on in the event of no airflow in the flue chamber.
- F. The factory installed DDC unit control system shall control the gas heat module. Field installed heating modules shall require a field ETL certification. The manufacturer's rooftop unit ETL certification shall cover the complete unit including the gas heating modules.

2.011 HEAT PUMP HEATING

- A. The evaporator coil, condenser coil, compressors and refrigerant circuit shall be designed for heat pump operation. The refrigerant circuit shall contain a 4-way reversing valve for the heat pump operation. The outdoor coil shall have an electronic expansion valve to control the refrigerant flow. The unit controller shall modulate the expansion valve to maintain compressor operation within the compressor operational envelope.
- B. The refrigerant system shall have a pump-down cycle.
- C. The unit shall have a natural gas furnace for hybrid heating. When the heatpump operation cannot maintain the discharge air temperature setpoint the natural gas furnace shall temper the airstream to the discharge air temperature setpoint.

2.012 CONDENSING SECTION

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- A. Outdoor coils shall have seamless copper tubes, mechanically bonded into aluminum plate-type fins. The fins shall have full drawn collars to completely cover the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil. Each outdoor air coil shall be factory leak tested with high-pressure air under water.
 - B. Fan motors shall be an ECM type motor for proportional control. The unit controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit in ambient conditions up to 125°F]. Mechanical cooling shall be provided to 0°F. Heat Pump Heating shall be provided to -10°F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.
 - C. The condenser fan shall be low noise blade design. Fan blade design shall be a dynamic profile for low tip speed. Fan blade shall be of a composite material.
 - D. The unit shall have scroll compressors. One of the compressors shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the compressor to maintain the discharge air temperature. [The inverter compressor shall have a separate oil pump and an oil separator for each compressor that routes oil back to the compressor instead of through the discharge line.
 - E. Pressure transducers shall be provided for the suction pressure and head pressure. Temperature sensor shall be provided for the suction temperature and the refrigerant discharge temperature of the compressors. All of the above devices shall be an input to the unit controller and the values be displayed at the unit controller.
 - F. Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for low head pressure compressor starting and increased compressor reliability. When there is a call for mechanical cooling the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.
 - G. Each circuit shall be dehydrated and factory charged with R32 Refrigerant and oil.

2.013 ELECTRICAL

- A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color-coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply fan motors shall have contactors and external overload protection. Knockouts shall be provided in the bottom of the main control panels for field wiring entrance.
- B. A GFI receptacle shall be unit mounted that is field powered.
- C. A single non-fused disconnect switch shall be provided for disconnecting electrical power at the unit. Disconnect switches shall be mounted internally to the control panel and operated by an externally mounted handle.

2.014 CONTROLS

- A. Provide a complete integrated microprocessor based Direct Digital Control (DDC) system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.
- B. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.

C. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.

D. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip.

E. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to ensure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.

F. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:

1. Return air temperature
2. Discharge air temperature
3. Outdoor air temperature
4. Space air temperature
5. Outdoor enthalpy, high/low
6. Compressor suction temperature and pressure
7. Compressor head pressure and temperature
8. Expansion valve position
9. Condenser fan speed
10. Inverter compressor speed
11. Dirty filter indication
12. Airflow verification
13. Cooling status
14. Control temperature (Changeover).
15. VAV box output status
16. Cooling status/capacity
17. Unit status
18. All time schedules
19. All time schedules
20. Previous alarms with time and date
21. Optimal start
22. Supply fan and exhaust fan speed
23. System operating hours

G. The user interaction with the keypad shall provide the following:

1. Controls mode
2. Cooling and heating change-over temperature with deadband
3. Cooling discharge air temperature (DAT)
4. Supply reset options
5. Temperature alarm limits
6. Lockout control for compressors
7. Compressor interstage timers
8. Night setback and setup space temperature

9. Building static pressure
10. Economizer changeover
11. Currently time and date
12. Tenant override time
13. Occupied/unoccupied time schedule
14. One event schedule
15. Holiday dates and duration
16. Adjustable set points
17. Service mode

H. If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:

1. Zone sensor with tenant override switch
2. Zone sensor with tenant override switch plus heating and cooling set point adjustment. (Space Comfort Control systems only)

I. To increase the efficiency of the cooling system the DDC controller shall include a discharge air temperature reset program for part load operating conditions. The discharge air temperature shall be controlled between a minimum and a maximum discharge air temperature (DAT) based on one of the following inputs:

1. Airflow
2. Outside air temperature
3. Space temperature
4. Return air temperature
5. External signal of 1-5 vdc
6. External signal of 0-20 mA
7. Network signal

J. The microprocessor controls shall be solely dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. No commissioning settings shall be lost, even during extended power shutdowns.

K. The microprocessor controls shall be dependent on starting and stopping of the unit via terminal strip control and logic. The control system shall be capable of providing a remote alarm indication. The microprocessor shall provide compressor capacity & status, defrost status (heat pump only), condensate overflow alarm, and dirty filter alarm.

L. All digital and analog inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip.

M. The keypad interface shall allow convenient navigation and access to the commissioning functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:

1. Supply and exhaust fan speed control
2. Refrigeration alarm details.

- 2.015** A2L Leak Mitigation Refrigerant Detection System (RDS) for compressorized rooftop equipment using A2L refrigerant.
- A. Compressorized rooftop equipment using A2L refrigerant shall come equipped with a factory installed Refrigerant Detection System (RDS) in compliance with UL60335-2-40. The factory-installed unit controller will respond and control the unit to comply with UL60335-2-40 according to the alarm status of the refrigerant detection system. See the unit Operations Manual for a detailed sequence of operations.
- B. The Refrigerant Detection System (RDS) shall consist of the following components:
1. Dedicated A2L Refrigerant Detection Control Board

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2. Refrigerant Sensor or Sensors. The number of sensors will vary based on the product and configuration as needed to comply with UL requirements.
- C. Operation and Monitoring:
1. The refrigerant sensor or sensors communicate with the refrigerant detection control board. The refrigerant sensors detect the presence of the A2L refrigerant outside of the sealed refrigeration piping and communicate the levels to the refrigerant detection control board. The refrigerant detection controller communicates the RDS status to the factory-installed unit controller.
 2. Alarm Communication: The unit controller will communicate RDS alarms based on the RDS status in the same way as any other alarm. Alarms are triggered by the following: 1) Refrigerant detected above 15% of the refrigerant lower flammability level (LFL); 2) Refrigerant Sensor Fault.
 - a. A customer relay is provided for the field to connect directly to the refrigerant detection control board as an alternative means to receive the above two alarm statuses.
 - b. A customer relay is provided for the field to connect directly to the refrigerant detection control board as an alternative means to receive the above two alarm statuses.
- D. Factory unit wiring diagrams must show the refrigerant leak detection system wiring.

2.016 ROOF CURB

- A. A prefabricated heavy gauge galvanized steel, mounting curb shall be provided for field assembly on the roof decking prior to unit shipment. The roof curb shall be a full perimeter type with complete perimeter support of the air handling section and condensing section. The curb shall be a minimum of 24" high and include a nominal 2" x 4" wood nailing strip. Gasket shall be provided for field mounting between the unit base and roof curb.

Part 3 - Execution

3.01 Installation, Operation, and Maintenance

- A. Installation, Operation, and Maintenance manual shall be supplied with the unit.
- B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation, and Maintenance manual instructions.
- C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

End of Section

1 General

1.1 Conditions

- .1 Read and conform to:
 - .1 The General Conditions of the Contract as amended,
 - .2 The General Requirements of Division 1,

1.2 Building Management System Subcontractor

- .1 All work of this Section shall be coordinated and provided by a single BMS Subcontractor.
- .2 The work of this Section shall be scheduled, coordinated, and interfaced with the associated work of other trades.
- .3 The work of this Section shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, warranties, services, and items which are required for the complete, fully functional and commissioned BMS, even if these are not specifically mentioned or fully described under this Section.
- .4 If the BMS subcontractor believes there are conflicts or missing information in the project documents, the subcontractor shall promptly request clarification and instruction from the design team.

1.3 General Description

- .1 Provide a complete control system for the Fire Station facility and PRS station facility. Include all programming, verification, start-up and training to deliver an operable system to the owner.
- .2 Provide a complete system including:
 - .1 Control Panel Including:
 - .1 Network Display Terminal
 - .2 Time Clock
 - .3 Run Status and Alarm lights for each AHU (total of 2 lights)
 - .2 RTU controllers
 - .3 VAV box controllers
 - .4 All Required Sensors and Devices
 - .5 Programming
 - .6 Site Testing/Verification
 - .7 Operator Training (4 hour) – Two training sessions of 2 hours each.
- .3 Provide electrical installation of the control panel and all associated devices.
- .4 Power for controls provided by others. Electrical division to provide 120 VAC power a local junction box near the VAV's. Controls contractor to provide power from junction box to the individual VAV controllers.
- .5 The control system shall use the BACnet protocol for communication to provide the capability of interacting with a Web based BAS.
- .6 Provide and install dampers, damper actuators as shown on the contract documents. It is the responsibility of the controls contractor to size the damper actuators and submit the selection of the damper actuators to the consultant for approval before installation.
- .7 Provide and install a complete operating CO/NOX detection system:
 - GEM-11 Multipurpose, Self-contained Gas Detector
 - Dual Channel, Integral electrochemical carbon monoxide (CO) sensor (0-200 ppm range), integral electrochemical nitrogen dioxide (NO2) sensor (0-10 ppm range) LED indicators, 4-20 ma output, two 5A@240 VAC SPDT relays, audible alarm and silence push. The following accessories to be provided:
 - Splash guard, water /dust tight enclosure, LED digital display
 - TIB-2250M Enclosed external transformer, 120-22 VAC powered version.
 - RSH-24VDC Remote strobe & horn combo, 24VDC w/ckt & N1 housing.
 - SCS-8000-SPG Large galvanized metal protective guard 16 gauge.

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- Gas Detection system by Critical Environment Technologies and Honeywell are acceptable products.

- .8 All dampers in the project are to be provided by the controls contractor and are to be Tamco series 9000 thermally insulated, equivalent product by Ruskin is acceptable. All dampers to be installed by Mechanical contractor.

1.4 Acceptable BMS Subcontractors

- .1 The following Controls manufacturers are treated as equal:

For York Region (PRS)

- .1 Ainsworth/ Viridian Automation- Delta Control
- .2 Setpoint Automation - Reliable controls

For Stouffville (Fire)

- 1. Viridian Automation (Delta Controls)

1.5 Warranty

- .1 Warrant work as follows:
- .1 Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.

2 Products

2.1 Materials

- .1 Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.2 Communication

- .1 Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

2.3 Controllers

- .1 BACnet.
 - 1. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
- .2 Communication
 - 1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on
 - 2. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
- .3 Environment. Controller hardware shall be suitable for anticipated ambient conditions.
 - 1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

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2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
 - .4 Memory.
 1. Controller memory shall support operating system, database, and programming requirements.
 2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
 - .5 VAV Controllers/Smart Actuators: Controllers to have integrated damper actuator and pressure sensor. Provide pre-loaded programs that are selectable via dip switches and allow for custom field programming.
 - .6 Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
 - .7 Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.
 - .8 Network Display Terminals to come with 4 line LCD display and navigation buttons.
 - .9 All electric switches and control devices to be labeled for the environment and application.

2.4 Auxiliary Control Devices

- .1 Temperature Sensors.
 1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
 2. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
- .2 Relays.
 1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
 2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable $\pm 100\%$ from set point shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.
- .3 Pressure Transducers.
 1. Transducers shall have linear output signal and field-adjustable zero and span.
 2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
- .4 Current Switches.
 1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.
- .5 Local Control Panels.
 1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.
 2. Provide Allen-Bradley (or equivalent) lights on panel.
- .6 All control devices to be labeled for the application.

2.5 Wiring and Raceways

- .1 General. Provide copper wiring, EMT conduit and metal flex as specified in applicable sections of Division 26.
- .2 Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.
- .3 All wiring to be properly labeled.

3. Execution

3.1 General Installation

- .1 Install all equipment, accessories, conduit and interconnecting wiring in a neat manner by a skilled and qualified person using the latest standard of practice for the industry.

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- .2 Unless otherwise specified meet manufacturer's latest printed instructions for materials, planned maintenance and installation methods.
 - .3 Notify consultant in writing of any conflict between these specifications and manufacturer's instructions.
 - .4 All equipment installed shall be mechanically stable and, as necessary, fixed to wall or floor. Anti-vibration mounts to be provided, if required, for the proper isolation of equipment.
 - .5 Install equipment to allow for easy maintenance access. Ensure equipment does not interfere in any way with access to adjacent equipment and personal traffic in the surrounding space.
 - .6 Install all electrical wiring in conformance with the requirements of the local electrical authority, Provincial Building Code and, unless otherwise indicated, the specifications of Division 26 Electrical.
 - .7 Install low voltage wiring in accordance with the control manufacturer's recommendations. All wiring to be FT6 plenum rated cable where allowed by code. Provide EMT conduit where applicable.

3.2 Installation of Controlled Devices and Sensors

- .1 Install all equipment in accordance with manufacturer's published instructions.
- .2 Supply equipment to be installed by other divisions in accordance with their work schedule.
- .3 Coordinate final location of all sensors with consultant's field representative prior to installation.
- .4 Sensor assemblies and elements must be readily accessible.
- .5 Locate all sensing elements to correctly sense measured variable. Isolate elements from vibrations and temperatures which could affect measurement.

3.3 Acceptance and Testing Procedures

- .1 Controls contractor requests completion acceptance in writing and advises owner's authorized representative of situations that prevent a complete testing of overall system performance.
- .2 Return to the site to perform additional tests and/or adjustments, if required, to prove system performance during the warranty period.

3.4 Training

- .1 Provide 4 hours of training in two sessions for the operator at the completion of the project.

3.5 Warranty

- .1 All components, parts, and assemblies shall be guaranteed against defects in material and workmanship for a period of one (1) year after acceptance.

End of Section

1 General

1.1 General

- .1 Read and conform to:
 - .1 The Contract CCDC 2-2008, Stipulated Price Contract as amended.
 - .2 Division 1 General Requirements.

1.2 SECTION INCLUDES

- .1 Sequence of operation (Fire station)
 - .1 Hydronic Heating system
 - .2 RTU
 - .3 VAV
 - .4 Misc.
- .2 Sequence of operations (EMS)
 - .1 Furnace
 - .2 ERV
 - .3 Baseboard Heater
 - .4 Misc.

2 Sequence of Operation- Fire Station

.1 Heating System

The system consists of modulating hot water boilers and heating pumps with the VFD.

The boilers are equipped with original manufacturer safeties and manufacturer recommended safeties. The boiler safeties have higher priority and BAS should not override any safeties.

Boiler plants shall be enabled during all the heating season from September 1st to May 31st. During Summer months, June, July, and August the boiler plant remains off.

1. Heating Pump (P1, P2)

The lead pump is enabled to run continuously when the system is enabled. The differential pressure and pump status shall be monitored. Minimum differential pressure value will be set up during balancing and will be adjustable. The lead pump speed shall be modulated to maintain system differential pressure set point. Lead pump assignment shall be rotated weekly, contractor shall coordinate scheduling requirements with building owner.

2. Hot water supply temperature

The supply setpoint shall be 60°C (140°F) (adj.) when the outside air temperature is 15.5°C (60°F) (adj.).

3. Boilers (B-1, B-2)

The lead hot water boiler shall be enabled to run when the hot water system is enabled, and the lead pump status has been confirmed, and the system hot water supply temperature is less than set point.

The hot water boilers shall modulate and be staged in sequence to maintain the system hot water supply temperature to set point. On failure of a boiler, as indicated by an alarm, the boiler shall be locked out. The next sequenced boiler shall take over operation. On alarm reset, the failed boiler shall return to service.

4. Hot Water flow

A magnetic flow meter and bypass control valve shall be installed in the hot water system. Exact location to be determined on site with Owner.

Magnetic flow meter shall monitor the return water flow to ensure boilers are provided with manufacturers recommended minimum flow rate.

Heating waster system bypass valve to be modulated to maintain the minimum required flow rate.

5. Emergency Shut-Off Switch

New boiler emergency shut-off switches shall be hard-wire interlocked to all boilers and gas fired hot water tanks in the boiler room. Upon activation of switch, all boilers and hot water tanks shall immediately be disabled.

6. Monitoring

The following data points shall be monitored:

- .1 Hot Water Boilers B-1, B-2:
 - .1 Supply Water Temperature
 - .2 Burner Status
 - .3 Common Alarm
 - .4 Local/Remote Switch Status
- .2 Common Hot Water Supply and Return Temperature
- .3 Common Hot Water Return Temperature

7. Critical Alarms

- .1 The lead boiler (B-1) is enabled, and status is not received (2-minute delay).
- .2 Low temperature limit.
- .3 Low leaving water temperature.

.2 Hot Water Unit Heater

- .1 Unit is enabled and disabled to maintain space air temperature to set point, initially set to 22°C (adjustable) during occupied period, and 18°C (adjustable) during unoccupied period.

.3 Radiation & Terminal Reheat Zones

Heating setpoints shall be limited to a reasonable range minimum and maximum setpoint are adjustable at the ows within hard code limits of 20 - 23°C setpoint adjustment is identified only as "w - c" for "warmer - cooler"

control valve modulates the flow through the wall fin or reheat coil to maintain space temperature at setpoint, as determined by thermostat mounted in the spaces.

Night setback of heating shall be implemented with a setback temperature of 15°C (adjustable at ows either globally or zone by zone within a reasonable range of 12 - 20°C)

During the setback period, occupants may override the setback for two hours by pushing the "override" button on the thermostat. The stat shall acknowledge the override by means of a red led which shall first flash for a few seconds and then burn continuously until the override period times out. Override period is adjustable at ows, either globally or zone by zone, within hard coded limits of 30 to 300 minutes

.4 Zones without Radiation

BAS modulates flow through two or three way reheat valves to maintain room temperature at setpoint. Setpoint is adjustable within a reasonable range.

Some zones have plate type temperature sensors, without mode override. Setpoints for these zones is adjustable within a reasonable range, at ows only.

BAS implements night setback of heating setpoint with override led on stat is "on" when zone is in override mode.

.5 Rooftop unit

- .1 The rooftop unit serves the space VAV boxes. Unit consists of a supply fan, exhaust fan, mixing dampers, DX cooling, gas heating and hydronic reheat coils.
- .2 The unit is a variable volume unit and the supply and exhaust fans have been provided with variable frequency drives.
- .3 The unit will provide both cooling and heating to the VAV boxes. Heating and cooling modes are shared with the VAV box controllers. The supply air temperature from the Roof Top Units will be set at 55 deg F.
- .4 During cooling season the VAV boxes will modulate to maintain space temperature at set point.
- .5 During heating season the reheat coils will modulate to maintain the room temperature at set point. BAS will maintain 55 deg F supply air temperature at the unit level.
- .6 Humidifier will operate during winter to maintain the room RH level at set point (50% RH).
- .2 Safeties and Limits
 - .1 The DDC controller will shutdown and lockout the unit if the supply air temperature drops below 4 Deg C when the unit is running. Note logic is not applied during the first 5 minutes of operation. Once shutdown the operator must correct the problem and manually restart the unit through the LCD. Low temperature protection will only work when the fans are being controlled by the DDC controller. If the fan is in hand there will be no low temperature protection.
 - .2 A high static pressure limit is hardwired to shut down the supply and return fans when the sensed pressure is above setpoint. Manual reset is required.
 - .3 Fan speed modulation is disabled until fan run status is received.
 - .4 Supply air temperature control is disabled until fan run status is received.
 - .5 Damper control is disabled until fan run status is received.
 - .6 If the supply air temperature rises above 135 Deg F (57 Deg C) the controller will shutdown the unit and issue an alarm. Manual reset through the LCD is required.
 - .7 If the return air temperature rises above 135 Deg F (57 Deg C) the controller will shutdown the unit and issue an alarm. Manual reset through the LCD is required.
 - .8 DX cooling is locked out when the outdoor air temperature is below 10 Deg C.
 - .9 Simultaneous heating and cooling is not permitted.
 - .10 The fire alarm system is hardwired to the fan VFD (by others) and will shutdown the unit in the event of an alarm.
- .3 Modes of Operation
 - .1 The occupied and unoccupied modes of operation are determined by a time clock. System can be set to run continuously in the occupied mode.
 - .2 The pre-cool mode is utilized to pre-cool the space during the summer to conserve energy. When seasonally enabled (manually by operator through LCD) the pre-cool mode will be activated when:
 1. The outdoor air temperature is between 10 Deg C and 22 Deg C.
 2. The average space temperature is more than 2 Deg C above the outdoor air temperature and is also above 18 Deg C.
 - .3 The pre-cool mode is disabled once the average space temperature is within 1 Deg C of the outdoor air temperature or reaches 18 Deg C.
 - .4 The disabled mode is manually set by the operator.
- .4 Start Up/Shutdown
 - .1 The supply fan starts.
 - .2 At start up the initial static pressure setpoint will be set to 375 Pa.
 - .3 At start up the initial supply air temperature setpoint will be either: 1) Set to 15 Deg C or 2) Set to 27 Deg C if the unit is starting on morning warm up, 3) Set to 13 Deg C if the unit is starting on morning cool down.
 - .4 Occupied Mode
 - .5 The rooftop unit runs continuously. Supply fan speed is controlled to maintain the supply air static pressure at setpoint. Setpoint is reset between a minimum of 190 Pa to a maximum of 437 Pa based on feedback from the zones. Setpoint will be reset based on the number of requests received. When 2 requests are received the setpoint will increase by 10 Pa every 5 minutes. When 4 or more requests are received the setpoint will

increase by 20 Pa every 5 minutes. When no requests are received the setpoint will be decreased by 10 Pa every 15 minutes.

- .6 The unit is controlled to maintain the supply air temperature at setpoint. Setpoint will be based and the setpoint reset will be based on the mode (heating or cooling). The heating mode is set when the outdoor air temperature drops below 5 Deg C, the cooling mode is set when the outdoor air temperature rises above 20 Deg C. When the outdoor air temperature is in between it will be set by the last mode of operation or can be manually set by an operator.
- .7 In the heating mode the following will occur:
 - 1. The supply air temperature setpoint will be reset between 12 Deg C and 15 Deg C based on feedback from the zones. Reheat coil in the zones will modulated to maintain the zone temperature at set point.
- .8 In the cooling mode the following will occur:
 - 1. The supply air temperature setpoint will be reset between 13 Deg C and 23 Deg C based on feedback from the zones. When a cooling request is received the setpoint will decrease 1 Deg C every 10 minutes. When no cooling requests are received the setpoint will be increased 0.5 Deg C every 10 minutes.
- .9 The dampers will be positioned to provide minimum fresh air to the space. When free cooling is available and required and available the dampers will modulate to provide additional fresh air for free cooling purposes. Free cooling will be the first stage of cooling. Free cooling will be available when the outdoor air temperature is more than 2.5 Deg C below the return air temperature. The exhaust damper will be controlled with the fresh air damper. When the damper is open above 30% the exhaust fan will be enabled. It's speed will increase linearly as the fresh air damper opens.
- .10 DX cooling and gas heating are controlled to maintain the supply air temperature at setpoint.
- .11 Pressure sensor to be installed at 2/3rd of the duct run to modulate the supply and return fan. Location of the sensor to be determined on site.
- .12 Bas to install pressure sensors to maintain the building pressure at neutral with respect to the outdoors.
- .5 Unoccupied Mode
 - .1 The rooftop unit is off.
 - .2 The fresh air and exhaust air dampers are closed. The return air damper is open.
- .6 Pre-Cool Mode
 - .1 Unit will operate as per the occupied mode with the following exceptions:
 - 1. Minimum fresh air volume is set to 0 cfm.
 - 2. The supply air temperature setpoint will be set to 15 Deg C.
 - 3. No mechanical cooling or heating is permitted. Mode is used to pre-cool spaces.
- .7 Disabled Mode
 - .1 The rooftop unit is off.
 - .2 The fresh air and exhaust air dampers are closed. The return air damper is open.
- .8 Integration with Other Systems
 - .1 Outside air temperature is shared over the network.
 - .2 Air requests are received from the network.
 - .3 Cooling requests are received from the network.
 - .4 Heating requests are received from the network.
- .9 Critical Alarms
 - .1 Fan is commanded on and status is not received (2 minute delay).
 - .2 Low temperature limit.
 - .3 High supply air temperature shutdown.
 - .4 High return air temperature shutdown.
- .10 General Alarms
 - .1 The supply air temperature drops below 7 Deg C.
 - .2 The supply air temperature rises above 43 Deg C.
- .11 Maintenance Alarms
 - .1 Fan is commanded off and status is on (10 minute delay).
- .12 Trends
 - .1 Supply air temperature and setpoint.
 - .2 Outside air temperature.

-
- .3 Return air temperature.
 - .4 Mixed air temperature.
 - .5 Supply air static pressure and setpoint.
 - .6 Fan status.

.5 Typical VAV/ Box

.1 General

- .1 The VAV box provides cooling, heating and ventilation to the space.
- .2 The mode of operation (heating or cooling) is provided by the air handling unit.
- .3 Reheat coil control valve is modulated to maintain zone temperature set point during winter.

.2 Modes of Operation

- .1 The occupied and unoccupied modes are determined by a time-of-day schedule.
- .2 The purge mode is activated set when the following is true:
 - .1 The system is in unoccupied mode.
 - .2 The outdoor air temperature is above 10 Deg C and below 24 Deg C.

.3 Occupied Mode

- .1 The VAV controller reads in velocity pressure and converts this information to an airflow value.
- .2 The controller will modulate the damper to maintain the airflow value at setpoint. Minimum and maximum airflow setpoints are shown on the VAV box schedule. The box is equipped with both cooling mode and heating mode airflow setpoint.
- .3 The VAV controller will increase/decrease the airflow setpoint to maintain the space temperature at setpoint.
- .4 When the AHU is in the cooling mode the VAV box will increase its airflow setpoint to provide additional cooling to the space. When the rooftop unit is in the heating mode the VAV box will increase its airflow setpoint to provide additional heating to the space.
- .5 The space temperature setpoint will be set to 22 Deg C heating and 24 Deg C cooling. Setpoints are operator adjustable.
- .6 During heating season, the reheat coil modulates to maintain the zone temperature at set point.

.4 Unoccupied Mode

If the AHU is still running the box will control as per the occupied mode with the following exceptions:

- .1 Minimum airflow setpoint will be set to unoccupied setting.
- .2 Supply air set point during heating season will be set to 12°C and the cooling setpoint will be set to 27°C.
- .3 If the rooftop unit is off the VAV box damper will be open.
- .4 Reheat coil will modulate to maintain 18°C during the unoccupied period.

.5 Pre-Cool Mode

The box will control as per the unoccupied mode with the following exceptions:

- .1 The cooling setpoint will be set to 18°C.
- .2 The minimum cooling airflow setpoints will be reduced to 5% of the maximum cooling airflow setpoint.
- .3 The minimum and maximum heating airflow setpoints will be set to 5% of the maximum heating airflow setpoint.

.6 Washroom and Storage Exhaust Fans (For fire & PRS)

The washroom and storage fans shall be energized based on time of the day schedule. BAS monitors the status of each fan. The BAS generates an alarm if the fan does not start when commanded.

.7 CO/NOx Ventilation (For Fire & PRS)

The respective exhaust fans of the apparatus bay will operate with the outdoor air damper to maintain the CO/NOx set point as read by the CO/NOx sensor. If the set point is not reached upon activation of the system for a pre-determined time, then the system generates an audible and visible alarm. The CO/NOx Set point will be determined during system start up.

.8 IR Heaters

N/A

.9 Outside Lighting (PRS & Fire)

BAS will turn on/off the exterior lighting based on the photocell input.

Sequence of operation- PRS

.9 Furnace

BAS average heating/cooling requirements and send heating/cooling command to furnace/air conditioning which has terminal control. Display each zone temperature on BAS graphic.

BAS controller dry contact provides 24VAC signal to furnace terminal strips to enable fan on/off, 1st stage heating and 2nd stage heating. BAS controller dry contact provides 24VAC signal to air conditioning unit terminal strips to enable 1st stage cooling and 2nd stage cooling. The initial 24VAC signal comes from furnace terminal strips – "R". BAS determines furnace/air conditioning idle, fan only, cooling and heating.

Temperature sensors on main supply/return air duct, display sensors' reading on BAS graphic, current sensors for furnace blower motor and air conditioning unit, display current reading on BAS graphic.

.10 Split A/c Unit

Based on the temperature reading the unit will turn on/ off by BAS

.11 Electric Baseboard, FFH

Based on the time of the day schedule, BAS will turn on/off the units.

.12 ERV

BAS shall turn on/ off , high low speed based on the input from the temperature and CO2 sensors from thermostats.

End of Section

THIS SECTION APPLIES TO THE EMS SECTION ONLY.

Table of Contents

PART 1 -	GENERAL	2
1.01	REFERENCES	2
1.02	RELATED REQUIREMENTS	3
1.03	GENERAL REQUIREMENTS	3
1.04	SYSTEM DESCRIPTION & OPERATION	3
1.05	WORK PERFORMED BY THIS SECTION	ERROR! BOOKMARK NOT DEFINED.
1.06	SUBMITTALS	4
1.07	APPROVALS	4
1.08	QUALITY ASSURANCE	4
1.09	COMMISSIONING	5
1.10	DELIVERY, STORAGE AND HANDLING	5
1.11	WARRANTY	5
1.12	ACCEPTABLE MANUFACTURER	5
PART 2 -	PRODUCTS	5
FOR REVIEW:		ERROR! BOOKMARK NOT DEFINED.
2.01	CONTROLLERS	5
2.02	OCCUPANCY AND VACANCY SENSORS	8
2.03	WALLSTATION	8
2.04	DIMMERS	9
2.05	PANELS	9
PART 3 -	EXECUTION	12
3.01	EXECUTION	12
3.02	INSTALLATION	12
3.03	TESTING	12
3.04	SITE PROTECTION	13

PART 1 - GENERAL

1.01 REFERENCES

- .1 CSA Group:
 - .1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.
 - .2 Ontario Electrical Safety Code (28th edition/2021).
 - .3 CSA C22.2 No. 14-13 – Industrial Control Equipment.
 - .4 CSA C22.2 No. 42 - General Use Receptacles.
 - .5 CSA C22.2 No. 42.1 - Cover Plates for Flush Mounted Wiring Devices.
 - .6 CSA C22.2 No. 184 - Solid-State Lighting Controls.
 - .7 CSA C22.2 No. 184.1 - Solid State Dimming Controls.
 - .8 CSA C22.2 No. 156 - Solid-State Speed Controls.
- .2 National Electrical Manufacturers Association (NEMA):
 - .1 WD1 (R2005) – General Color Requirements for Wiring Devices.
 - .2 WD6 – Dimensional Specifications.
- .3 Ontario Building Code.
- .4 UL 924 - Standard for Safety of Emergency Lighting and Power Equipment
- .5 CAN/CSA-C22.2 No. 141, Emergency Lighting Equipment, latest edition.
- .6 1.2.2. CAN/CSA-C22.2 No. 205, Signal Equipment, latest edition.
- .7 1.2.3. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
- .8 1.2.4. International Electrotechnical Commission (IEC)
- .9 1.2.5. National Electrical Manufacturers Association (NEMA)
- .10 1.2.6. Underwriters Laboratories, Inc. (UL)
- .11 1.2.7. UL 508 – Standard for Industrial Control Equipment
- .12 1.2.8. UL 916 – Standard for Energy Management Equipment
- .13 1.2.9. UL 924 – Standard for Emergency Lighting and Power Equipment
- .14 Canada Green Building Council (CaGBC)
- .15 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .16 LEED Canada-EB: O M-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.
- .17 American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
- .18 ASTM International (ASTM)
 - .1 D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight
- .19 C62.41-1991 – Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .20 Canadian Standards Association (CSA).
 - .1 CSA C22.2 # 14 Industrial Control Equipment
 - .2 CSA C22.2 # 184 Solid-State Lighting Controls

- .3 CSA C22.2 # 156 Solid-State Speed Controls
- .21 International Electrotechnical Commission.
 - .1 (IEC) 801-2 Electrostatic Discharge Testing Standard.
 - .2 IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.
- .22 International Organization for Standardization (ISO)
 - .1 9001:2000 – Quality Management Systems.
- .23 National Electrical Manufacturers Association (NEMA)
 - .1 WD1 (R2005) - General Color Requirements for Wiring Devices.
- .24 Underwriters Laboratories, Inc. (UL):
 - .1 489 (2002) - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit- Breaker Enclosures.
 - .2 508 (1999) - Standard for Industrial Control Equipment.
 - .3 1472 (1996) - Solid-State Dimming Controls.
 - .4 924 (2003) - Emergency Lighting and Power Equipment.
- .25 National Fire Protection Association (NFPA)
 - .1 701 (2004) Standard Methods of Fire Tests for Flame Propagation

1.02 NIL(NOT IN LIST).

1.03 GENERAL REQUIREMENTS

- .1 Provide all conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning relay lighting control system as described herein and shown on the plans
- .2 Comply with requirements of the Owner's General Requirements and all documents referred to therein.
- .3 Comply with requirements of Section 20 01 10 Mechanical General Requirements.
- .4 Comply with requirements of Section 20 01 50 Basic Materials and Methods.
- .5 Comply with the requirements of Section 25 05 10 BAS General Requirements
- .6 Comply with the requirements of Section 25 10 10 BAS Control Network
- .7 Comply with the requirements of Section 25 30 10 BAS Instrumentation and Devices
- .8 Comply with the requirements of Section 26 05 00 Electrical General Requirements

1.04 SYSTEM DESCRIPTION & OPERATION

- .1 The Lighting Control system as defined under this section shall include luminaires powered by line voltage and dimming low voltages controls from the Building Automation Controllers,
- .2 All lighting interior and exterior for the entire complex is to be controlled via the lighting control system using the following types of supporting devices:
 - .1 Where applicable, the occupancy sensor(s) will interact such that occupancy will determine the ON / OFF state of the lighting being controlled.
 - .2 Momentary light switch to send signal to turn light zone on or off
 - .3 Dimming level determined by wall mounted control in controlled space.

- .3 The Lighting Control and Automation system as defined under this section covers the following equipment:
 - .1 The lighting control system specified in this section shall provide time-based, sensor-based (occupancy), and manual lighting control as required.
 - .2 The system shall be capable of turning lighting loads on/off as well as dimming lights (if dimming is required).
 - .3 All system controllers shall be part of the BAS, enabling digital communication between devices, each controller
 - .4 The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity, even if network connectivity to the greater system is lost.
 - .5 The system architecture shall facilitate remote operation via a computer connection
- .4 Minimum lighting control performance required, unless local energy code is more stringent.
 - .1 Occupancy/vacancy requirements – Provide occupancy/vacancy sensors as indicated on drawings and sequence of operation.
 - .2 Dimmers and lighting relays shall be capable of functioning separately. Systems where the 0-10V dimmers and relays are linked shall not be acceptable.
 - .3 Provide the ability to provide occupancy status back to the Building Automation System.
- .5 Shall be capable of automatically responding to a Demand Response Signal and adjusting the lighting level. (Required for California Title 24 2013)

1.05 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 26 05 05
- .2 Submittal package shall contain:
 - .1 A complete bill of materials
 - .2 Sets of catalog cuts for standard equipment
 - .3 Product data for each of the products specified. Include data on features, components, ratings, and performance. Include dimensioned drawings with isometric projections of components and enclosures and details of the ballasts
- .3 Sets of shop drawings detailing all mechanical and electrical equipment including one-line diagrams, BAS (low voltage) wiring diagrams wire counts, internal wiring and physical dimensions of each item. Marked up catalog cuts are unacceptable.
- .4 Upon completion of all contractor's wiring, and after all fixtures are installed, the contractor shall request the services of a Delta or Reliable Controls representative to completely check out the system prior to energizing the system. At the time of check out and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.
- .5 Two complete sets of as-built drawings, PDF and CAD files shall ship with the equipment when it leaves the factory, along with operations and maintenance manuals for the relay system.
- .6 Be responsible to ensure that any LED fixture supplied are compatible with the equipment being furnished on this project.
- .7 Follow manufacturer's installation instructions.

1.06 APPROVALS

- .1 Prior approval in writing by the Architect/Electrical specifier of record is required for all shop drawings.

1.07 QUALITY ASSURANCE

- .1 All equipment shall be 100% tested. Sample testing is not acceptable.

- .2 All standard system line voltage components shall be CSA or ULC listed and so labelled when delivered to the job site.
- .3 All systems must comply with Ontario Electrical Safety Code

1.08 COMMISSIONING

- .1 Upon 100% completion of luminaires the system shall be completely commissioned by factory trained and authorized service personnel. The commissioning will be performed after the electrical contractor ensures the system installation is complete and that all loads have been tested live for continuity and freedom from defects. The system shall be capable of being programmed through the use of a the building Automation System Application Determine which sensors are connected assign groups and scenes outlined, Set lighting zones and device responses to sensor or control input, Upon completion of the system check-out the installer/programmer shall demonstrate the operation of the system to the appropriate owners' representatives.
- .2 The primary lighting manufacturer of record shall retain the commissioning agent and this manufacturer will insure the execution of the commissioning per specification.
- .3 Training: On site Training shall be considered a part of the commissioning process and will include 3 session with 4 hours each session at the time of turnover

1.09 DELIVERY, STORAGE AND HANDLING

- .1 Materials must be delivered in a timely manner to other trades.
- .2 Store materials away from exposure to harmful construction and weather conditions and at temperature and humidity conditions recommended by the manufacturer.

1.10 WARRANTY

- .1 All equipment shall be warranted free of defects in materials and workmanship.
- .2 24 months from date of turn-over to the Owner.

1.11 ACCEPTABLE MANUFACTURER

- .1 The specification is a custom York Region Designed BAS controlled Lighting System Controls as per provided details and drawings.
- .2 The controllers will be one of two options:
 - .1 Delta Controls Automation
 - .1 Red5-EDGE-ROOM + RED5-MODULE-8Xp
 - .2 Reliable Controls Automation
 - .1 Mach-Prolight
- .3 Controls panel enclosures
 - .1 CCA (Company Control Automation) Electrical & Technical Services Co.
 - .2 Alternate manufacturers must comply with the specifications herein in every detail
- .4 Control Relay must meet the following specifications:
 - .1
- .5 Alternative manufacturers must comply with the specifications herein in every detail.

PART 2 - PRODUCTS

2.01 CONTROLLERS

-
- .1 General Requirements
 - .1 Must be latest version of the specified controller of the platform used on site for the Building Automation System Delta controls or Reliable Controls
 - .2 Delta Controls- Red5-EDGE-ROOM + RED5-MODULE-8Xp
 - .1 Technology
 - .1 Arm® Cortex®-A8
 - .2 32-bit 600 MHz RISC CPU
 - .3 256 MB DDR3L RAM
 - .4 4 GB MMC flash memory
 - .5 Real-time clock
 - .6 Supercapacitor power backup for RTC and CPU
 - .2 Power
 - .1 24VDC, 2W typical (7W max)
 - .2 24VDC, 100W max output fully loaded
 - .3 Communication Ports
 - .1 2 Ethernet (10/100-Base T)
 - .2 BACnet/IP, BACnet over Ethernet, BACnet/SC
 - .3 1 RS-485 port supporting up to 4 devices with the following protocols:
 - .1 BACnet MS/TP up to 76800 bps
 - .2 Delta LINKnet up to 76800 bps
 - .3 Modbus RTU up to 115200 bps
 - .4 1 CAN bus port supporting up to 2 O3-HUB devices
 - .5 2 USB 2.0 ports
 - .4 Universal Points
 - .1 Up to 8 inputs (16 bit), supporting:
 - .1 0–5 VDC
 - .2 0–10 VDC
 - .3 10 kΩ thermistor
 - .4 Dry contact (using 10 kΩ thermistor software setting)
 - .5 4–20 mA (using external 250 Ω resistor on 0–5 V setting)
 - .2 Up to 8 outputs (12-bit), supporting:
 - .1 0–10 V @ 20 mA max (sourcing)
 - .2 1–10 V @ 10 mA max (sinking)
 - .5 Connectors
 - .1 Removable screw-type terminal connectors
 - .6 Wiring Class
 - .1 Class 2/SELV
 - .7 Dimensions
 - .1 ROOM - 108 × 111 × 58 mm (4.25 × 4.37 × 2.28 in.)
 - .2 MODULE - 36 × 111 × 58 mm (1.42 × 4.37 × 2.28 in.)
 - .8 Mounting
 - .1 DIN rail mountable (EN 50022-35x7.5)
 - .9 Weight
 - .1 ROOM - 193 g (0.425 lb)
 - .2 MODULE - 72.9 g (0.161 lb)
 - .10 Ambient Rating
 - .1 –30°C to 55°C (–22°F to 131°F)
 - .2 10% to 95% RH (non-condensing)
 - .11 Compliance & Listings
 - .1 CE
 - .2 FCC
 - .3 C-UL Listed
 - .4 UL 916 Listed

-
- .5 BTL Listed
 - .3 Reliable Controls: Mach-Prolight
 - .1 Technology
 - .1 66 MHz high-performance 32-bit embedded microcontroller with onboard Flash memory.
 - .2 Controller database, values, and configuration held in robust nonvolatile memory.
 - .3 Easily update system firmware at any time over the network.
 - .2 Power
 - .1 Isolated 24 VAC $\pm 10\%$ 20 VA maximum, 50/60 Hz.
 - .3 Communication Options
 - .1 One EIA-485 (RS-485) port that supports a baud rate of up to 76.8 Kbps. Auto-baud detection.
 - .2 One SMART-Net port that supports up to four devices on a SMART-Net network.
 - .3 One EnOcean RS-232 four-wire port that supports a baud rate of 57.6 Kbps. 30 m (100 ft) maximum distance.
 - .4 Universal Inputs
 - .1 12-bit A/D converter.
 - .2 Use software to select thermistor/dry contact, 4–20 mA, or 0–10 VDC.
 - .5 Impedance:
 - .1 3 M Ω for 0–10 VDC range
 - .2 250 Ω for 4–20 mA range.
 - .3 20 M Ω pull-up for thermistor/dry contact range.
 - .4 Pulse counting up to 40 Hz. Supports flow meters.
 - .5 24 VAC overvoltage protection.
 - .6 Universal Outputs
 - .1 12-bit D/A converter.
 - .2 Analog: 0–12 VDC.
 - .3 Binary: Software configurable between 0–12 VDC.
 - .4 Output power: Universal ± 75 mA at 12 VDC; pulse 24 VAC at 0.5 A.
 - .5 24 VAC overvoltage and short protection.
 - .6 Use jumper to select relay driver outputs.
 - .7 Relay Outputs
 - .1 -R model supports up to 16 outputs.
 - .2 24 VAC momentary pulse to latch relay.
 - .3 Single-wire connection through to 24 VAC.
 - .8 Memory and Real-Time Clock Backup (-C option)
 - .1 Capacitor backup maintains database memory for 10 years and maintains clock operation for 72 hours after power loss.
 - .2 Real-time clock accurate to ± 1 second per day.
 - .9 Wiring Terminals
 - .1 12–30 AWG (3.31–0.05 mm²).
 - .2 Stranded or solid core.
 - .3 Copper conductors only.
 - .10 Dimensions
 - .1 10.9 cm L x 19.1 cm W x 4.6 cm H
 - .2 (4 5 /16" L x 7 1 /2" W x 1 13/16" H).
 - .11 Mounting
 - .1 #8 clearance holes on 17.8 cm W (7" W) centerline.
 - .2 Option to mount to DIN rail accessory.
 - .12 Weight
 - .1 0.3 kg (0.7 lb).
 - .13 Ambient Limits

- .1 Operating: -20°C to 55°C (-4°F to 131°F).
- .2 Shipping: -40°C to 60°C (-40°F to 140°F).
- .3 Humidity: 10%–90% RH noncondensing.
- .14 Certifications
 - .1 [BTL Listed \(B-BC, B-LD\)](#).
 - .2 CE.
 - .3 CFR 47 Part 15 Class B.
 - .4 Title 24 compliant.
 - .5 ASHRAE 90.1 compliant.
 - .6 WEEE.

2.02 OCCUPANCY AND VACANCY SENSORS

- .1 General:
 - .1 Sensors using passive infrared, ultrasonic, microphonic, and multi-technology adaptive technology.
 - .2 Sensor timeouts configurable by system software.
 - .3 Electrical: Rating: 24 VDC input voltage, up to 40 mA current draw.
 - .4 Mechanical: Mounting: Sensors for mounting on ceilings and walls, including corners, must be available.
- .2 Manufacturers
 - .1 IR-TEC Model BOS-515NxD
 - .2 Other approved equivalent
 - .1 Must be tested by York Region Technical Services team prior to approval
- .3 Specifications
 - .1 Power supply: 12~24VAC/DC ± 10%
 - .2 Power supply: 12~24VAC/DC ± 10%
 - .3 Current drain: 12~24VAC/DC ± 10%
 - .4 Signal output: 10/20mA, 24VDC @ vacant/occupied Infrared sensor: 10/20mA, 24VDC @ vacant/occupied
 - .5 Detectable speed: Form A relay, NO, dry contact
 - .6 Mounting height: Omni-directional quad element pyroelectric
 - .7 Detection range: 1~10 ft./sec. (0.3~3m/sec)
 - .8 ALS setting: Subject to the lens type applied
 - .9 ON delay setting: Subject to the lens applied and height
 - .10 OFF delay setting: BOS-515Nxx: 0/5"/10"/15"/30"/1'2'
 - .11 Op. humidity: Max. 95% RH
 - .12 Op. temperature: 40°F~131°F (-40°C~55°C)
 - .13 Dimensions: Ø2.36"x H1.45"(Ø60 x H37mm)

2.03 WALL STATION

- .1 General:
 - .1 Single/dual pole push-button
 - .2 Fits in standard NEMA wall box
 - .3 Provides low voltage momentary contact signal for a BAS to activate
 - .4 Terminal block connection
 - .5 Color White
- .2 Manufacturers
 - .1 IR-TEC Model PBS-721/PBS-722
 - .2 Other approved equivalent
 - .1 Must be tested by York Region Technical Services team prior to approval

.3 Specifications

- .1 Control Signal: Momentary Contact
- .2 Output: 1-Pole or 2-Pole
- .3 Op. temperature: -14°F ~ 122°F (-10°C ~ 50°C)
- .4 Dimensions: 4.13"H x 1.77"W x 1.04"D (w/mounting plate)

2.04 DIMMERS

.1 General:

- .1 Single pole push-button dimmer
- .2 Fits in standard NEMA wall box
- .3 Provides low voltage momentary contact signal for a power pack or BAS to activate dimming.
 - .1 Short press will activate the manual on/off signal
 - .2 Long press on increase or decrease will control the 0-10VDC dimming
- .4 Terminal block connection
- .5 Color White

.2 Manufacturers

- .1 IR-TEC Model PBD-720
- .2 Other approved equivalent
 - .1 Must be tested by York Region Technical Services team prior to approval

.3 Specifications

- .1 Power: 12-24VDC
- .2 Control Signal: Momentary, 50mA, 24VDC
- .3 Dimming Control: 0-10VDC, max 25 mA (Sink)
- .4 Dimming Range: 1%-100%
- .5 Op. humidity: Max 95% non-condensation
- .6 Op. temperature: -14°F ~ 122°F (-10°C ~ 50°C)
- .7 Dimensions: 4.13"H x 1.77"W x 1.04"D (w/mounting plate)

2.05 LIGHTING CONTROL PANELS (CCA, WWW.CCA.ONE)

2.06 HARDWARE FEATURES:

- .1 Controller Back-Box:
 - .2 Controller Capacity/Configurations: Controllers shall be available in sizes to accommodate 4, 8, 16, 24, 32, 40, 48, 56, and 64 relay outputs. Controllers shall be available with the electronics in the center and voltage dividers with the lighting relays on the right and left sides.
- .2 Electrical:
 - .1 Controller Power Supply: Each programmable lighting controller shall be provided with a dual-rated, UL-listed Class 2 transformer capable of either 120/277 VAC or 120/347 VAC primary (50 to 60 Hz). It shall contain an internal self-resetting fuse.
 - .2 Connections: All connections shall be made to clearly and permanently labeled termination points.
- .3 Controller Electronics:
 - .1 Controller CPU: Each programmable controller shall be provided with a CPU (Central Processing Unit) that shall provide all the programming and control functions for the entire controller.
- .4 Switching and Control Devices:

-
- .1 Switch Stations: line switch stations shall be available in momentary push button.
 - .2 Photocell Controllers:
 - .3 Occupancy Sensor Input Module:.
 - .4 0-10V Dimmer Output Module: ed.
 - .5 Programming:
 - .1 All programming must follow same specifications as the Building Automation Controls 25 90 00.
 - .2 Sensors will be installed to ensure that there will be no dead zones and it will detect someone entering the zones they serve
 - .3 Occupied Mode
 - .1 Open Office spaces
 - .1 During occupied mode the lighting in the open area zones will be ON
 - .2 Each open office space will be controlled by motion sensors
 - .1 If no occupancy is detected for 30min the lighting zone will turn off
 - .2 The sensors will then turn on zone when person enters the space
 - .2 Enclosed Office Area Rooms: Office/ Small meeting rooms
 - .1 During occupied mode the lighting in the enclosed room zones will be OFF until one of the following occurs:
 - .1 Occupancy Sensor detects person entering space
 - .2 Wall Switch is activated calling for lights to be turned ON
 - .2 Each Enclosed Office Space will be controlled by motion sensor or wall ON/OFF switch
 - .3 If no occupancy is detected for 15min the lighting zone will turn off
 - .3 Meeting Rooms:
 - .1 During occupied mode the lighting in the enclosed room zones will be OFF until one of the following occurs:
 - .1 Occupancy Sensor detects person entering space
 - .2 Wall Dimming Switch is activated calling for lights to be turned ON
 - .2 Each Enclosed Office Space will be controlled by motion sensor or Wall Dimming Switch
 - .3 Dimming function will work by holding the UP or DOWN to set the lighting level desired by occupying staff
 - .4 To turn ON or OFF lights
 - .1 one push of UP button will turn lights ON
 - .2 one push of DOWN button will turn lights OFF
 - .5 If no occupancy is detected for 15min the lighting zone will turn off
 - .4 Storage Room
 - .1 During occupied mode the lighting in the enclosed room zones will be OFF until one of the following occurs:
 - .1 Occupancy Sensor detects person entering space
 - .2 Wall Switch is activated calling for lights to be turned ON

- .2 Each Storage room will be controlled by motion sensor or wall ON/OFF switch
 - .3 If no occupancy is detected for 30min the lighting zone will turn off
 - .5 Mechanical/Electrical/Janitorial Rooms: Facilities Space
 - .1 During occupied mode the lighting in the enclosed room zones will be OFF until the following occurs:
 - .1 Wall Switch is activated calling for lights to be turned ON
 - .2 Each Facilities Space will be controlled by wall ON/OFF switch
 - .4 Unoccupied Mode
 - .1 All zones once the scheduled Unoccupied mode is activate lights will be in the OFF mode.
 - .1 Except Facilities Spaces which are controlled by the local light switch only
 - .2 All enclosed areas will continue running on normal operation and turn off when room has no more occupancy detected.
 - .3 Prior to going into Unoccupied mode in Open Space the LAS will check occupancy in each zone
 - .1 If occupancy is detected the zone will remain ON until no occupancy is detected for 15min.
 - .5 Exterior lighting
 - .1 All exterior lighting will be controlled by the Fire Station.
 - .6 Input Types:
 - .1 Momentary ON/OFF: When momentary contact is made between the ON and COM, relay outputs controlled by this input shall be turned ON. When momentary contact is made between OFF and COM, relay outputs controlled by this input shall be turned OFF.
 - .2 Relay Output OFF Options: Each relay shall have the option to control the relay OFF in a certain way other than the default OFF.
- .6 BAS System / Lighting Control System: Programmable lighting controllers integrated/interfaced with other building control and alarm systems must remain completely functional and continue to process all programmed commands, including time schedules and local switching.
 - .1 Runtime Logging and Trending: Each lighting control panel shall be capable of logging Runtime and Trending data for each relay. This data shall be able to be harvested and exported from the entire system.
 - .2 Runtime Logging: The controller shall be able to internally log the runtime of each relay for up to 30 days. This data shall be able to be harvested with a personal computer at 1-minute intervals.
- .7 Graphical Control Interface (Base Building BAS):
 - .1 Graphical Background Screens: All LAS graphics must use the most recent property layout drawings available to show most recent building and property layouts
 - .2 Must follow same design and alarms specifications as set forth in BAS Specification 25 90 00.
 - .3 Fault Log: It shall log and notify of any relay or network faults.
 - .1 The software shall monitor itself and restart if there is a communication issue with the system.
 - .2 An alarm shall report if a relay does not turn on or off correctly with real-time status updates.

- .3 It shall log the loss of communications of each network and every node per network. It shall log when it goes offline and when it goes back online.
- .4 Control Icons: Control icons shall be unlimited per screen and shall be chosen from an extensive library. It shall be able to use custom control icons that can be created and saved as BMP, JPEG, or GIF images. Control icons shall be able to be placed anywhere on the screen and edited at any time.
- .5 Navigation Icons: These shall have navigation buttons for going from one screen to another. These icons shall have the capability to be Global and be visible on all screens. Icons shall have standard sizes that shall be editable for color, size, and font. It shall be able to use custom control icons that can be created and saved as BMP, JPEG, or GIF images. Navigation icons shall be able to be placed anywhere on the screen and edited at any time.
- .6 Sequence Control: It shall be able to sequences with up to 16 transitions over a 12-hour period for events. It shall be able to turn on/off single relays, LL Groups, set a Preset, or LL Scenes in a sequence.
- .7 Schedules: It shall have programmable schedules that send commands to each network and each node in the system.
 - .1 It shall automatically control relays, groups, scenes, presets, or trigger a sequence.
 - .2 Schedules shall be based on a fixed time, shared time, or before-at-after sunrise-sunset.
- .8 Diagnostics Dashboard: It shall have a tool to monitor all of the relays and devices in the system.

PART 3 - EXECUTION

3.01 EXECUTION

- .1 Verify that wiring conditions, which have been previously installed under other sections or at a previous time are acceptable for product installation in accordance with manufacturer's instructions.
- .2 Field measurements and coordinating the physical size of all equipment with the architectural requirements of the spaces into which they are to be installed.
- .3 Inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

3.02 INSTALLATION

- .1 Receive, mount, connect and place into operation all equipment. Provide all conduit, wire, connectors, hardware and other incidental items necessary for a properly functioning lighting control and relay system as described herein and shown on the plans.
- .2 Comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions and product carton instructions for installation.
- .3 Test that all branch load circuits are operational before connecting loads to system load terminals and then de-energize all circuits before installation.
- .4 Power shall not be applied to the relay system during construction and prior to turn-on unless specifically authorized by written instructions from the manufacturer.

3.03 TESTING

- .1 Upon completion of the installation, notify the manufacturer that the system is ready for formal check out. Notification shall be given in writing a minimum of 21 days prior to the time factory-trained personnel are required on site.
- .2 Upon completion of all line, load and interconnection wiring and after all fixtures are installed, manufacturer's rep shall completely check the installation prior to energizing the system. Each installed relay system shall be tested for proper ON/OFF operations, and proper LED illumination.

Each installed control panel shall be tested verifying that each controlled load adjusts to the selected setting and that all switch LED's illuminate properly.

- .3 At the time of check out and testing, the Owner's representative shall be thoroughly instructed in the proper operation of the system.

3.04 SITE PROTECTION

- .1 Contractor shall protect installed product and finished surfaces from damage during all phases of installation including storage, preparation, testing and clean-up.

END OF SECTION 25 90 30

1 General

SCOPE / SUMMARY

Provide all metering equipment required to measure and trend electrical consumption and demand by end use.

RELATED INSTRUCTIONS

1.1.1.1 Refer to Section 26 00 00, Electrical General Requirements.

Design Requirements / Products

Provide electrical meter as shown on the electrical drawings:

1.1.1.2 Facility incoming electricity

METERING EQUIPMENT

Electricity Meters

1.1.1.3 Internet Protocol (IP) based meter complete with:

1.1.1.3.1 Built-in web server.

1.1.1.3.2 Capable of operating with a dedicated IP address (to be provided by the Region).

1.1.1.3.3 Communications Protocols:

1.1.1.3.3.1 HTTP/Post capable of pushing data to 3rd party applications/databases.

1.1.1.3.3.2 Modbus TCP

1.1.1.3.4 Built-in real-time and historic graphics accessible with any HTML 5 internet browser (computer, tablet, phone) on the Region's network. Data to be displayed in local time, adjusted for daylight savings time.

1.1.1.3.5 Real-time clock with battery backup and email alert for battery end of life.

1.1.1.3.6 Time-Stamp:

1.1.1.3.6.1 Represent date and time

- 1.1.1.3.6.2 In UTC time or offset from a specified UTC time
 - 1.1.1.3.6.3 Resolution: Minimum 1 second
 - 1.1.1.3.7 Ability to export all stored trend data to comma separated value (.csv) or Microsoft Excel format for importing into spreadsheets. Time-stamps to be exported as a single field with a numeric (non-text) value in local time.
 - 1.1.1.3.8 Published application programming interface (API) allowing data to be retrieved from the meter via non-proprietary means, such as JavaScript Object Notation (JSON).
 - 1.1.1.3.9 Built-in trending and data storage:
 - 1.1.1.3.9.1 2 years of consumption data (kWh) at 1 minute intervals with time-stamp; and
 - 1.1.1.3.9.2 10 years of consumption data (kWh) at 1 hour intervals with time-stamp.
 - 1.1.1.3.9.3 Stored in non-volatile memory.
 - 1.1.1.3.10 No special software required to set up meter or access data.
 - 1.1.1.3.11 Security:
 - 1.1.1.3.11.1 Unrestricted access to data and graphics over the Region's network.
 - 1.1.1.3.11.2 Password protection for access to setup, changing settings/parameters and deleting data.
 - 1.1.1.3.12 Ability to measure, store and trend the following data complete with time-stamp:
 - 1.1.1.3.12.1 Accumulated energy per phase (kWh)
 - 1.1.1.3.12.2 Accumulated total energy (kWh)

	1.1.1.3.12.3	Active power per phase (kW)
	1.1.1.3.12.4	Active total power (kW)
	1.1.1.3.12.5	RMS voltage per phase
	1.1.1.3.12.6	RMS current per phase
	1.1.1.3.12.7	Power factor per phase
	1.1.1.3.12.8	Total power factor.
	1.1.1.3.12.9	Line frequency
1.1.1.4	Acceptable product: z3 Controls Inc. NetMeter Current Transformers	
1.1.1.5	Compatible with electricity meter input without the use of transformers or other devices.	
1.1.1.6	Linear accuracy +/-1% of reading.	
1.1.1.7	Accuracy at 10% to 130% of rated current.	
1.1.1.8	Unburdened current transformers shall not be permitted.	
1.1.1.9	Acceptable product: Magnelab, Inc. SCT series.	
Data Cabling		
1.1.1.10	Cat 5e or Cat 6 Unshielded Twisted Pair (UTP)	
1.1.1.11	Colour: Green	

Execution

INSTALLATION REQUIREMENTS

Optimize electrical distribution to allow reduction in number of meters by grouping similar/like end use loads.

Install meter in a painted, hinged NEMA 1 (or better) enclosure complete with modular terminal blocks, finger safe fuse holders, fuses and power supply. Label front of enclosure with meter name, IP address and load(s) measured.

Provide disconnect at panel board for voltage reference.

All communication cables to be continuous. No splicing is allowed.

Affix York Region Property Services Branch Asset ID tag (to be provided by the Region) to meter prior to installation.

Sensor and network configuration to be done in consultation with the Region's Property Services Branch.

Connect meter to the Region's IT network.

Commission meter:

- 1.1.1.12 Ensure latest available firmware version is installed in meter.
- 1.1.1.13 Obtain Network information from York Region project manager and program into meter, including IP address, subnet mask, default gateway, primary and secondary DNS addresses.
- 1.1.1.14 Set meter clock to current local time, Set up email alerts as specified and/or requested by the Region's project manager.
- 1.1.1.15 Set up trend logging as specified and/or requested by the Region's project manager. At minimum, set up trend logging per 2.2.1.1.8 and 2.2.1.1.11 above.
- 1.1.1.16 Set default homepage to display real-time demand graphs and consumption statistics.
- 1.1.1.17 Verify CT rating is correctly entered in meter setup.
- 1.1.1.18 Confirm each voltage and current reading displayed on meter software using voltmeter and clamp-on ammeter.
- 1.1.1.19 Verify CT's are wired to corresponding voltage reference and that CT's are installed in correct orientation.
- 1.1.1.20 Verify meter information is viewable through a web browser on a device on the Region's network.
- 1.1.1.21 Complete and submit Energy Meter Installation/Startup Verification Form (26 09 13.01).
- 1.1.1.22 Provide training on meter software use to Region staff including Facilities Operations and Maintenance and Corporate Energy Services.
- 1.1.1.23 Provide meter manufacturer's calibration certificate(s), installation, operations and maintenance manuals and recommended meter recalibration interval(s).

END OF SECTION

Natural Gas Generator Set Specification

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70% of the ESP unless otherwise agreed by the RIC engine manufacturer.
- B. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Thermal damage curve for generator.
 - 2. Time-current characteristic curves for generator protective device.
 - 3. Sound test data, based on a free field requirement.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.
 - 1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
 - 2. Wiring Diagrams: Control interconnection, Customer connections.
- C. Certifications:
 - 1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.

1.4 INFORMATIONAL SUBMITTALS

- A. Source quality-control test reports.
 - 1. Certified summary of prototype-unit test report. Include statement indicating torsional compatibility of components. Generators that do not have a prototype test report available for the generator model being supplied will not be accepted.
 - 2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.
 - 3. List of factory tests to be performed on units to be shipped for this Project.

4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

B. Warranty:

1. Submit the manufacturer's warranty statement to be provided for this Project.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this project.
- B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100km of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer. The supplier must be a reputable manufacturer with a minimum of 50-years of experience in building, designing, and manufacturing generators. The generator manufacturer shall be the original equipment manufacturer (OEM) for the diesel engine, alternator, radiator and all the generator mounted controls. Generator assemblers who package various manufactured components or non-OEM generator manufacturers will not be accepted.
- D. Comply with NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
- E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).
- F. Comply with NFPA 99 (Essential Electrical Systems for Health Care Facilities).
- G. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.
- H. Comply with CSA 22.1 and CSA C22.2. Canadian Electrical Code, Part I & II
- I. Noise Emission: Comply with Ministry of Environment for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- J. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.
- K. NIL. (Not in list)
- L. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- M. CSA, B149.1.20 - Natural Gas and Propane Installation Standard
- N. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
- O. UL1236 – Battery Chargers
- P. IEC8528 part 4. Control Systems for Generator Sets
- Q. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: -40.0°C (-40.0°F) to 40.0°C (104.0°F).
2. Relative Humidity: 0 to 95%.
3. Altitude: Sea level

1.7 WARRANTY

- A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for standby product from registered commissioning and start-up. Warranty coverage will be comprehensive and cover all parts, labour, and travel. The owner is not to incur any expenses for approved warranty repairs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: The basis for this specification and design is Cummins Power Generation model C150N6. Only the approved bidders listed below, if they meet the requirements of this specification, shall supply equipment for this project. Generator manufacturers that are not on the approved manufacturer's list will be rejected for this project.

1. Cummins Power Generation

2.2 ENGINE-GENERATOR SET

- A. Factory-assembled and tested, natural gas engine-generator set.
- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.
- C. Capacities and Characteristics:
1. Power Output Ratings: Electrical output power rating for Standby operation of not less than 150kW, at 80% lagging power factor, 120/208V, Parallel Wye, Three phase, 4 -wire, 60 hertz.
 2. Alternator shall be capable of a maximum motor starting of 663kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.
 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.
- D. Generator-Set Performance:
1. Steady-State Voltage Operational Bandwidth: 1% of rated output voltage from no load to full load.
 2. Transient Voltage Performance: Not more than 27% variation for 100% step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 6 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.

3. Steady-State Frequency Operational Bandwidth: 0.5% of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Not more than 16.2% variation for 100% step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 7 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.
6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5% total and 3% for any single harmonic for linear loads. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.
7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300% of rated full-load current for not less than 8 seconds without damage to generator system components.
8. NIL. (Not in List).
9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

2.3 ENGINE

- A. Fuel: Natural Gas
- B. Rated Engine Speed: 1800RPM.
- C. Lubrication System: The following items are mounted on engine or skid:
 1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.
 2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.
 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Engine Gas Train: Must comply with CSA B149. Including but not limited to two DC powered solenoid shutoff valves, a low gas pressure alarm, CSA listed stainless steel flexible connection and flange connection for the customer if the gas train is larger than 2 inches.
- E. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.
 1. Designed for operation on a single 240VAC, Single phase, 60Hz power connection. Heater voltage shall be shown on the project drawings.
 2. Provided with a 12VDC thermostat, installed at the engine thermostat housing
- F. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function

of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.

G. Cooling System: Closed loop, liquid cooled

1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40°C.
2. Coolant: Solution of 50% ethylene-glycol-based antifreeze and 50% water, with anticorrosion additives as recommended by engine manufacturer.
3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110% load condition.
4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

H. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure.

I. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element.

J. Starting System: 12V, as recommended by the engine manufacturer; electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
2. Cranking Cycle: As required by CSA C282.
3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.
4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.
5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.
6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger rated at a minimum of 10A. It will include the following features:
 - a. Operation: Equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20°C to plus 40°C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10%.

- d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.
- f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.4 CONTROL AND MONITORING

- A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.
- B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.
- E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
 - 1. AC voltmeter (3-phase, line to line and line to neutral values).
 - 2. AC ammeter (3-phases).
 - 3. AC frequency meter.
 - 4. AC kVA output (total and for each phase). Display shall indicate power flow direction.
 - 5. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
 - 6. Emergency Stop Switch: Switch shall be a red "mushroom head" pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
 - 7. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
 - 8. DC voltmeter (alternator battery charging).
 - 9. Engine-coolant temperature gauge.
 - 10. Engine lubricating-oil pressure gage.

11. Running-time meter.
 12. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.)
 13. AC Protective Equipment: The control system shall include over/under voltage, over current, short circuit, loss of voltage reference, and over excitation shut down protection. There shall be an overload warning, and overcurrent warning alarm.
 14. Status LED indicating lamps to indicate remote start signal present at the control, existing alarm condition, not in auto, and generator set running.
 15. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.
 16. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.
 17. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).
- F. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.
- G. Remote Alarm Annunciator: Comply with NFPA 110/CSA C282. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. The following alarm lamps must be displayed on the remote annunciator:
1. 3 x Customer Faults
 2. Genset Supplying Load
 3. Charger AC Failure
 4. Low Coolant Level
 5. Low Fuel Level
 6. Check Genset
 7. Not in Auto
 8. Genset Running
 9. High Battery Voltage
 10. Low Battery Voltage
 11. Weak Battery
 12. Fail to Start
 13. Low Coolant Temperature
 14. Pre-High Engine Temperature

15. High Engine Temperature
16. Pre-Low Oil Pressure
17. Low Oil Pressure
18. Overspeed

2.5 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Overcurrent Protection: The generator set shall be provided with a UL Listed/CSA Certified protective device that is coordinated with the alternator provided to prevent damage to the generator set on any possible overload or overcurrent condition external to the machine. The protective device shall be listed as a utility grade protective device under UL category NRGU. The control system shall be subject to UL follow-up service at the manufacturing location to verify that the protective system is fully operational as manufactured. Protector shall perform the following functions:
 1. Initiates a generator kW overload alarm when generator has operated at an overload equivalent to 110% of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
 2. Under single phase or multiple phase fault conditions, or on overload conditions, indicates an alarm conditions when the current flow is in excess of 110% of rated current for more than 10 seconds.
 3. Under single phase or multiple phase fault conditions, operates to switch off alternator excitation at the appropriate time to prevent damage to the alternator.
 4. The operator panel shall indicate the nature of the fault condition as either a short circuit or an overload.
 5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot greater than 120% of nominal voltage.
 6. The generator set shall be provided with a unit mounted main line circuit breaker, sized to carry the rated output current at 0.8pF of the generator set on a continuous basis. The circuit breaker shall incorporate an electronic trip unit (LSI) that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided. The breaker shall be provided based on the size and electronic trip requirements of the generator output and be 100% rated.

2.6 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H
- D. Temperature Rise: 105°C / Class F environment.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125% of rating, and heat during operation at 110% of rated capacity.
- F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.

- G. Enclosure: Drip-proof.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, 3-phase true RMS sensing, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.
- I. The alternator shall be provided with anti-condensation heater(s) in all applications where the generator set is provided in an outdoor enclosure, or when the generator set is installed in a coastal or tropical environment.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- K. Subtransient Reactance: 13% maximum, based on the rating of the engine generator set.

2.7 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: Sound Attenuated aluminum housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.
- B. Construction:
 - 1. Motorized Intake Louvers: Equipped with bird screen to permit air circulation when engine is not running while excluding birds and rodents. The louver motor shall be installed with auxiliary contacts to monitor and alarm a supervised location if it does not open within 30-seconds per CSA B149.
 - 2. Hinged Doors: With padlocking provisions.
 - 3. Exhaust System:
 - a. Muffler Location: Within enclosure in a separate compartment outside the engine section.
 - 4. Hardware: All hardware and hinges shall be stainless steel.
 - 5. Mounting Base: Suitable for mounting on sub-base fuel tank or housekeeping pad.
 - 6. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.
- C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40°C.
- D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 75dBA measured at any location 7 m from the engine generator in a free field environment.
- E. Site Provisions:
 - 1. Lifting: Complete assembly of engine generator, enclosure shall be designed to be lifted into place as a single unit, using spreader bars.

2.8 VIBRATION ISOLATION DEVICES

- A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

2.9 FINISHES

- A. Zinc phosphate pretreatment, e-coat primer, and super durable powder coat paint to help minimize corrosion and colour fade.

2.10 ENCLOSURE ELECTRICAL:

- A. Provide panel board with circuit breakers within the enclosure to isolate or disconnect power to the various generator auxiliary equipment. Breaker quantity and size as recommended by the generator manufacturer's engineered calculations for the items below – including but not limited to the battery charger, coolant heater, oil heater, alternator heater and other generator auxiliary equipment.
- B. Main power supply to be 60A, 120V/240V, 1-phase.
- C. NIL (Not in List).
- D. Space heater, rated at 208V 1-phase, to adequately keep the enclosure at 10°C at all times per CSA C282.
- E. Additional one AC LED lighting in vapor proof fixtures with a single-pole switch to accommodate ease of maintenance or inspection work inside the enclosure.
- F. One 120VAC, 15A duplex convenience receptacles.
- G. All electrical enclosure wiring to be in CSA approved liquid tight flex, it will be used to provide a non-rigid connection between the engine and the enclosure.
- H. All electrical components are CSA or ULC listed and bear the CSA or ULC label.

2.11 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: The equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under abnormal conditions. Calculations and testing on similar equipment which are allowed under CSA are not sufficient to meet this requirement.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this project. Perform tests at rated load and power factor at the generator manufacturer's facility in the Toronto area. If the generator has been run and tested at the manufacturer's factory at 0.8PF prior to shipment, then a resistive load test can be performed for the factory witness testing. A certified factory test report must be submitted to show the generator has been run at 0.8PF. Any generator that has not been tested at 0.8PF prior to shipment shall use a reactive load bank for the factory witness test. Include the following tests and record the values on a formal test report:
 - 1. Test engine generator set manufactured for this project to demonstrate compatibility and functionality at 100% load.
 - 2. Full load run for 2-hours and taking readings at 15 min intervals, and record the following:
 - a. Time of reading
 - b. Running time
 - c. Ambient temp in °C
 - d. Lube oil pressure
 - e. Lube oil temp in °C (if applicable for the generator)
 - f. Engine coolant temp in °C
 - g. Alternator voltage (all 3-phases)

- h. Alternator current (all 3-phases)
 - i. Power in kW
 - j. Frequency in Hz
 - k. Power factor
 - l. Battery voltage
 - m. Gas pressure (if gauge is provided)
- 3. Maximum power.
- 4. Single-step load pickup.
- 5. Simulated available safety shutdowns per CSA C282.
- 6. Transient load steps for voltage, frequency, and kW. Load steps are as follows:
 - a. 0% - 25% - 0%
 - b. 0% - 50% - 0%
 - c. 0% - 75% - 0%
 - d. 0% - 100% - 0%
- C. Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner and consulting engineer. The supplier is responsible to provide two weeks' notice for testing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions.
- B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- D. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- E. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.
- F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

- G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.2 ON-SITE ACCEPTANCE TEST

- A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with the required fuel supplied by the contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:
 - B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.
 - C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a **2-hour** full load (resistive) test with recording values per **2.11.B.2**, and a one-step rated load pickup test in accordance with CSA C282. Provide a resistive load bank and make temporary connections for full load test, if necessary.
 - D. Simulate available safety shutdowns per CSA C282.
 - E. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service and observing proper operation of the system for at least **1-hour**. Coordinate timing and obtain approval for start of test with site personnel.

3.3 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program must be a maximum of 4-hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.5 SERVICE AND SUPPORT

- A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The inventory shall have a commercial value of \$3 million or more. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.
- B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 100km of the site.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

END OF SECTION

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 1 of 7

1.0 GENERAL

1.1 SCOPE

- 1.1.1 The Contractor shall furnish and install the low voltage automatic transfer switch and bypass isolation transfer switch having the ratings, features/accessories and enclosures as specified herein and as shown on the contract drawings.

1.2 REFERENCES

- 1.2.1 The automatic transfer switch and bypass isolation switches and all components shall be designed, manufactured and tested in accordance with the latest applicable CSA standards as follows:

- .1 CSA 22.2 No. 178 – Automatic Transfer Switches
- .2 CSA C282-05 – Emergency Electrical power Supply for Buildings
- .3 CSA Z32 – Electrical Systems in Health Care Facilities

1.3 SUBMITTALS – FOR REVIEW/APPROVAL

- 1.3.1 The following information shall be submitted to the Engineer:

- .1 Master drawing index
- .2 Front view and plan view of the assembly
- .3 Schematic diagram
- .4 Nameplate schedule
- .5 Component list
- .6 Conduit space locations within the assembly
- .7 Assembly ratings including:
 - .1 Short-circuit rating
 - .2 Voltage
 - .3 Continuous current rating
- .8 Major component ratings including:
 - .1 Voltage
 - .2 Continuous current rating
 - .3 Interrupting ratings
- .9 Cable terminal sizes
- .10 Product Data Sheets.

- 1.3.2 Where applicable, the following additional information shall be submitted to the Engineer:

- .1 Busway connection
- .2 Connection details between close-coupled assemblies
- .3 Composite front view and plan view of close-coupled assemblies
- .4 Interlock schematic drawing, Kirk-key or as indicated otherwise, and sequence of operations
- .5 Mimic bus.

- 1.3.3 Submit ten (10) copies of the above information.

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 2 of 7

1.4 SUBMITTALS – FOR INFORMATION

1.4.1 When requested by the Engineer, the following product information shall be submitted:

- .1 Descriptive bulletins.
- .2 Product guides/sheets

1.5 SUBMITTALS – FOR CONSTRUCTION

1.5.1 The following information shall be submitted for record purposes:

- .1 Final as-built drawings and information for items listed in section 1.04
- .2 Wiring diagrams
- .3 Certified production test reports
- .4 Installation information

1.5.2 The final (as-built) drawings shall include the same drawings as the construction drawings and shall incorporate all changes made during the manufacturing process.

1.5.3 Submit ten (10) copies of the above information.

1.6 QUALIFICATIONS

1.6.1 The manufacturer of the assembly shall be the manufacturer of major components and control modules installed within the assembly.

1.6.2 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.6.3 For the equipment specified herein, the manufacturer shall be certified as a minimum to ISO 9002.

1.7 REGULATORY REQUIREMENTS

1.7.1 Provide a certificate of compliance with CSA 22.2 No. 178 for the transfer switches furnished under this section. The certificate of compliance is not required if the manufacturer's published data submitted and approved reflect CSA C22.2 No. 178.

1.8 DELIVERY, STORAGE AND HANDLING

1.8.1 Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.9 OPERATION AND MAINTENANCE MANUALS

1.9.1 Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 3 of 7

2.0 PRODUCTS

2.1 MANUFACTURERS

2.1.1 Cummins

- .1 Asco Power Technologies
- .2 Russelectric

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the engineer ten (10) days prior to bid date.

2.2 RATINGS

- 2.2.1 The bypass isolation automatic transfer switch shall have withstand, closing and interrupting ratings sufficient for the voltage and the available short circuit at the point of application as shown on the system drawings.
- 2.2.2 The voltage rating of the transfer switch shall be no less than the system voltage rating. The continuous current rating of the transfer switch shall be no less than the maximum continuous current requirements of the system.
- 2.2.3 The bypass isolation automatic transfer switch shall be 100% equipment rated for continuous duty.
- 3.3.4 The bypass isolation automatic transfer switch shall be fully rated to protect all types of loads, inductive and resistive, from loss of continuity or power, without de-rating, either open or enclosed.
- 2.2.5 All control devices (i.e. pilot devices, relays, and metering) must be manufactured to industrial standards. All relays supplied shall be furnished with self-cleaning contacts.

2.3 TRANSFER SWITCH

- 2.3.1 Transfer switches shall consist of completely enclosed contactors assemblies and a separate control panel. The contactors assemblies shall be operated by a stored energy mechanism and will only be energized during a transfer operation, providing inherently double throw switching action (breaker type transfer switch not acceptable).
- 2.3.2 Each transfer switch shall be positively interlocked both mechanically and electrically to prevent simultaneous closing of both sources during automatic or manual operation. Each transfer switch shall be capable of achieving a neutral position for systems maintenance purposes. A transfer switch position indicator shall be included on the face of the transfer mechanism to display the switch position.

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 4 of 7

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- 2.3.3 Transfer switches shall be capable of being operated manually under full rated load conditions. Manual operation shall provide true quick-make, quick-break operation to prevent possible flashovers from switching the contacts slowly.
- 2.3.4 On transfer switches requiring a fourth pole for switching the neutral, the neutral shall be fully rated with equal withstand, closing and interrupting ratings to the power poles. The neutral pole contacts shall be of identical construction as, and operate simultaneously with, the main power contacts. Switched neutral poles, which are add-on or overlap or that are not capable of breaking full rated load current are not acceptable.
- 2.3.5 Main contacts shall be designed to withstand multiple fault currents and shall meet CSA 22.2 No. 178 and C22.2 No. 5.

2.4 BYPASS ISOLATION SWITCH

- 2.4.1 Single-sided (one-way) bypass-isolation switches shall provide manual bypass of the load to the emergency source. All main contacts shall be manually driven and operated.
- 2.4.2 Separate bypass and isolation handles shall be utilized to provide clear distinctions between these functions. All operators shall be permanently affixed and operable without opening the enclosure door (EEMAC1 only).
- 2.4.3 For bypass operation, a single-throw isolating handle mechanism shall be operated to isolate the automatic transfer switch from the normal, emergency, and load power conductors. Bypass switches will only be permitted to operate when the isolating mechanism is in the isolation position. Emergency and normal bypass switches shall be interlocked via a mechanical interlocking plate.
- 2.4.4 Field installation of power connections shall be at the line and load terminals of the bypass isolation switch. All power interconnections shall be silver-flashed or tin-plated copper bus. All control inter-wiring shall be provided with disconnect plugs.

2.5 MICROPROCESSOR LOGIC CONTROL

- 2.5.1 The transfer switch shall be controlled by a Cutler-Hammer microprocessor-based controller. The controller shall be hardened against potential problems from transients and surges. Operation of the transfer switch and monitoring of both sources shall be managed by the controller.
- 2.5.2 The logic control panel shall control the operation of the transfer switch. All sensing and logic shall be controlled by an onboard microprocessor for maximum reliability, minimum maintenance, and built-in serial communications. The logic controller shall be connected to the transfer switch by and interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the control panel to be disconnect from the transfer switch for routine maintenance.
- 2.5.3 Microprocessor Controller
- .1 ATC 600 or approved equal from the approved manufacturer as listed above

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 5 of 7

2.6 CUSTOMER METERING

2.6.1 Where indicated on the drawings, provide a separate customer metering compartment with front hinged door and include the following:

- .1 Current transformers where shown on the drawings or elsewhere specified shall be wired to shorting-type terminal blocks.
- .2 Potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the drawings.

2.6.2 Microprocessor-Based Metering System

2.7 WIRING/TERMINATIONS

2.7.1 Terminal blocks shall conform to NEMA ICS 4. Terminal blocks for remote connections shall be arranged to facilitate the entrance of external conductors from the top or bottom of the enclosure. The main transfer switch terminals shall be suitable for the termination of conductors shown on the plans.

2.8 ENCLOSURE

2.8.1 Each transfer switch shall have an EEMAC 1 general purpose enclosure unless otherwise noted.

2.9 FINISH

2.9.1 The enclosure shall be painted with the manufacturer's standard painting procedures to ensure suitability for environmental conditions as referenced in the plans. EEMAC 1, 12, 3R and 4 enclosures shall be painted with the manufacturer's standard ASA 61 gray paint.

2.10 TRANSFER SWITCH OPERATION

2.10.1 The following Voltage and Frequency sensing shall be supplied:

- .1 The voltage of each phase of the normal source shall be monitored, with dropout adjustable from 50% to 90% of nominal and pickup adjustable from dropout setting +2% to 100% of nominal
- .2 The voltage of each phase of the emergency source shall be monitored, with dropout adjustable from 50% to 90% of nominal and pickup adjustable from dropout setting +2% to 100% of nominal
- .3 The frequency of the emergency source shall be monitored, with dropout adjustable from 90% to 100% of nominal and pickup adjustable from dropout setting +1 Hz to 110% of nominal.
- .4 Voltage measurement accuracy shall be +/-2% of nominal input voltage and frequency measurement accuracy shall be +/-0.1 Hz.

2.10.2 The following Time Delay features shall be supplied:

- .1 A time delay shall be provided to override a momentary power outage or voltage fluctuation, adjustable from 0 to 120 seconds.
- .2 A time delay shall be provided on transfer to emergency, adjustable from 0 to 30 minutes.
- .3 A time delay shall be provided on retransfer from emergency to normal, adjustable from 0 to 30 minutes.

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 6 of 7

This time delay shall be bypassed if emergency source fails and normal source is available.

- .4 A time delay shall be provided after retransfer that allows the generator to run unloaded prior to shutdown, adjustable from 0 to 30 minutes.
- .5 All delays shall be field adjustable from the microprocessor-based controller without the use of special tools.

2.11 ACCESSORIES

- 2.11.1 Selectable 3-phase(ϕ) or 1-phase(ϕ) failure protection on normal supply.
- 1.11.2 Selectable 3-phase(ϕ) or 1-phase(ϕ) failure protection on emergency supply.
- 2.11.3 Pilot light indication of transfer switch position and availability of normal emergency voltage sources.
- 2.11.4 Transfer switch position indicator
- 2.11.5 A momentary test selector switch or pushbutton shall be provided to simulate normal source failure.
- 2.11.6 Engine start contacts.
- 2.11.7 Transfer motor disconnect intended for manual operation.

2.12 OPTIONAL ACCESSORIES

- 2.12.1 Auxiliary relay contacts shall be provided that are energized when power is available on the normal source.
- 2.12.2 Load Sequencing: Transfer switch logic shall allow the ability to perform load sequencing of 0-10 devices.

3.0 EXECUTION

3.1 FACTORY TESTING

- 3.1.1 The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of CSA and EEMAC standards.
 - .1 Insulation check to ensure the integrity of insulation and continuity of the entire system
 - .2 Visual inspection to ensure that the switch matches the specification requirements and to verify that the fit and finish meet quality standards
 - .3 Mechanical tests to verify that the switch's power sections are free of mechanical hindrances
 - .4 Electrical tests to verify the complete electrical operation of the switch and to set up time delays and voltage sensing settings of the logic
- 3.1.2 The manufacturer shall provide three (3) certified copies of factory test reports.

3.2 INSTALLATION

- 3.2.1 The contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 7 of 7

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- 3.2.2 All necessary hardware to secure the assembly in place shall be provided by the contractor.
- 3.2.3 The equipment shall be installed and checked in accordance with the manufacturer's recommendations.
- 3.3 FIELD QUALITY CONTROL**
- 3.3.1 Provide the services of a qualified factory-trained manufacturer's representative to assist the contractor in installation and start-up of the equipment specified under this section for a period of 2 working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- 3.3.2 The contractor shall provide three (3) copies of the manufacturer's field start-up.
- 3.4 MANUFACTURER'S CERTIFICATION**
- 3.4.1 A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- 3.4.2 The Contractor shall provide three (3) copies of the manufacturer's representative's certification.
- 3.5 TRAINING**
- 3.5.1 The contractor shall provide a training session for up to five (5) owner's representatives for 1 normal Workday at a jobsite determined by the owner.
- 3.5.2 The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, and major Components within the assembly.
- 3.6 FIELD SERVICE ORGANIZATION**
- 3.6.1 The manufacturer of the ATS shall also have a national service organization that is available throughout the Canada and is available on a call 24 hours a day, 365 days a year.

END OF SECTION

3.5 TRAINING

**Low Voltage Bypass/Isolation
Automatic Transfer Switches**

Page 8 of 7

3.5.1 The contractor shall provide a training session for up to five (5) owner's representatives for 1 normal workday at a jobsite location determined by
~~the owner.~~

3.5.2 The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, and major components within the assembly.

3.6 FIELD SERVICE ORGANIZATION

3.6.1 The manufacturer of the ATS shall also have a national service organization that is available throughout the Canada and is available on a call 24 hours a day, 365 days a year.

END OF SECTION

1.0 GENERAL

1.1 SUMMARY

- 1.1.1 This Section of the Specification is an integral part of the Contract Documents and shall be read accordingly.
- 1.1.2 Comply with general condition, Supplementary conditions of the contract, section 16010 – Electrical General Requirements
- 1.1.3 Comply with section 16050 – Basic Materials & Method.
- 1.1.4 Comply with EIA/TIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces.
- 1.1.5 Comply with J-STD-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications.

1.2 SCOPE

- 1.2.1 Provide empty raceway systems including conduits, terminal cabinets, plywood backboards, pull boxes, outlets and cover plates for enclosure of wiring.
- 1.2.2 Telecommunication systems include, but not limited to, voice, data, cable TV, P.A., security and access control, emergency alarm, CCTV, CATV, etc.
- 1.2.3 Co-ordinate with system contractors for all the work.
- 1.2.4 Provide P.A. speakers backboxes.

2.0 PRODUCTS

2.1 MATERIALS

- 2.1.1 Wall outlets shall be 115 mm square boxes with plaster rings to suit single gang devices unless otherwise noted. Provide stainless steel cover plates for the outlet boxes for future use.
- 2.1.2 Conduit size shall be in accordance with systems contractor's requirements and recommended standards.
- 2.1.3 Minimum pull box size shall be as follows:

Maximum conduit size	Size of pull boxes in millimetres			For each additional conduit size increase width by:-
	Width	Length	Depth	
27mm	102mm	406mm	76mm	51mm
35mm	152mm	508mm	76mm	76mm
53mm	203mm	914mm	102mm	127mm
78mm	305mm	1219mm	127mm	152mm
103mm	381mm	1524mm	203mm	203mm

- 2.1.4 Plywood backboards shall be minimum 1200 x 2400 mm, 19 mm thick, painted with 2 coats of fire retardant light grey enamel.
- 2.1.5 Provide a minimum of 2 duplex receptacles on separate circuits at each backboard.
- 2.1.6 Provide grounding at each backboard.

3.0 EXECUTION

3.1 INSTALLATION

- 3.1.1 Vertically mount outlet boxes, unless noted otherwise, 300 mm to centre above floor, or 150 mm above counter top where shown at counters or benches.
- 3.1.2 Fish conduit, clear blockages and outlet and clean out pull boxes at completion of installation. Leave conduit free of water or excess moisture. Install No. 12 gauge galvanized soft iron pull wire, or 1/8" nylon pull cord (minimum 400LB) continuously from outlet to outlet, through conduit and fasten at each box.
- 3.1.3 Conduit bonds shall have a bending radius of not less than nine times conduit diameter. Ream out conduit and identify ends with green paint.
- 3.1.4 Install additional steel pull boxes in such a manner that, throughout entire system, there shall be not more than two 90 degree or equivalent bends or more than 30,000 mm in each run, so that wire or cables may be pulled in or withdrawn with reasonable ease.
- 3.1.5 how as-installed conduit routing and location of all pull boxes on the record drawings, prior to project completion, for use by systems contractors to facilitate wiring and equipment installation. Include above noted information on final record drawings at project completion.
- 3.1.6 Co-ordinate with P.A. supplier for types and sizes of P.A. speakers back boxes to be provided by Division 16 and proceed accordingly.

END OF SECTION

1. GENERAL REQUIREMENTS

1.1 ABBREVIATIONS

- .1 *ACAMS* Access Control and Monitoring System, see definitions
- .2 *ACS* Access Control System
- .3 *ADO* Automatic Door Operator
- .4 *CR* Card Reader
- .5 *CS* York Region Corporate Security Team
- .6 *DC* Door Contact
- .7 *IDS* Intrusion Detection System, see definitions
- .8 *IP* Internet Protocol
- .9 *ITS* York Region Information Technology Services Team
- .10 *LAN* Local Area Network
- .11 *MAG* Electromagnetic Lock
- .12 *NEMA* National Electrical Manufacturers Association
- .13 *POE* Power Over Ethernet
- .14 *PTZ* Pan, Tilt and Zoom Camera
- .15 *REX* Request to Exit Sensor, see definitions
- .16 *RFA* Request for Assistance, see definitions
- .17 *SCADA* Supervisory Control And Data Acquisition, see definitions
- .18 *TLS* Transport Layer Security Protocol
- .19 *UPS* Uninterruptible Power Supply, see definitions
- .20 *VMS* Video Management System
- .21 *WAN* Wide Area Network, see definitions

1.2 DEFINITIONS

- .1 *ACAMS*: integrated security system including an *ACS*, *IDS* and *VMS*.
- .2 *Access Level*: customizable set of permissions granted to a user or group to access secure spaces or perform specific actions. Permissions may be further customized using schedules.
- .3 *Alarm*: is a status in the *ACS* or *IDS* when a situation occurs which requires immediate on-site investigation.
- .4 *Alert*: a notification from the *ACAMS* to notify of unusual conditions. Alerts may escalate to alarms if the situation worsens.
- .5 *Arming Station*: consists of an arming button, arming *CR* and keypad. Used for local arming of *IDS*.
- .6 *Bond Sensor*: device used to measure the force required to hold an object in place or the force exerted by an object when held. Used to ensure that a *MAG* maintains the necessary force to properly secure doors.

- .7 *Explosion Proof*: refers to the certification required of electrical and related safety devices used in hazardous locations.
- .8 *Fail Safe*: system or mechanism designed to automatically default to an open or unlocked condition in the event of a failure or malfunction.
- .9 *Fail Secure*: system or mechanism designed to maintain security by remaining locked or secure in the event of a failure or power loss.
- .10 *Forced Entry*: An alarm that is generated on the *ACS* when a door monitored by the *ACS* is opened without prior authorization from the *ACS*.
- .11 *Hold Open*: An alarm that is generated on the *ACS* when a door monitored by the *ACS* remains open for an extended duration after an authorized opening.
- .12 *IDS*: is a system to monitor, detect and notify unauthorised access or the deviation of sensor observations from acceptable values.
- .13 *Integrator*: is a pre-qualified contractor responsible for programming and supplying hardware, equipment, and licences for the *ACAMS*.
- .14 *Installer*: is a pre-qualified contractor responsible for installing the *ACAMS* and its components.
- .15 *Intrusion Alarm*: An alarm generated by the *IDS* immediately after any *intrusion zone* faults while the *IDS* is fully armed.
- .16 *Intrusion Zone*: area monitored by the *IDS* with 1 or more *DC* and/or glass break sensors
- .17 *RFA button*: security device designed to be activated quickly and easily by staff in emergency situations to notify appropriate personnel. Device may be wired or wireless.
- .18 *RFA*: an alarm triggered by activation of a *RFA button* or Universal Washroom Emergency Call button.
- .19 *REX*: a component in the *ACAMS* that allows individuals to exit a secured area without triggering an alarm or compromising security protocols.
- .20 *Security Contractor*: is inclusive of both the *integrator* and *installer*
- .21 *Supervision*: refers to the continuous monitoring and self-checking of the system's components to ensure they are functioning correctly and are not compromised.
- .22 *SCADA*: is a system used for monitoring and controlling industrial processes and infrastructure, gathering real-time data from remote locations.
- .23 *UPS*: is a device that provides backup power to electrical equipment in the event of a power outage or fluctuation, ensuring continuous operation and protection against data loss or hardware damage.
- .24 *Valid Card Swipe*: Presentation of proximity card or tag to a *CR* and subsequent authentication of user *Access Level* by the *ACS*.
- .25 *WAN*: is York Region's telecommunications network that extends throughout the Region, connecting multiple smaller networks at remote sites, such as *LANs*, to facilitate communication and data exchange across the Region.

1.4 **ACAMS OPERATION - GENERAL**

- .1 The *ACAMS* automatically uploads/downloads information to/from the control panels while the control panels are in communication with the central server. Data transfer does not interfere with normal operations.
- .2 User Interface
 - a. Graphical interface has a multilayer hierarchy where the highest level is a map of York Region showing each connected facility on the map using appropriate icon based on the facility designation (eg: corporate, environmental, paramedic).
 - b. Each connected facility has a dedicated graphical display or series of displays. Dedicated facility graphics:
 - i. are based on applicable architectural floor plan for that facility;
 - ii. include the current real-time status of the Facility and all field devices, including cameras, RFA buttons, strobes and remote release buttons;
 - iii. allow direct control of system functions at the site, such as arming, disarming, and door control; and
 - iv. Show the AC power status using the facility's main panel power fail input to monitor AC power status.
- .3 Audit Trail / Event Log

- a. The central server maintains a consolidated event log for every connected site within the Region's portfolio.
 - b. Event Log includes:
 - i. All access card activities including name, and action granted or denied
 - ii. Logging in and out of operators
 - iii. Scheduled activations and deactivations
 - iv. Trouble and alarm reports
 - v. All failures, arming and disarming of systems
 - vi. System resets and restarts
 - vii. Intrusion detection alarms
 - viii. All system events on the IDS
 - ix. For elevators on ACS, all card swipes and subsequent button presses for floor(s) selected / elevator call.
 - x. For parking controls on ACS, the parking control open/close status information.
 - c. The local system at each site holds at least 24 hours or 5,000 events in a rolling log. New records overwrite the oldest records once the log capacity is reached.
 - d. Upon loss of communication with central server, alarms continue to sound locally, and events continue to be recorded in the local event log. Once communication is restored, these records are automatically transferred to, and saved on, the consolidated event log on the central server.
- .4 Third Party Monitoring
- a. Each *IDS* panel has at least 2 paths of communication to the 3rd party monitoring service including hard-wire *LAN* and cellular.
 - b. All arming and disarming events are communicated to the 3rd party monitoring service.
 - c. All *alarms* are communicated to the 3rd party monitoring service.
 - d. *Alerts* are not communicated to the 3rd party monitoring service.
 - e. Each *IDS* panel sends receiver supervision time signals to the 3rd party monitoring service following the 1 hour NFPA 72 standard.
 - f. *IDS* reports power loss to 3rd party monitoring service.
- .5 *ACS*
- a. Authentication on the *ACS* is based on *access levels*. *Access levels* are managed by *CS*.
 - b. Upon *valid card swipe*, at a pedestrian door, the *ACS* authorizes entry and temporarily releases the electric locking device allowing the door to be opened.
 - c. Upon *valid card swipe*, at a vehicle entry point (gate or door), the *ACS* authorizes entry and commands the entry point to automatically open temporarily.
- .6 Arming and Disarming of *IDS*
- a. Arming at each Facility only occurs when the system is Ready to Arm, as indicated on the *IDS* keypad. This arming process may proceed if *alerts* are present.
 - b. Local arming is triggered following a *valid card swipe* on a dedicated arming CR, followed by a press of the dedicated arming button. System then fully arms after exit delay of 45 seconds.
 - c. *IDS* automatically disarms, upon an authorized entry to the facility. The door does not have to be opened for the *alarm* system to be disarmed.
 - d. *IDS* can also be armed and disarmed remotely (either manually or automatically) via the central server.
 - e. Arming CR cannot be used to disarm *IDS*.
- .7 Alarms and Alerts
- a. Each door controlled by the *ACS* generates *forced entry* and *hold open alarms*.
 - i. A forced entry alarm is generated when a *forced entry* occurs.
 - ii. Manual key entry to a facility is treated as a *forced entry*.
 - iii. A *forced entry* is not generated, if the *REX* associated with the door is triggered or activated prior to the door opening.

- iv. An *alert* is generated if a door remains open for 45 seconds following an authorized entry/exit from a secured space.
 - v. A *hold open* is generated if a door, without *ADO*, remains open for 10 seconds following an *alert* from that door. Integral beeper on the CRs associated with the held open door will sound and continue to sound until the door is closed.
 - vi. A *hold open* is generated if a door, with *ADO*, remains open for 10 seconds beyond the *ADO* cycle time following an authorized entry/exit from/to a secured space. Integral beeper on the CRs associated with the held open door will sound and continue to sound until the door is closed.
 - vii. *Forced entry* and *hold open alarms* on doors for Corporate and SCADA data centres are treated as *intrusion alarms*.
 - b. *ACAMS* signals a “tamper trouble” *alert* when any supervised wires are cut or short circuited.
 - c. *Intrusion Alarms* are only triggered when the *IDS* is fully armed.
 - d. All *intrusion alarms* are annunciated:
 - i. Locally on all keypad(s) at the Facility;
 - ii. On the *ACS* Alarm Monitor application;
 - iii. To the 3rd party monitoring station; and
 - iv. To the *SCADA* system, where applicable.
- .8 *IDS* Key pads
- a. Display the name of the facility and the nature of any faults in the system.
 - b. Are not used for Arming, Disarming, or clearing of any faults.
 - c. Indicate ‘Ready to Arm’ while the *IDS* is disarmed and all intrusion points are “fault free”
 - d. During the “Exit Delay” after initiating arming sequence, sounders beep slowly and display shows “Exit Delay in Progress”
 - e. When the *IDS* is fully armed, sounders are silent and the “armed” status indicator is illuminated.
- .9 *VMS*
- a. Camera stream recordings are stored on remote recording servers via the *WAN*.
 - b. Camera streams record at different frame rates depending on if there is motion in the field of view.
 - c. Video recordings include a burn in of the date, time and the camera description on every frame of the recording.
 - d. Privacy Masks are added:
 - i. For staff spaces, directly above the staff member’s chair, to cover the person however leaving hand activity visible.
 - ii. For resident room doorways in long term care facilities, to cover the door.
 - iii. For exterior cameras that capture public’s homes, to cover the public’s entire homes
 - iv. For holding cells, to cover the toilets.
 - v. For safes, to cover the code entry keypad
 - vi. As directed by *CS*
 - e. Following a loss and subsequent restoration of communication between camera and server, local recordings of cameras with local storage, are uploaded to the remote recording server to recover any gaps in recording coverage.
- .10 Intercom Systems

- a. When activated, the remote intercom initially calls an associated intercom master station, where provisioned, and, if unanswered or not provisioned, routes the call to a designated phone number.
- b. When the remote intercom is activated, video from the intercom is recorded on *VMS*.
- .11 *RFA*
 - a. *RFA* is triggered any time an *RFA button* or Emergency Call Button in a washroom is activated.
 - b. *RFA* remains active until the *alarm* is acknowledged using the 'panic all clear' button on the associated graphic.
 - c. When a *RFA* is triggered, the graphic map on the *ACS* shows the exact location of the *RFA button* (either actual or assigned) and a description of the *alarm*.
 - d. When a *RFA* is triggered, the associated strobes light and piezo buzzers sound.
 - e. Strobes in security offices are associated with all panic buttons in the facility
 - f. Strobes in employee only program spaces are associated with the *RFA buttons* in the facility associated with that program area.
 - g. Strobes outside designated rooms are only associated with *RFA buttons* within the room.
 - h. Wireless *RFA buttons* are each assigned to a specific room.
- .12 Universal Washroom
 - a. Each Emergency Call Button is connected to both *ACS* and *IDS* for monitoring.
 - b. Activation of Emergency Call Button triggers an *RFA* on the *ACS* graphic and *IDS*.
- .13 Lockdown Button
 - a. When a Lockdown button is activated, schedules are ignored, and all associated doors default to locked state and are only accessible by *valid card swipe*.
 - b. When the Lockdown button is deactivated, all associated door schedules resume normal operation.
- .14 Glass Break Sensor
 - a. Glass break sensors trigger an *alarm* on the *ACS* whenever the sensor is triggered.
 - b. When an *alarm* is generated on the *ACS* from a glass break sensor, the graphic map shows the exact location of the sensor and a description of the *alarm*.
 - c. *Alarms* from glass break sensors on the *ACS* remain active until the alarm is acknowledged using the 'glass break all clear' button on the associated graphic.
 - d. Glass break sensors trigger an *Intrusion Alarm* on the *IDS* only if the sensor is triggered while the system is fully armed.
- .15 *REX*
 - a. Motion *REX*
 - i. Motion *REX* are configured to shunt *forced entry* only; triggering of a motion *REX* does not release the electric door strike.
 - b. Exit Button *REX*
 - i. Activation of Exit Button *REX* temporarily releases associated *MAG*, activates secure side *ADO* activation device, where present, and allows associated door to be opened.
- .16 Remote Release button
 - a. Activation of a remote release button associated with an automatic gate or overhead door causes the portal to temporarily open automatically.
 - b. Activation of a remote release button on a door without *ADO*, temporarily releases the electric locking device. The door can then be opened manually.
 - c. Activation of a remote release button on a door with *ADO*, temporarily releases the electric locking device, and temporarily activates the non-secure activation device. The door can temporarily be opened manually or automatically, by triggering the non-secure side activation device to activate the *ADO*.
- .17 *MAG*
 - a. The Bond sensor reports if the corresponding door is improperly closed.
 - b. Where installed on a double door, both doors are treated as a single opening.
 - c. Upon power loss to the magnet, the Bond sensor reports the door as *forced open* irrespective of whether the door opened.

.18 *ADO*

- a. For all *ADOs* installed on doors with *ACS* Control:
 - i. *CR* on the insecure side of the door is always active.
 - ii. *ADO* activation device on non-secure side of the door is inactive, except following a *valid card swipe* on associated *CR*, activation of associated remote release button or if door is unlocked by schedule.
 - iii. The door is normally closed and locked unless scheduled otherwise.
 - iv. If there is no maglock on the door, the *ADO* activation device on the secure side of the door is always active.
 - v. If there is a maglock on the door, the *ADO* activation device on the secure side of the door is normally inactive.
- b. When a person is entering a secure space via a door with *ADO* installed:
 - i. Upon valid card swipe, non-secure side activation device is temporarily activated, and the electric locking device released.
 - ii. The door can then be opened manually or automatically, by triggering the non-secure side activation device to activate the *ADO*.
 - iii. After opening or time delay, the door will relock, and the non-secure side activation device will become inactive.
- c. When a person is leaving a secure space via door with *ADO* installed:
 - i. Door without *MAG*: The door can be opened manually or automatically, by triggering the secure side activation device to activate the *ADO*. The door relocks after opening.
 - ii. Door with *MAG*: The secure side activation device is normally inactive. Exit button *REX* activation is required to release *MAG* and activate the secure side activation device. After Exit button *REX* activation, the door can temporarily be opened manually or automatically, by triggering the secure side activation device to activate the *ADO*. The door relocks after opening or time delay and the secure side activation device becomes inactive.
 - iii. Motion *REX*, if present, is integrated with *ADO* activation device.

.19 Elevator Access Control Integration

- a. Where a *CR* is installed in an elevator cab, upon *valid card swipe*, the floor buttons corresponding to authorized floors are temporarily unlocked in that elevator cab only, for the user to select.
- b. Where a *CR* is installed in an elevator lobby, upon *valid card swipe*, the elevator is called to that lobby.
- c. The *ACS* does not affect the service, or fire mode operation of the elevator.
- d. If the *CR* loses communication with the controller, floors remain in fail secure condition.
- e. *ACAMS* does not monitor or capture elevator operational alarms.
- f. Each elevator with *ACS* control has a toggle switch (or key switch) to bypass *ACS*. In bypass mode, the elevator operates as if there was no *ACS*.

.20 Parking Controls

- a. *ACS* Integration
 - i. All control functions for barrier operation are controlled through the *ACS*.
- b. Parking Operator
 - i. Entrance barrier opens automatically via signal from the *ACS* upon *valid card swipe* at either *CR* on the access control pedestal or via ultra long-range *CR* (where present).
 - ii. Entrance barriers may also be opened remotely through the *ACS* graphical interface, intercom system or, where present, by remote release button.
 - iii. Parking controls at an exit open on vehicle departure when the departure loop senses the vehicle.
 - iv. Barriers reclose when the associated reset loop detects the vehicle passing beyond the barrier or timer elapses.
 - v. Parking control loops do not function in reverse.
- c. Barrier Arm

- i. If a barrier arm encounters an object while closing, the barrier arm immediately signals an *alarm* to the *ACS* and completely opens.
 - ii. Barrier arm can be manually operated locally in the event of a power or communications failure.
- .21 Monitor Points
 - a. Main Incoming Power Status
 - i. Monitor main incoming 120VAC supply to *ACS* and reflect status on site graphic.
 - b. Generator Run Status
 - i. Monitor generator run status on *ACS* and reflect run status on site graphic.
 - c. Vaccine Fridges and Freezers Alarm
 - i. Monitor the alarm point on *ACS* and *IDS* and reflect alarm status on site graphic.
 - ii. *Alarms* are triggered and communicated to the 3rd party monitoring station irrespective of the arming status of the *IDS*.

1.5 SECURITY SYSTEM SUBMITTALS

- .1 General
 - a. All submittals shall be provided in electronic format. Submittals shall be provided in PDF, without electronic locks, encryption, or restrictions. Drawings shall also be provided in AutoCAD (DWG) format.
 - b. All submittals must adhere to the Region defined naming convention (see [Appendix B: Security System Naming Convention Standards](#)) for all system components and must be consistent with the names used in the software and on site.
 - c. Submittals shall include at least the following:
 - i. System riser diagram(s)
 - ii. System layout/floorplan
 - iii. Network connectivity diagrams
 - iv. Vertical and horizontal wiring diagrams
 - v. Site Specific point-to-point wiring diagrams and schematics
 - vi. Device landing schedule(s)
 - vii. System integration schematic(s) and wiring diagrams
 - viii. Tub/enclosure layout diagram(s)
 - ix. 120 VAC Line Voltage Electrical connections and wiring diagrams
 - x. Addressing and dip switch setting charts
 - xi. Product specifications and cut-sheets
 - xii. Complete Bill of Materials
- .2 Shop Drawings
 - a. The *integrator* shall produce the complete set of shop drawings for approval by *CS* or designate.
 - b. The security contractor shall NOT start any implementation work until the shop drawings are approved.
 - c. Shop drawings shall cover the entire scope of the Work and shall include all submittal items identified under [1.5.1 General](#) and also the following:
 - i. Any dependencies which are not included in these Drawings, such as wall space, electrical requirements, and air conditioning.
 - ii. Any compatibility issues between the existing installation and the proposed new equipment.
- .3 As-Built Documentation
 - a. The as-built documentation for the *ACAMS* installation shall be submitted for approval by *CS* or designate, as a requirement to achieve substantial performance of the Work.
 - b. As-built documentation shall cover the entire scope of the Work that was completed under the Contract Documents, and shall include all submittal items identified under [1.5.1 General](#) and also the following:

- i. All technical notes, software scripts, firmware details and other documentation covering the IT portion of the Work covered under this Contract.
 - ii. IDS configuration files
 - iii. List of serial numbers for all supplied parts
 - iv. List of IP and MAC addresses for networked devices
 - v. Lists of all usernames and passwords used for the installation and configuration of the system and devices
 - vi. Splice box locations marked on the wiring diagram
 - vii. Commissioning documentation (see [Appendix C: Security System Commissioning Forms](#)). The commissioning documentation must be completed by the *integrator* and signed by the Consultant, if applicable, and Regional representative.
- c. Hard copy of approved documents shall be included inside main security enclosure.

1.6 TESTING AND QUALITY ASSURANCE

- .1 ITS Software and Hardware Penetration Testing
 - a. The *integrator* shall work with ITS to perform security penetration testing for supplied hardware and/or software, as required by ITS.
 - b. The *integrator* shall supply, if requested, copies of all network device specifications and data sheets to ITS in preparation for the penetration testing.
 - c. The *integrator* shall supply, if requested, a demo of each device type to ITS for penetration testing.
- .2 Site Testing
 - a. Site testing shall be performed by the *integrator* following installation of, or modification to, the ACAMS at a facility.
 - b. During site testing, the *integrator* shall complete the Region's commissioning forms (see [Appendix C: Security System Commissioning Forms](#)) to confirm that all hardware and software components of the system are installed and functioning as intended.
 - c. Following successful testing (i.e. no remaining failed tests), the *integrator* shall submit completed forms to Region, or designate.
- .3 Commissioning
 - a. After site testing has been completed, commissioning shall be scheduled with the Consultant, if applicable, and Regional representative(s).
 - b. The *integrator* shall demonstrate, to the satisfaction of CS, that the system and all of its components are functioning, as per the contract documents. This approval process shall be performed in 2 phases:
 - i. A virtual commissioning with the Region's Security System Administrator
 - ii. A final in-person commissioning with CS.
 - c. All failed tests shall be corrected, and retested until successful test is achieved, prior to the Consultant approving, and the Region accepting the system.

1.7 WARRANTY & TECHNICAL SUPPORT

- .1 The Security Contractor shall provide all warranty services for ACAMS for a period of twenty-four (24) months from the date of Total Performance of the Work and shall provide all necessary material required to replace any defective products during this period.
- .2 The beneficiary of the Warranty shall be the Regional Municipality of York.
- .3 The *integrator* shall always have qualified technical support available during normal working hours and emergency support available throughout the warranty period.

1.8 CLOSE OUT

- .1 Project Close Out process requires that the following documents and miscellaneous items are completed and provided to the Region:

- a. Assignment of all warranties, licences and product registrations to the “Regional Municipality of York” and documentation to this effect;
- b. All associated work is reported to, and permits are closed out with, appropriate Authority Having Jurisdiction;
- c. Ensure that all temporary configurations are returned to their permanent “operational” status and appropriate documentation is provided confirming this status;
- d. All installation software, accessory cables, calibration units and any other material accompanying the installed equipment; and
- E. All keys, special tools, spare parts, unused components, permits, approvals, as-built documentation and project related documentation.

1.9 NETWORK TCP/IP COORDINATION

- .1 Configuration and activation of *LAN* equipment maintained by *ITS* is to be co-ordinated by the Region. The *integrator* shall provide two weeks advance notification to the Region for configuration of network ports.
- .2 IP addresses shall be provided by *ITS* on request from the *integrator* to the Region.
- .3 Communications between all distributed security devices on the *WAN* shall use TCP/IP protocol. Communications between the security devices that does not involve the Region’s network may use any appropriate protocol.

2. PRODUCTS

2.1 GENERAL

- .1 The *security contractor* is responsible to supply all equipment identified in the contract documents, unless otherwise noted.
- .2 The *security contractor* shall supply all necessary wiring, termination equipment/devices and other necessary miscellaneous components which are not specified in the Contract Documents, but which are necessary to implement a fully functional, and networked, *ACAMS*.
- .3 The *Installer* shall provide new wiring for all new and reused security devices.
- .4 The *Installer* shall provide wire and cable according to the drawings and *ACAMS* requirements; see [Appendix D: Cabling](#).
- .5 The *integrator* shall review the versions of software, firmware and hardware currently in service and validate the compatibility of new installations with the existing system.
- .6 The *integrator* shall supply and install all necessary software licencing to operate the security solution based on the Contract Documents, including integration, camera and CR licenses.

2.2 REGIONAL SECURITY SYSTEM INTEGRATED PLATFORMS

- .1 The Region has 2 *ACAMS* platforms, Lenel and Honeywell
- .2 The Region’s Lenel *ACAMS* is constituted by the following systems:
 - i. *ACS* is Lenel OnGuard.
 - ii. *IDS* is Bosch RPS
 - iii. *VMS* is Lenel Milestone XProtect® Expert.
- .3 The Region’s Honeywell *ACAMS* is constituted by the following systems:
 - i. *ACS* is Honeywell Enterprise Buildings Integrator.
 - ii. *IDS* is Honeywell Vista
 - iii. *VMS* is Honeywell Digital Video Manager.

2.3 NETWORK EQUIPMENT

- .1 All servers and network switches connected to the *LAN* or *WAN* shall be provided by the Region.

2.4 SECURITY SYSTEM DEVICES

- .1 Pre-approved devices and solutions shall be used wherever possible; see [Appendix E - Pre-approved security devices](#).
- .2 The use of any equipment which is not approved by the Region, or designate, is strictly prohibited.
- .3 All *ADO* sequencing boards and electric strikes for doors controlled by *ACS* shall be supplied by the *integrator*.
- .4 All security devices supplied under this contract shall meet the environmental requirements as identified in [Appendix F - Environmental Requirements](#).
- .5 Power supplies shall be provided from a single manufacturer, who must be approved by the security system manufacturer.
- .6 Each *MAG* shall:
 - a. be Plate Magnet style with a minimum holding force of 540 kg.
 - b. have indicator LED's showing if they are closed or open
 - c. have integral hold force sensors (Bond sensor)
 - d. have integral double pole door contacts.
 - e. where installed on a double door, be equipped with separate magnet and plate for each door and enclosed in a single housing.
- .7 *RFA* Strobes shall be blue in colour.

3. EXECUTION

3.1 GENERAL

- .1 The *security contractor* is responsible to install all equipment identified in the contract documents, unless otherwise noted.
- .2 The *security contractor* shall identify and report all pre-existing or related construction defects which will affect the progress of the Work to the Region and the Consultant, if applicable, before commencing construction work.
- .3 The *installer* shall install and wire all *ACAMS* equipment according to the manufacturer's recommendations. Any instances where *installer* fails to follow manufacturer's recommendations shall be corrected by *installer* with no additional cost to the Region.
- .4 Redundant *ACAMS* components and cabling shall be completely removed.
- .5 The security contractor shall limit switchover time to one day when replacing existing *ACAMS* or components, minimizing *ACAMS* down time for the facility. No facility shall remain unsecured overnight.
- .6 Modification of the fire alarm system, and signage is included in the scope of work.
 - a. The *integrator* shall retain appropriate fire company, typically the Region's Fire Alarm System contractor of record for that location, to complete fire system tie-in and testing.
- .7 Permits
 - a. The *integrator* is responsible for permits, and associated coordination (including approvals and inspections, engineered drawings and fire alarm interconnections) associated with *MAG* installation.
 - b. *CS*, or designate, shall be present for final permit inspection for *MAG* installation.
 - c. Electrical permits are not required for retrofit security projects; *security contractor* may report electrical installation work through the Region's Continuous Safety Services (CSS) Program with the Electrical Safety Authority at no cost to the contractor.
- .8 Work at Regional Water and Wastewater facilities
 - a. All work undertaken in hazardous locations shall be coordinated and scheduled with the Region in advance of the work, to have a Regional representative present during the work.
 - b. The Security Contractor shall contact the Region's Remote Operations Centre daily at 905-895-2143 or 905-895-2144 prior to entering or performing any work at the facility.

3.2 SOFTWARE/SYSTEM CONFIGURATION

- .1 The *integrator* shall ensure that the new/updated *ACAMS* under this contract is configured to follow the requirements outlined in [Section 1.4 - SECURITY SYSTEM OPERATION - GENERAL](#)
- .2 All programming and configurations of the *ACAMS* completed under this Contract shall be consistent with existing programming.
- .3 All security related work under this Contract shall be reflected in the *ACAMS* database and associated graphics.
- .4 The *integrator* shall provide their own cellular connectivity to connect to the Region's network for any work under this Contract.
- .5 The *integrator* shall use client applications on a Region provided virtual machine to program, configure and test the system.
- .6 Naming of *ACAMS* and components
 - a. All system components shall be configured and named as outlined in [Appendix B: Regional Security System Naming Convention Standards](#).
 - b. Component naming shall be consistent throughout the system.
 - c. All alarm points shall have a unique and unambiguous name;
 - d. Name camera with patch panel information in software.
- .7 User Interface
 - a. The *integrator* shall use the existing dynamic icons, approved by CS, to populate the graphical interface or, if necessary, create additional custom dynamic icons.
 - b. The *integrator* shall create custom alarms for each facility which shall clearly display any intrusion and/or alarm events using the *ACS Alarm Monitor* application.
 - c. The *integrator* shall follow the standard graphic template, at resolution 1920x1080, for facility graphics for Lenel *ACAMS* (See [Appendix G – Sample Graphics](#))
 - d. The *integrator* shall create hover messages for each item added to the graphical interface.
- .8 Monitor Zones
 - a. The *integrator* shall update existing or, if necessary, create new monitor zones.
 - b. Each facility shall be assigned a single unique monitor zone.
 - c. Each facility monitor zone shall be added to the master monitor zone for the Region.
- .9 The *integrator* to create/update master *access level* for the site which includes all *CRs* at the site.
- .10 The *integrator* shall update all system hardware components, including cameras, with the latest manufacturer approved firmware versions prior to final commissioning.
- .11 The *integrator* shall change all camera passwords from their factory defaults to a password provided by the Region.
- .12 Server Software and configuration
 - a. The *integrator* will not be provided with direct access to database servers.
 - b. The *integrator* shall work with *ITS* to perform application or database server programming and configuration.
 - c. All work requiring access to the database and/or application servers must be coordinated with the Region a minimum of one week in advance.
 - d. All changes to the network configuration and network attached devices must be approved by *ITS*.
- .13 Cameras
 - a. Configure camera settings as provided by *ITS* and as per [Appendix H: Camera Settings](#).

3.3 INSTALLATION - ELECTRICAL

- .1 The General Contractor's Electricians are responsible to supply and install all new electrical raceways and junction boxes for *ACAMS* installation. Existing raceways may be reused.
- .2 Install exposed raceways parallel or perpendicular to building lines and group neatly.
- .3 Seal around all conduit penetrations.

- .4 Where emergency power is available at a site, the *installer* shall use dedicated 120VAC emergency circuits for *ACAMS* installation.
- .5 Where emergency power is not available at a site, *installer* shall use dedicated 120VAC circuits for *ACAMS* installation.
- .6 Electricians shall not work on “hot circuits” without special permission from the Region.
- .7 Install circuit breaker lockout, in energized position, on each circuit breaker serving the *ACAMS*

3.4 INSTALLATION – WIRES AND CABLES

- .1 *Installer* is responsible to install cable for *ACAMS* installation.
- .2 Label all wiring infrastructure, including fibre optic cabling, with wire markers in accordance with [Appendix I: Security System Labelling Requirements](#).
- .3 Cabling in open areas shall be run within raceways.
- .4 Where raceways are available, install cables in raceway.
- .5 Exposed cabling is only allowed above drop ceilings or where otherwise approved by CS.
- .6 Install exposed cables parallel or perpendicular to building lines and group neatly.
- .7 Arrange cables in parallel rows on cable trays.
- .8 Install through-wiring in junction boxes and pull boxes leaving a minimum of 300 mm of slack inside box.
- .9 Install cables in electrical boxes and equipment enclosures located in outdoor, wet or sprinklered areas with watertight cable connectors.
- .10 Use direct burial rated cable for all outdoor applications.
- .11 Where security low voltage wiring is run in parallel to ≥ 110 VAC electrical wiring or conduit, provide minimum of 300 mm separation between the wires.
- .12 Cable Splicing
 - a. All cable runs should be continuous and splice-free.
 - b. If splices are required, approval from CS is required for each splice.
 - c. Each approved splice or junction must be identified and accessible after project completion.
 - d. Splices shall be made in junction boxes utilizing DIN rail-mounted terminal blocks.
- .13 Field device cabling
 - a. For Regional Water and Wastewater facilities shall be home run to security control panel in designated IT room.
 - b. For access control at small facilities (with <10 doors on *ACS*) shall be home run to security control panel in designated IT room.
 - c. For access control at large facilities (with ≥ 10 doors on *ACS*) shall be run to local control enclosures.

3.5 INSTALLATION – SECURITY SYSTEM DEVICES

- .1 Label every serviceable component of the *ACAMS* in accordance with [Appendix I: Security System Labelling Requirements](#).
- .2 All exterior mounted *ACAMS* components shall be appropriately sealed to prevent intrusion by water or pests.
- .3 A minimum quantity of 10% of inputs, 10% of relay outputs and 10% of CR ports are to remain available for use in all systems which are being affected by the project.
- .4 The location of equipment shown on the Drawings may be revised during construction, but prior to its installation, and the Security Contractor shall not be entitled to any additional costs for the relocation of equipment if the new location is within 1000 mm of the original location.
- .5 All removed equipment shall be immediately delivered to CS upon removal. The Security Contractor to dispose of equipment that CS determines is not required for Region to retain.
- .6 All temporarily removed equipment shall be immediately delivered to CS for temporary storage.
- .7 All surplus equipment shall be delivered to CS upon contract completion.
- .8 Install snubbing diodes in all security devices incorporating electro-magnetic operation including electric strikes and MAGs.

- .9 Install all power supplies and transformers with a back plate and use a common ground wire.
- .10 Electric locks shall be powered from dedicated and independently fused 24VDC power supplies
- .11 All access control board power to be on dedicated 12VDC power supplies
- .12 Install a relay on main incoming 120VAC supply to *ACS*; connect relay contact to power fail input on the *ACS* main panel.
- .13 Enclosures
 - a. All control panels and modules shall be housed in enclosures.
 - b. Each enclosure containing a control panel and/or module shall:
 - i. Be wall mounted and located as shown on the drawings.
 - ii. Have key operated lock on the cabinet door, keyed to the Region's designated keyway;
 - iii. Have a monitored cabinet tamper mechanically mounted on the cabinet door;
 - iv. Have NEMA rating suitable for the installed environment, as identified in the contract documents; and
 - v. Be sized sufficiently to ensure ease of maintenance, adequate ventilation, and space for 20% expansion
 - c. Each enclosure containing one or more ACAMS control panels shall:
 - i. Include power back-up from a smart UPS (with network and power monitoring software functionality);
 - ii. Include a dedicated network jack for maintenance purposes;
 - iii. Have residential style light switch for local power disconnect inside the enclosure
 - iv. Have a switched LED light inside panel, upstream of local power disconnect, for Water and Wastewater facilities only; and
 - v. Be fed from dedicated 120VAC power circuit.
 - d. Cabinets containing local door control modules shall be installed on secure side, in vicinity to the door and at most, 2500 mm above the floor.
 - e. If enclosure is installed above finished drywall ceiling, access hatch shall be installed for servicing.
- .14 Supervision
 - a. Install supervision on all *DC* and *REX* connected to *ACS* at the remote end of the detection line using 2 resistors to provide 4 state monitoring.
 - b. Install supervision on each field device monitored by the *IDS* at the remote end of the detection line using 1 resistor to provide 2 state monitoring.
- .15 Third Party Monitoring
 - a. The *integrator* shall program and test the *IDS* connection, along each communication path, to the 3rd party monitoring.
 - b. The *integrator* shall coordinate configuration and testing of the system for each relevant signal with the Region's 3rd party monitoring service.
 - c. Cellular antenna shall be installed appropriately to ensure a consistent and reliable signal. Minimum acceptable signal strength is 'good'.
- .16 *RFA*
 - a. Hard-wired *RFA buttons* connected to fixed furniture shall be located facing away from the user and in a discreet location, but easily accessible to the employee.
 - b. Hard-wired *RFA buttons* in first aid rooms shall be located near the bed and clearly identified.
 - c. Piezo buzzers shall be located in the ceiling space, in proximity to its associated strobe.
- .17 *CR*
 - a. All conductors in *CR* cables shall be connected both at the *CR* and its associated control board reader port as per the following layout:
 - Red – 12VDC
 - Black – Ground (RTN)
 - White – Wiegand Data 1 / Clock / RS485-A
 - Green – Wiegand Data 0 / Data / RS485-B
 - Orange – LED Input (Green)

Yellow – Beeper Input
Blue – Hold Input / LED Input (Blue)
Brown – LED Input (Red)
Bare – Drain

- .18 *MAG*
 - a. Where possible, *installer* shall install *MAG* on secure side of door.
 - b. For all interior doors, connect the *Bond Sensor* to the *ACS* only.
 - c. For all perimeter doors, connect the *Bond Sensor* to the *ACS* and *IDS*.
 - d. Integration of exit button with *MAG* shall be with physical wiring only.
- .19 *DC*
 - a. *DC* associated with doors controlled by *ACS* shall be directly connected to *ACS*.
 - b. *DC* associated with perimeter access doors, exterior hatches, and data centres shall be directly connected to *IDS*.
 - c. *DC* installed on a hollow door with trough to be secured with silicone.
 - d. *DC* installed on an overhead door to be installed at height specified in door detail drawing.
- .20 *ADO*
 - a. *ADO* is typically supplied and installed by others.
 - b. Install door interface relay on each *ADO* with *ACS* control to integrate the *ADO* operation with the *ACS*.
 - c. Door interface relay shall be powered via power supply for *ACS* and not *ADO*.
- .21 *REX*
 - a. Locate motion *REX* on secure side of door so that the sensor is triggered by all individuals exiting through the door.
 - b. *REX* associated with door that has *DC* or *MAG* connected to *IDS* shall also be connected to *IDS*.
- .22 Electric Strikes
 - a. Shall be configured to fail secure.
 - b. Install in-line power controller for each electric strike.
 - c. Install appropriate face plate for electric strike to ensure full operation of door latch.
- .23 Glass Break Sensor
 - a. Shall be installed within 6100mm of the glass that the sensor monitors
- .24 Access Control Pedestal for Parking Controls
 - a. Keypad CR, and remote intercom shall be installed at appropriate height for use by driver of passenger vehicles
 - b. CR shall be installed at appropriate height for use by bus and/or truck driver.
 - c. Ultra long-range CR shall be installed on a separate pole; pole to be located as indicated on drawings.
- .25 Cameras
 - a. Each camera shall have a single ethernet connection for video feed, power, and camera control through the *LAN*.
 - b. Video signals/images must not be affected by any elevator systems interference.
 - c. Cameras to be zoomed out to the widest viewing angle to maximize coverage or otherwise as directed by *CS*.

3.6 INSTALLATION – SECURITY SYSTEM INTEGRATIONS

- .1 System Integration
 - a. Integration between the *ACS* hardware, software and *IDS* shall be seamless in both online and offline modes.
 - b. The *ACS* and *IDS* are integrated locally via hard-wire inputs and outputs (see [Appendix J: Typical Lenel Security System Wiring Schematics](#)) and in software via the *WAN*.
 - c. The *ACS* and *VMS* applications are integrated via the *WAN*.
- .2 SCADA Integration

- a. The *integrator* shall provide 3 dry contact outputs from the IDS to the *SCADA* system for all Regional Water and Wastewater facilities:
 - i. Intrusion Alarm
 - ii. *IDS* Armed/Disarmed
 - iii. Spare
 - b. Outputs shall be configured and wired fail safe.
 - c. The Security Contractor shall coordinate integration to the Region's *SCADA* system with the Region 2 weeks in advance of the integration to have appropriate Regional representative present and to assist with the integration.
- .3 Elevator Access Control Integration
 - a. The Security Contractor shall break the "control signal" and not the "common supply" for the call button.
 - b. The *installer* shall use the spare conductors in the travelling cable, where available, when integrating *ACS* to an existing elevator.
- .4 Overhead Door and Bi-Fold door Controller Integration
 - a. The Security Contractor shall supply and install a momentary dry contact output 'request to exit' signal from door controller to associated card reader board on *ACS* for doors that are controlled by *ACS*.
- .5 Parking Controls Integration
 - a. The Security Contractor shall supply and install a momentary dry contact output from the *ACS* to activate the parking controls and shall monitor status of parking controls via dry contacts inputs (position status and alarm).
 - b. All points shall be wired fail safe.

APPENDICES

Appendix	Contents
A	Prequalified Security System Vendors
B	Security System Naming Convention Standards
C	Security System Commissioning Forms
D	Cabling
E	Pre-Approved Security Devices
F	Environmental Requirements
G	Sample Graphics
H	Camera Settings
I	Security System Labelling Requirements
J	Typical Lenel Security System Wiring Schematics

4.1 Appendix A – Prequalified Security System Vendors

- .1 The Region's only Honeywell ACAMS *integrator* is Honeywell Building Automation:

Honeywell Building Automation	Callum Marshall callum.marshall@honeywell.com (647) 455-3365
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- .2 Lenel ACAMS *integrators* prequalified under Request for Supplier Qualification Number RFSQ-755-22 (as of July 28, 2023):

360 Advanced Security Corporation	Andrew Pierce Andrew.p@360asc.com (647) 212-9654
Chubb, UTC Fire and Security Canada Inc.	Stephen Yates stephen.yates@chubbsfs.ca (416) 659-1754
Paladin Technologies Inc.	Greg Cowan gcowan@paladintechologies.com (437) 684-7963
Securitas Electronic Security (Canada) Inc.	Tom Nanou Tom.nanou@securitasES.com (416) 678-7353

- .3 *Installers* pre-qualified under Request for Supplier Qualifications Number RFSQ-756-22 (as of October 31, 2023):

AC Electric	Chambers, Alex estimating@acelectricinc.ca (416) 939-0244
CEC Services Inc.	Kyle Feinstein kyle.feinstein@multitechcorp.ca (905) 713-3711
Electro-Works Ltd.	Dondi Keough dondi@tcsecure.ca (416) 529-7180
Ozz Electric	Michael Manias mmanias@ozzelectric.com (416) 989-7568

4.2 Appendix B – Security System Naming Convention Standards

All components and interconnections are to be identified by a unique name which shall be used in software (database), and on drawings, documentation and labels.

These names are to be assigned in compliance with the following parameters:

- Do not use full name on graphics, rather use device type and number.
- Commence allocation of sequential numbers/addresses from “1” for each site.

System Controllers and Panels:

E005A01 **E005** = Site Number (provided by Region)
E005I01 **A** = ACS Controller
 I = IDS Panel
 01 = Panel Sequential Number

Door:

E005D001 Z001 **E005** = Site Number
 D = CR/Door
 001 = Door Sequential Number.
 Z001 = IDS Zone Number (if applicable)

Camera:

E005C001 **E005** = Site Number
 C = Camera
 001 = Camera Sequential Number.

Glass Break:

E005GB001 Z001 **E005** = Site Number
 GB = Glass Break
 001 = Glass Break Sequential Number.
 Z001 = IDS Zone Number (if applicable)

Intercom:

E005IRS001 **E005** = Site Number
E005IMS001 **IRS** = Remote Intercom Station
 IMS = Intercom Master Station
 001 = Intercom Sequential Number.

4.3 Appendix C – Security System Commissioning Forms

The commissioning procedure is described in [Section 1.6 Testing and Quality Assurance](#).

Note that the forms are available in Excel format and should be submitted in that format. There are 11 forms:

- 1) Cover Page
- 2) ACS - Access Control System
- 3) IDS - Intrusion Detection System
- 4) Video Surveillance
- 5) Doors - Pedestrian Doors, Overhead Doors & Hatches
- 6) Gate Control (to be reviewed)
- 7) Glass Break Sensors
- 8) RFA Buttons
- 9) RFA Strobes and Piezo Buzzers
- 10) Remote Release Buttons
- 11) Video Intercom

4.4 Appendix D – Cabling

1. **General**

- .1 Refer to Corporate ITS Cabling & Wiring Standard for network and video cabling requirements.
- .2 Cabling shall follow the wiring guide in Table 2 below:

Table 1 - Security System wiring guide

Purpose	Cable type	Gauge	Conductors	Description	Belden number*
RS-485	Non-plenum	24	2 Pairs	Overall shield	9842
	Plenum	24	2 Pairs	Overall shield	88102
RS-232	Non-plenum	24	5	Overall shield	9610
	Plenum	24	6	Overall shield	83506
Reader drops	Non-plenum	22	8	Overall shield	5506FE
	Plenum	22	8	Overall shield	6506FE
	Non-plenum	18	8	Overall shield	5306FE
	Plenum	18	8	Overall shield	6306FE
12 VDC power	Plenum	24	6	Overall shield	83506
	Plenum	18	2	Overall shield	6300FE, 88760
Instrumentation	Non-plenum	18	2	Overall shield	8760

*Belden cables are provided as a design basis, the *installer* may also use an approved equivalent cable

- .3 All exposed cabling must carry an FT6 fire rating.

4.5 Appendix E – Pre-approved Security Devices

Appendix E: Pre-Approved Security Devices									
Component Type	Manufacturer	Part #	Description	Honeywell	Lenel	IDS	ACS	VMS	Intercom
Arming Button	RCI	R991RBPTD9	Pneumatic Time Delay Pushbutton	X	X	X	X		
Button REX	RCI	991E-PTD-32D	Pneumatic Time Delay Pushbutton REX	X	X		X		
Card Reader	HID	20NKS-00-01BD08	Signo 20 Reader (mullion-mount style)	X	X		X		
Card Reader	HID	40KNKS-00-01BD08	Signo 40 Keypad Reader (single gang box mount style)	X	X		X		
Card Reader	HID	40NKS-00-01BD08	Signo 40 Reader (single gang box mount style)	X	X		X		
Communication Module	Bosch	B426	Ethernet Communication Module		X	X			
Communication Module	Bosch	B444-A	Plug-in cell communication module, 4G LTE		X	X			
Controller	Bosch	B9512G	Control Panel, IP		X	X			
Controller	Honeywell	TS3	Temaline Control Panel	X			X		
Controller	Honeywell	128BPE	Vista Commercial Intrusion Panel	X		X			
Controller	Lenel	LNL-2220	Intelligent Dual Reader Controller		X		X		
Diode	N/A	1N 4007	High Voltage Rectifier Diode	X	X		X		
Door Contact	K M Thomas	TA-4106-ES	Magnetic Door Contact, Explosion Proof	X	X	X			
Door Contact	Magnasphere	HSL-1.5-101	Door Contact, Surface Mount (UL 634 LEVEL 1) SPST			X			
Door Contact	Magnasphere	HSL-1.5-111	Door Contact, Surface Mount (UL 634 LEVEL 1) DPST			X	X		
Door Contact	Magnasphere	MSS-19C	Magnetic Door Contact, Recessed Standard Door, SPST				X		
Door Contact	Nascom	N78X/STDD	Magnetic Door Contact, Recessed Standard Door, DPDT		X	X	X		
Door Contact	Nascom	N78X/STSD	Magnetic Door Contact, Recessed Standard Door, SPDT	X	X		X		
Door Contact	Tane Alarm	SD-82	Magnetic Door Contact, Recessed Steel Door, SPDT	X	X		X		
Door Contact	Tane Alarm	SD-84	Magnetic Door Contact, Recessed Steel Door, DPDT		X	X	X		
Door Interface Relay	Camden	CX-12	Door interface relay / sequencing board	X	X		X		
Electric Strike	Assa Abloy HES	1006 xx 630	Electric Strike, Recessed	X	X		X		
Electric Strike	Assa Abloy HES	HES 9500-630	Electric Strike, Surface Mounted, Fire Rated	X	X		X		
Electric Strike	Assa Abloy HES	HES 9600-630	Electric Strike, Surface Mounted	X	X		X		
Enclosure	Bosch	B56	Keypad Surface Mount Box		X	X			
Enclosure	LifeSafety Power	E4M1	Enclosure with door and backplate		X	X	X		
Glass Break Detector	Honeywell	FG-1625F	Honeywell FlexGuard glass break detector	X	X	X			
Input/Output Module	Bosch	B208	SDI2 8-Input Expansion		X	X			
Input/Output Module	Bosch	B308	SDI2 8-Output Expansion Module		X	X			
Input/Output Module	Honeywell	RTU-A01	Digital I/O Module for up to 4 Inputs/Outputs	X			X		
Input/Output Module	Lenel	LNL-1100	Input Control Module		X		X		
Input/Output Module	Lenel	LNL-1200	Output Control Module		X		X		
Intercom Station	Zenitel	ITSV-4	HD IP Video Phone with 5" Screen	X	X				X
Keypad	Bosch	B930	ATM Style-Alpha Numeric Keypad (SD12)		X	X			
Keypad	Honeywell	6160	Vista Series Remote Keypad	X		X			
Motion REX	Honeywell	IS320	REX Motion PIR	X	X	X	X		
Overhead Door Contact	Nascom	N205AU	Door Contact, Overhead Door	X	X	X			
Overhead Door Contact	Tane Alarm	MET-44 WG	Door Contact, Overhead Door (SPDT)	X	X	X			
Parking Gate control	Autogate	FLEX-18	Automatic Arm and Loop Sensor	X	X		X		
Pedestal	Batko	FRP-8443	Double Pedestal Pole Mount (84"/43")	X	X		X		X
Pedestal Hood	Batko	FRH-2316	Pedestal Hood Housing for Access or Intercom	X	X		X		X
Power Control Module	LifeSafety Power	C4/C8	Power control module 4/8 output		X		X		
Power Controller	Assa Abloy HES	2005M3	SMART Pac® III, Electric Strike In-Line Power Controller	X	X		X		
Power Distribution Module	LifeSafety Power	D8	Power distribution module		X		X		
Power Supply	LifeSafety Power	FPO series	FPO series power supply		X		X		
Reader Interface Module	Honeywell	RTU-A08	Weigand Interface Unit	X			X		
Reader Interface Module	Honeywell	TK_S014	Lonworks Weigand Interface Unit	X			X		
Reader Interface Module	Lenel	LNL-1320	Dual Reader Interface Module		X		X		
Relay	Phoenix Contact	2900329	General Purpose Relay DPDT (2 Form C)	X			X		
Relay	Phoenix Contact	2966906	General Purpose Relay SPDT (1 Form C)	X			X		
RFA Wireless Button	Bosch	RFPB-SB	Mobile Panic Button RF Transmitter		X				
RFA Wireless Button	Honeywell	F5802WXT	Mobile Panic Button RF Transmitter	X		X			
RFA Wireless Reciever	Bosch	B810	Mobile Panic Button RF Receiver		X				
RFA Wireless Reciever	Honeywell	5881EN	Mobile Panic Button RF Receiver	X		X			
Surveillance Cabinet	AXIS Communications	T98A18-VE	Surveillance Cabinet	X	X			X	
Ultra Long Range Reader	Nedap	9215689	Ultra Long-Range Vehicle RFID Reader	X	X		X		
Ultra Long Range Tag	Nedap	9882650	Ultra Long-Range Vehicle ID Window Button	X	X		X		
Video Camera	AXIS Communications	P3268-LV	Fixed Indoor Dome Camera, 3.4mm lens	X	X			X	
Video Camera	AXIS Communications	P3268-LVE	Fixed Outdoor Dome Camera, 3.4mm lens	X	X			X	
Video Camera	AXIS Communications	P3738-PLE	Fixed 360/Panoramic Indoor/Outdoor Camera	X	X			X	
Video Camera	AXIS Communications	P4708-PLVE	Dual Sensor Panoramic Camera	X	X			X	
Video Camera	AXIS Communications	P9117-PV	Dome Corner Camera, 3.4mm lens	X	X			X	
Video Camera	AXIS Communications	Q6078-E	PTZ Indoor/Outdoor Camera	X	X			X	
Video Decoder	AXIS Communications	D1110	4k Video Decoder with HDMI output	X	X			X	
Video Intercom	Zenitel	TCIV-2	IP and SIP Video Intercom	X	X				X
Video Surveillance Monitor	ORION Image	43RCE	42.5" Full HD LED LCD Monitor	X	X			X	

4.6 Appendix F – Environmental Requirements

All security devices supplied under this contract shall meet the following environmental requirements, unless otherwise identified.

Note that these specifications are intended to address only the requirements in “normal” spaces and do not extend to the special requirements which may exist in “special” locations, such as sewage or water treatment facilities.

Outdoor Operational Environments

Air Temperature:	-40°C to +40°C
Ambient Humidity	10% to 80% RH
Wind	0 to 240 km/hr (150 mph)
Rain / Snow	up to 6 mm/min
Solar Radiation	up to 1000 W/m ²
Vibration	1.5 mm displacement, 20 m/s ² acceleration, 2 – 200 Hz
Dust	3.0 mg / m ² h

Indoor Operational Environments

Air Temperature:	+10°C to +35°C
Ambient Humidity	10% to 80% RH)
Vibration	1.5 mm displacement, 20 m/s ² acceleration, 2 – 200 Hz

Storage Environments

Air Temperature:	-45 °C (-50 °F) to 45 °C (115 °F)
Ambient Humidity	10% to 90% (RH)

4.7 Appendix G – SAMPLE GRAPHICS

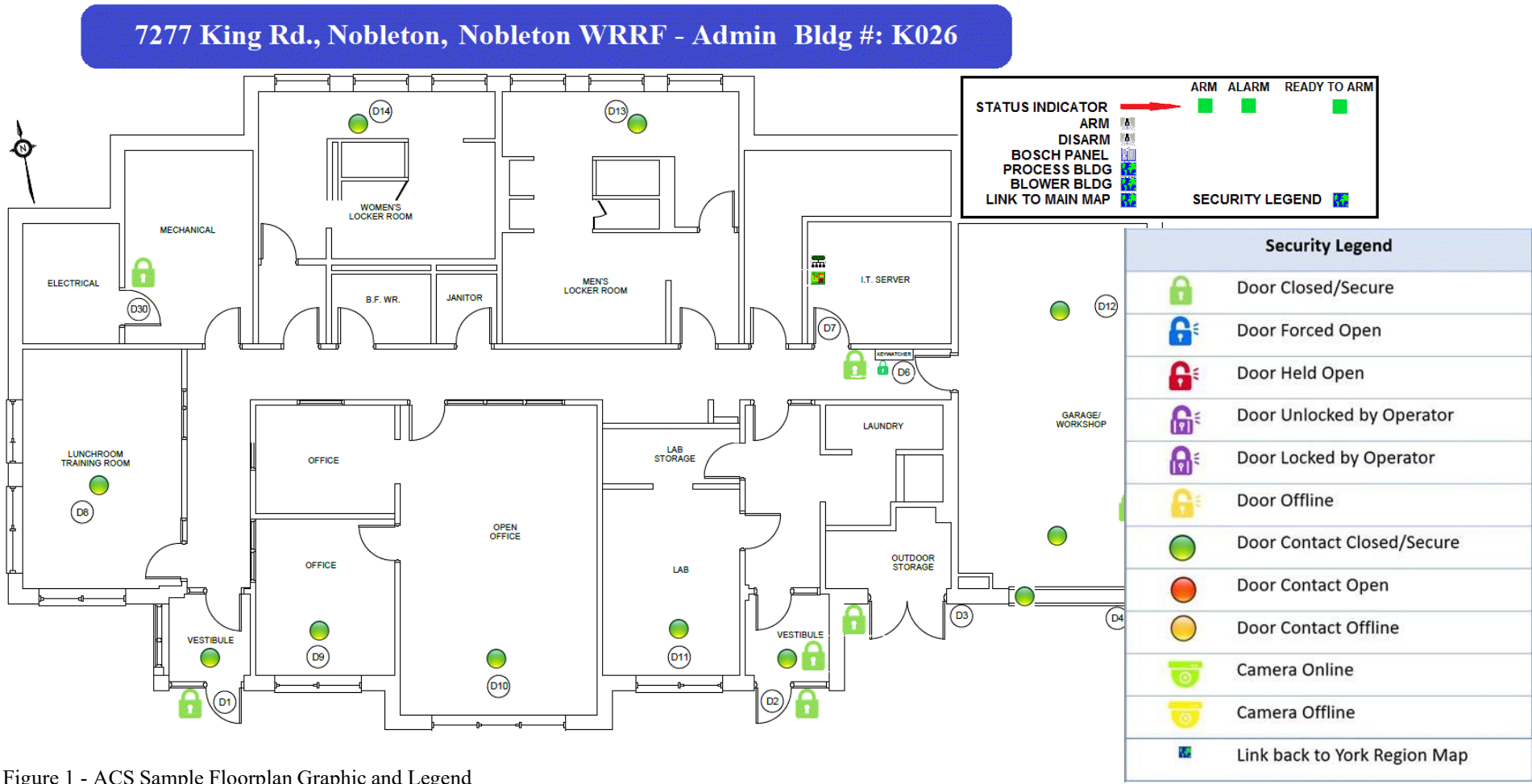


Figure 1 - ACS Sample Floorplan Graphic and Legend

4.8 Appendix H – Camera Settings

Table 2 identifies the standard settings for security cameras connected to the *WAN*:

Table 2 - Camera Settings

Field	Setting
Background (Stream 1) record frame rate, with motion	30 fps
Background (Stream 1) record frame rate, without motion	6 fps
Live View (Stream 2) frame rate	15 fps
Background recording duration	24 hours
Background delete after	30 days
Compression format	H.264
Compression Ratio	Medium
Resolution for PTZ	1920 x 1080
Resolution for fixed camera	1920 x 1080
PTZ preset speed	20
PTZ preset dwell time	1 second
NTP Server	172.16.1.46 & 172.16.19.47
HTTPS TLS	Disabled
Dot1x	Disabled
SNMP V2c only	Enabled
ReadCommunity: (case sensitive)	ykregion
WriteCommunity: (case sensitive)	Region Standard

4.9 Appendix I – Security System Labelling Requirements

1. General

- .1 The *installer* shall identify and label every serviceable component of the *ACAMS* including:
 - a. enclosures
 - b. cameras
 - c. network components
 - d. overhead DC
 - e. CR
 - f. cables
 - g. main alarm outputs and relays
 - h. batteries
 - i. power supplies
 - j. other components which are installed to support the *ACAMS*
- .2 All labelling shall be consistent on site, in as-built documentation and in software.
- .3 All labelling is to be permanent and legible:
 - a. Label printing shall be machine generated, at least 12-point Arial font and with black lettering on white background
 - b. Labels shall not fade or deteriorate due to exposure to the environment.
 - c. Labels to be harsh environment permanent adhesive laminated tape

2. Card Readers

- .1 Labels to be adhered to the side of the *CR* that is facing the door or gate.

3. Enclosures

- .1 Labels shall be centred from left to right.
- .2 Security cabinet shall include:
 - a. Exterior Label (on cabinet door/cover)
 - Cabinet name, as shown on the drawings
 - Cabinet purpose / nature of the equipment within.
 - b. Interior Device Labels
 - All Networked equipment is to be labelled with corresponding IP information
 - Type of Application
 - Signal source (Relay Output / Circuit / Port Number)
 - Power source (including Voltage, type of power, distribution panel and circuit number or power supply)
- .3 Junction boxes and pull boxes shall be identified with at least:
 - Nature of enclosure content, e.g., Security, Power

4. Cables

- .1 Cable labels shall be flexible cable labels of the “wraparound self-sealing” variety and of suitable size to fit the cables to which they are applied.
- .2 Identify all controller wiring at terminal blocks and connection points with the controller terminal (I/O) address numbers.
- .3 Inter-connection and terminal strips for elevator integration.

5. T-bar and ceiling

- .1 Label t-bar or finished ceiling, where equipment is installed above the ceiling.

6. Batteries

- .1 Each installed battery shall be labelled
- .2 Battery labels shall identify the date of battery install, with the date format: YYYY-MM-DD.

4.10 Appendix J – Typical Lenel Security System Wiring Schematics

1. **LENEL SECURITY PANEL WIRING AND TERMINATIONS**
 - .1 Lenel *ACAMS* status integration
 - a. Alarm: Connect output 1 from Bosch main panel to input 7 on Lenel site controller via contact 1 on relay 1
 - b. Armed/Disarmed: Connect output 2 from Bosch main panel to input 8 on Lenel site controller via contact 1 on relay 2
 - c. Ready to Arm: Connect output 3 from Bosch main panel to input 3 on Lenel site controller via contact 1 on relay 3
 - .2 Lenel *ACAMS* disarming integration
 - a. Connect output 4 on Lenel site controller to Bosch main panel input 2
 - b. Upon valid card swipe from any exterior *CR*, output 4 on Lenel site controller to fire momentarily
 - .3 Lenel *ACAMS* arming integration
 - a. Connect output 2 on Lenel site controller to Bosch main panel input 1 and in series with arming button and relay 3
 - b. Upon valid card swipe from any arming *CR*, output 2 on Lenel site controller to fire for 15 seconds
 - .4 NC contact on each cabinet tamper to be wired in series, to tamper input on Lenel site controller
 - .5 Connect power supply AC fault output to Lenel site controller power fault input and *IDS* via relay.
 - .6 Perimeter door hardware wiring for Lenel *ACAMS*
 - a. 1st pole from *DPDT* relay on *DC* for perimeter door to be connected to associated input on Lenel door controller
 - b. 2nd pole from *DPDT* relay on *DC* connected in parallel with auxiliary NO contact on associated motion *REX* and intrusion input on *IDS*
 - c. Any single pole intrusion point that also needs to be connected to ACS via relay output from *IDS*.
 - .7 Use on board ethernet for Bosch System Integration