

ARCHITECTURAL SPECIFICATION

Issued for Bid and Permit

THP – Oncology Radiation Treatment Expansion 2200 Eglinton Avenue West, Mississauga, Ontario

Cumulus Architects Inc.
160 Pears Avenue - Suite 300
Toronto, Ontario
M5R 3P8

Tel: 416-539-0763

Project No. 23010

November 28, 2025

Document Responsibility and Project Directory

1.1 Document Responsibility

- .1 Refer to Project Manual, Section 00 01 10 - Table of Contents, for indication of document responsibility (DR). Abbreviations for entity responsible for document preparation are as follows:
 - .1 A - Denotes documents prepared by Architect.
 - .2 E - Denotes documents prepared by Electrical Engineer.
 - .3 H - Denotes documents prepared by Architectural Hardware Consultant.
 - .4 M - Denotes documents prepared by Mechanical Engineer.
 - .5 O - Denotes documents prepared by Owner.
 - .6 R – Denotes documents by Radiation Shielding Consultant.
 - .7 S - Denotes documents prepared by Structural Engineer.
- .2 Professional seals if applied next to company names in the project directory (below) govern only those specification sections and schedules identified by the corresponding document responsibility (DR) abbreviation in Section 00 01 10.

1.2 Project Directory

- .1 Owner:
Trillium Health Partners
2200 Eglinton Avenue West
Mississauga, Ontario
L5M 2N1

Tel: 905-813-2200
- .2 Architect (the *Consultant*):
Cumulus Architects Inc.
160 Pears Avenue, Suite 300
Toronto, Ontario
M5R 3P8

Tel: 416-539-0763
- .3 Structural Engineer:
Entuitive Corporation
200 University Avenue, 7th floor
Toronto, Ontario
M5H 3C6

Tel: 416-477-5832

.4 Mechanical Engineer:

WSP

2 International Boulevard, Suite 201
Toronto, Ontario
M9W 1A2

Tel: 416-798-0065

.5 Electrical Engineer:

WSP

2 International Boulevard, Suite 201
Toronto, Ontario
M9W 1A2

Tel: 416-798-0065

.6 Architectural Hardware Consultant:

Spyder SC Inc.

26 Dale Crescent
Bradford West Gwillimbury, Ontario
L0L 1L0

Tel: 647-271-6489

.7 Radiation Shielding Consultant:

Veritas Medical Solutions

160 Cassell Road
Harleysville,
PA 19438

Tel: 484-374-0069

END OF SECTION

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DR - indicates entity responsible for preparation of listed documents (see Section 00 01 05)

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1.1 Information Available for Review

- .1 The following documents are made available for review:
 - .1 Hazardous materials/designated substances report(s):
 - .1 "Asbestos Survey", dated 2023 Annual Update Report, prepared by OHE Consultants.
 - .2 Owner's guidelines and policies:
 - .1 Infection Prevention and Control and People Health and Safety during Construction, Renovation and Maintenance, dated January 25, 2023.
 - .2 "Trillium Health Partners, Queensway Health Centre, Mississauga Hospital & Credit Valley Hospital, Capital Planning & Redevelopment / Facilities – Contractor Handbook, Contractor Guidelines, Policies and Procedures", dated March 14, 2025.
 - .3 Concrete reports:
 - .1 "Concrete Scanning & Private Utility Locating", dated 14 April, 2024, prepared by Grizzly Concrete Cutting Inc.
 - .2 "Concrete Scanning & Private Utility Locating", dated 20 April, 2024, prepared by Grizzly Concrete Cutting Inc.
 - .3 Scan/drawings:
 - .1 "Location Scan H1 (Revised)", dated April 14, 2024, prepared by Grizzly Concrete Cutting Inc.
 - .2 "Location Scan H2 (Revised)", dated April 20, 2024, prepared by Grizzly Concrete Cutting Inc.
 - .3 "Location Scan H3 (Revised)", dated April 20, 2024, prepared by Grizzly Concrete Cutting Inc.
 - .4 "Locate Results", dated June 10, 2024.
 - .4 Conduit Study:
 - .1 "Halcyon Conduit Relocation – Feasibility Study", dated October 15, 2024, prepared by WSP.
 - .5 Geotechnical investigation:
 - .1 "Geotechnical Investigation Proposed Building Additions "A", "F", and "M", dated August 2001, prepared by Peto MacCallum Ltd. Consulting Engineers.
 - .6 Equipment Design Guides:
 - .1 "Halcyon Product Planning Guide PPG-AL-G", dated August 2025, prepared by Varian.
 - .2 "Site Pre-Planning Guidelines Xstrahl 200', Version 4.1, prepared by Xstrahl Medical.
 - .7 Veritas Shielding Design Guides:
 - .1 "Shielding Physics Report, dated October 23, 2025, prepared by Veritas Medical Solutions.

Information Available for Review

- .2 "Designers' Desk Reference" Version 10-21, prepared by Veritas Medical Solutions.
 - .3 "SmartDoor Shielded Entry Systems Swing-Style Configuration", prepared by Veritas Medical Solutions.
 - .4 "Veritas Radiation Shielded Bi-Parting Sliding Door Systems", prepared by Veritas Medical Solutions.
- .2 The accuracy of the information contained in the above listed documents has not been independently verified by the *Consultant*.

END OF SECTION

Summary of Work

PART 1 - GENERAL

1.1 Section Includes

- .1 *Contract Documents* conventions.
- .2 Law, notices, permits and fees.
- .3 Items supplied by *Owner*.
- .4 Electronic files.
- .5 Seismic design requirements.

1.2 *Contract Documents* Conventions

- .1 The *Contract Documents* have been arranged into various divisions, sections, drawings, and schedules for the purpose of presenting the *Work* in a logical and organized form and to enable ease of reference and interpretation, and are not intended to be an arrangement of precise and independent *Subcontractors*, or jurisdiction of responsibility for the various parts of the *Work*.
 - .1 The *Contractor* shall be solely responsible for coordinating the execution of the *Work* of this *Contract* in accordance with the requirements of the *Contract Documents*.
 - .2 The *Consultant* and *Owner* shall not be required to decide on questions arising with regard to agreements or contracts between the *Contractor* and *Subcontractors* or *Suppliers*, nor to the extent of the parts of the *Work* assigned thereto, nor to establish subcontract limits between Sections or Divisions of the *Work*.
 - .3 No extra will be allowed as a result of the failure to coordinate and allocate the *Work* such that the *Work* is provided in accordance with the *Contract Documents*.
- .2 The *Specifications* are written in the imperative mood and in streamlined form. The imperative language is directed to *Contractor*, unless stated otherwise.
- .3 Complete sentences by reading "shall", "*Contractor* shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.
- .4 Fulfill and perform indicated requirements whether stated imperatively or otherwise.
- .5 When used in the context of a *Product*, read the word "provide" to mean "supply and install to result in a complete installation ready for its intended use".
- .6 Named *Products* alternates or equals, indicated by the phrases "or approved alternate by XYZ Manufacturing" or "or approved equal by XYZ Manufacturing", shall be interpreted to mean that named *Product* alternate or equal, if selected for use in lieu of indicated or specified *Product*, meets or exceeds performance, appearance, general arrangement, dimensions, availability, code and standards compliance, and colour of specified *Product*. Be responsible for costs and modifications associated with the inclusion of named *Product* alternate or equal at no additional cost to the *Owner*.
- .7 The use within the *Contract Documents* of the words "include" or "including" or variations thereof is not limiting.

Summary of Work

- .8 The use within the *Contract Documents* of the words “make good” or “making good” shall mean that, when a finish or material has been altered, the material or finish shall be repaired or replaced, and refinished to match existing quality and appearance to acceptance of *Consultant*, and that repaired or replaced and refinished *Work* shall not be discernible from existing materials or finishes when judged by the *Consultant* from a viewing distance of 1830 mm (6'), and that such work is included in the *Contract Price*.
- .9 Where a component, device, item, or part of materials or equipment is referred to in the singular number, such reference shall require the provision of as many components, devices, items, or parts of material or equipment necessary to complete the *Work*.
- .10 Reference standards:
 - .1 “Reference standards” means consensus standards, trade association standards, guides, and other publications expressly referenced in *Contract Documents*.
 - .2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing, except as follows:
 - .1 If a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the edition or version referenced in the applicable code or other regulatory requirement shall apply.
 - .3 The *Contract Documents* may specify, indicate, or schedule requirements that exceed the requirements of the building code, other applicable codes, requirements of authorities having jurisdiction, and standards cited in the *Contract Documents*. In such cases, the requirements specified, indicated, or scheduled in the *Contract Documents* shall govern.
 - .4 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to *Consultant* for clarification.

1.3 **Contract Documents for Construction Purposes**

- .1 *Owner* shall supply *Contractor* with a complete set of *Contract Documents* in electronic form before commencement of the *Work*.

1.4 **Laws, Notices, Permits, and Fees**

- .1 The building code - Ontario Regulation 163/24, including amendments, shall govern the *Work*.
- .2 Comply with codes, by-laws, and regulations of authorities having jurisdiction over the *Place of the Work*. Codes and regulations form an integral part of the *Contract Documents*.
- .3 *Owner* shall apply and pay for the building permit. The *Contractor* shall pick up building permit from the municipal department having jurisdiction at the *Place of the Work*. Obtain and pay for all other permits, licenses, deposits and certificates of inspection as part of the *Work*.
- .4 Arrange for inspection, testing and acceptance of the *Work* required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay costs.
- .5 Obtain permits required to execute work on municipal rights of way. Obtain damage deposits for sidewalks, roads and services, unless otherwise indicated.

Summary of Work

- .6 It is the responsibility of the *Contractor* to schedule notifications and inspections required by authorities having jurisdiction such that notifications can be properly received and that inspections can be properly undertaken without causing a delay in the *Work*. The *Contractor*, at no additional cost to the *Owner*, shall be solely responsible for any delay in the *Work* caused by failure to properly schedule required notifications and inspections.
- .7 The *Contractor* shall provide to the chief building official or the registered code agency, where a registered code agency is appointed under the Ontario Building Code Act in respect of the construction to which the notice relates, the required notices set out in Division C – Part 1 Sentence 1.3.5.1(2) and Sentence 1.3.5.2 of the Ontario Building Code, O. Reg. 332/12 as amended. The *Contractor* shall be present at each site inspection by an inspector or registered code agency as applicable under Division C – Part 1 Sentence 1.3.5.2 of the building code.
 - .1 It is the responsibility of the *Contractor* to schedule notifications to the chief building official or the registered code agency such that the inspection pertaining to the notifications can be made within the time frame as required under Division C – Part 1 Sentence 1.3.5.3 of the Ontario Building Code, O. Reg. 332/12 as amended, without causing a delay in the *Work*. The *Contractor*, at no additional cost to the *Owner*, shall be solely responsible for any delay in the *Work* caused by failure to properly schedule required notifications and inspections.

1.5 Documents at the *Place of the Work*

- .1 Maintain at the *Place of the Work*, one copy of documents in accordance with GC 3.11.1, supplemented by the following:
 - .1 Construction and submittal schedules.
 - .2 RFI responses and RFI log.
 - .3 Field test reports and independent testing reports.
 - .4 *Consultant's* field review reports and deficiency reports.
 - .5 Manufacturer's field review reports.
 - .6 Reports by authorities having jurisdiction.
 - .7 Building and other applicable permits, and related permit documents.
 - .8 Daily log including:
 - .1 Number of workers actively working at the *Place of the Work* by each subcontract.
 - .2 *Subcontractors* working at the *Place of the Work*.
 - .3 Parts of the *Work* being worked on.
 - .4 Working hours worked at the *Place of the Work*.
 - .5 Activities with intermittent progress.
 - .6 Time lost and explanation for such time lost.
 - .7 Difficulties (work scheduled to start but did not with the reason why, delays, labour inefficiencies, labour shortage).
 - .8 *Products* and materials delivered.
 - .9 Equipment mobilized and/or demobilized.

Summary of Work

- .10 Demolition conditions.
- .11 Start and finish date of each part of the *Work*.
- .9 As-built drawings recording as-built conditions, instructions, changes for structure, equipment, wiring, plumbing, and the like, as called for in Section 01 78 00 and Divisions 21, 22, and 23 and Divisions 26, 27, and 28, prior to being concealed.
- .2 Make above material available to *Consultant* upon request.

1.6 Not In Contract Items and Items Supplied by Owner

- .1 NIC (Not In *Contract*) shall be used to designate various items of equipment that require coordination for installation although are not provided as part of the *Work*.
- .2 SBO (Supplied by *Owner*) shall be used to designate various items of equipment that will be supplied by the *Owner* for installation by the *Contractor* as part of the *Work*.
 - .1 **Owner Responsibilities:**
 - .1 Order and pay for items supplied by *Owner* not already in *Owner's* possession.
 - .2 Arrange and pay for delivery of items supplied by *Owner* F.O.B. the *Place of the Work*, within time frames required by *Contractor's* progress schedule. If delivered sooner than required by *Contractor's* latest progress schedule submitted to *Owner*, arrange and pay for delivery to a temporary storage location and subsequent delivery to the *Place of the Work*.
 - .3 Advise *Contractor* in writing of the value of items supplied by *Owner* for *Contractor's* insurance purposes.
 - .4 Arrange and pay for delivery to *Contractor* of reviewed *Shop Drawings*, *Product* data, samples, and manufacturer's installation instructions.
 - .5 Inspect deliveries jointly with *Contractor*.
 - .6 Submit claims for transportation damage.
 - .7 Arrange for replacement of damaged, defective or missing items identified at time of delivery.
 - .8 Arrange for manufacturer's field services.
 - .9 Arrange for delivery of manufacturer's warranties to *Contractor* for inclusion in operation and maintenance manual.
 - .2 **Contractor Responsibilities:**
 - .1 Designate in progress schedule, time frames for delivery of items supplied by *Owner* to the *Place of the Work* and for receipt of related submittals. If the *Place of the Work* is not ready to receive delivery of items supplied by *Owner* within the time frame indicated in the latest progress schedule submitted to *Owner*, arrange and pay for delivery to a temporary storage location and subsequent delivery to the *Place of the Work*.
 - .2 Review all required submittals and notify *Consultant* of any observed discrepancies or anticipated problems.
 - .3 Ensure that course of construction insurance is adequate to cover items supplied by *Owner*.
 - .4 Receive and unload items supplied by *Owner* at the *Place of the Work*.

Summary of Work

- .5 Inspect deliveries jointly with *Owner*. Record and notify *Owner* and *Consultant* of shortages and visibly damaged or defective items.
- .6 Handle items supplied by *Owner* at the *Place of the Work*, including uncrating and storage. Dispose of waste materials and debris.
- .7 Take appropriate precautions to protect items supplied by *Owner* from loss or damage.
- .8 Repair or replace items damaged at the *Place of the Work*.
- .9 Assemble, install, connect, adjust, and finish items supplied by *Owner* as specified.
- .10 Arrange for inspections required by authorities having jurisdiction as specified.
- .11 Arrange for or perform testing as specified.
- .12 Workmanship warranty for installation.

1.7 Electronic Files

- .1 In the event that the *Contractor*, a *Subcontractor*, or a *Supplier* requests AutoCAD files from the *Consultant*, the *Consultant* will be allowed to use their discretion whether or not they will provide them. The *Consultant* may charge a fee for providing the electronic files and/or require a copyright waiver to be signed, also at the *Consultant's* discretion.

1.8 Seismic Design and Requirements

- .1 Design building components, assemblies and systems of the *Work*, as applicable, to meet seismic requirements pertinent to the location of the *Place of the Work* in accordance with the building code, and comply with requirements of jurisdictional authorities.
- .2 Post-Disaster Building: Conform to building code requirements for building classification, 'Post-Disaster Building'. Elements of structures, non-structural components and equipment shall be designed in accordance with building code requirements for seismic design, connections, and seismic restraint for 'Post-Disaster Buildings'.
- .3 Vibrating equipment shall receive seismically designed vibration isolation. Only non-vibrating equipment are permitted to be secured to the structure. Structural connection shall be by means of direct connection to the structure by bolting, using rigid seismic restraints, or taught cable restraints. Connection to structure shall occur only at locations capable of withstanding the forces applied.
- .4 The proposed connections and general design of *Products*, equipment and systems shall be described in shop drawing format with identification and location of forces imposed on the structure. The *Shop Drawings* shall be stamped by a Professional Engineer licensed to practice in the *Place of the Work* and have the appropriate understanding of the issues at hand. The *Shop Drawings* shall be submitted for review to the *Consultant* prior to putting the work in hand. The *Consultant* shall review these *Shop Drawings* for loads imposed on the structure.
- .5 Professional Engineer responsible for preparation of seismic engineered submittal shall review the *Work* and shall submit letters of general conformity for those parts of the *Work* in accordance with engineered submittal requirements of Section 01 33 00.

PART 2 - PRODUCTS

Not applicable.

Summary of Work

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Substitution Procedures

PART 1 – GENERAL

1.1 Section Includes

- .1 Substitution procedures.
- .2 Submission requirements for proposed substitutions.

1.2 Definition

- .1 In this Section “Substitution” means a *Product*, a manufacturer, or both, not originally specified in *Contract Documents* by proprietary name but proposed for use by *Contractor* in place of a *Product*, a manufacturer, or both, specified by proprietary name.

1.3 Substitution Procedures

- .1 Proposals for substitutions of *Products* and materials must be submitted in accordance with procedures specified in this section.
- .2 *Contractor* may propose a Substitution wherever specifications include the phrases "or equal", "or approved equal", "Substitutions: in accordance with Section 01 25 00", or words conveying this intent. Where specifications do not include such language, *Contractor* proposed substitutions shall not be permitted.
- .3 Do not order or install any substitution without a *Supplemental Instruction* or *Change Order*.
- .4 Provided a proposed Substitution submission includes all of the information specified in this Section under Submission Requirements For Proposed Substitutions, *Consultant* may review submissions, if directed by *Owner*, but in any case with the understanding that the *Contract Time* will not be altered due to the time required by the *Consultant* to review the submission and by the *Contractor* to implement the substitution in the *Work*.
- .5 *Consultant* may recommend to *Owner* acceptance of a Substitution proposed by *Contractor* if satisfied that:
 - .1 The proposed substitute *Product* is the same type as, is capable of performing the same functions as, interfaces with adjacent work the same as, and meets or exceeds the standard of quality, performance and, if applicable, appearance and maintenance considerations, of the specified *Product*.
 - .2 The proposed substitute manufacturer has capabilities comparable to the specified manufacturer.
 - .3 The Substitution provides a benefit to *Owner*.
- .6 Failure to order a specified *Product* or to order a *Product* by a specified manufacturer in adequate time to meet construction progress schedule shall not be considered a valid reason to propose a Substitution. Refer to Section 01 60 00, paragraph 1.2 “Availability of Products”.
- .7 If *Owner* accepts a Substitution, the change in the *Work* will be documented in the form of either a *Supplemental Instruction* or *Change Order* as specified in Section 01 26 00.
- .8 If a Substitution is accepted in the form of a *Supplemental Instruction* or *Change Order*, *Contractor* shall not revert to an originally specified *Product* or manufacturer without *Consultant*’s prior written acceptance.

Substitution Procedures

1.4 Submission Requirements for Proposed Substitutions

- .1 Include with each proposed Substitution the following information:
 - .1 Identification of the Substitution, including *Product* name and manufacturer's name, address, telephone numbers, and web site.
 - .2 Reason(s) for proposing the Substitution.
 - .3 A statement verifying that the Substitution will not affect the *Contract Price* and *Contract Time* or, if applicable, the amount and extent of a proposed increase or decrease in *Contract Price* and *Contract Time* on account of the Substitution.
 - .4 A statement verifying that the Substitution will not affect the performance or warranty of other parts of the *Work*.
 - .5 Manufacturer's *Product* literature for the Substitution, including material descriptions, compliance with applicable codes and reference standards, performance and test data, compatibility with contiguous materials and systems, and environmental considerations.
 - .6 *Product* samples as applicable.
 - .7 A detailed comparison of the physical properties and performance characteristics of the specified *Product* and the Substitution, with any significant variations clearly highlighted.
 - .8 Availability of maintenance services and sources of replacement materials and parts for the Substitution, as applicable, including associated costs and time frames.
 - .9 If applicable, estimated life cycle cost savings resulting from the Substitution.
 - .10 Details of other projects and applications where the Substitution has been used.
 - .11 Identification of any consequential changes in the *Work* to accommodate the Substitution and any consequential effects on the performance of the *Work* as a whole. A later claim for an increase to the *Contract Price* or *Contract Time* for other changes in the *Work* attributable to the Substitution will not be considered.
 - .12 Confirmation of proposed substitution delivery, in writing by *Product* manufacturer.
 - .13 Compliance with the building codes and requirements of authorities having jurisdiction.
 - .14 Copy of manufacturer's warranty for any *Product* or system for which an extended warranty has been specified, along with copy of manufacturer's warranty for specified *Product* or system with differences highlighted.
- .2 Substitutions submitted on *Shop Drawings* without following requirements of this section prior to submission of the affected *Shop Drawings* will cause the *Shop Drawings* to be rejected.
- .3 Proposed substitutions shall include costs associated with modifications necessary to other adjacent and connecting portions of the *Work*.

PART 2 - PRODUCTS

Not applicable.

Substitution Procedures

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Contract Modification Procedures

PART 1- GENERAL

1.1 Section Includes

- .1 Schedule of labour rates.
- .2 Schedule of equipment rates.
- .3 *Supplemental Instructions.*

1.2 Schedule of Labour Rates

- .1 Prior to the first application for payment, submit for the *Consultant's* review a schedule of labour rates for all trades and classifications of trades, such as journeymen, apprentices, and foremen that will be employed in the *Work*. Provide a breakdown of payroll burden component of labour rates.
- .2 Labour rates shall reflect the salaries, wages, and benefits paid to personnel in the direct employ of the *Contractor*, *Subcontractors*, and sub-*Subcontractors*, stated as hourly rates, that will be used when:
 - .1 Preparing price quotations for *Change Orders*.
 - .2 Determining the cost of work attributable to *Change Directives*.
- .3 Labour rates stated in the schedule of labour rates shall be consistent with rates that will actually be paid, and payroll burden costs that will actually be incurred, in the normal performance of the *Work*, during regular working hours. Labour rates shall not include any additional overhead and profit component.
- .4 Where collective agreements apply, the labour rates shall not exceed those established by collective agreement.
- .5 Obtain the *Owner's* written acceptance of the schedule of labour rates before submitting the first *Change Order* quotation.
- .6 Accepted schedule of labour rates will be used solely for evaluating *Change Order* quotations and cost of performing work attributable to *Change Directives*.
- .7 The *Contractor* may request amendments to the accepted schedule of labour rates if changes in the labour rates that will actually be paid, or payroll burden cost that will actually be incurred, in the normal performance of the *Work* can be demonstrated. Obtain the *Owner's* written acceptance of such changes.

1.3 Schedule of Equipment Rates

- .1 Prior to the first application for payment, submit for the *Consultant's* review a schedule of equipment rates for *Contractor* owned *Construction Equipment*.
- .2 Equipment rates shall reflect the rates that will be used when:
 - .1 Preparing price quotations for *Change Orders*.
 - .2 Determining the cost of work attributable to *Change Directives*.
- .3 Equipment rates stated in the schedule shall be consistent with local equipment rental market rates and shall not include any additional overhead and profit component.
- .4 Provide equipment rates for hourly, daily, weekly, and monthly use.

Contract Modification Procedures

- .5 Obtain the *Owner's* written acceptance of the schedule of equipment rates before submitting the first *Change Order* quotation.
- .6 Accepted schedule of equipment rates will be used solely for evaluating *Change Order* quotations and cost of performing work attributable to *Change Directives*.
- .7 The *Contractor* may request amendments to the accepted schedule of equipment rates if changes in local equipment rental market rates can be demonstrated. Obtain the *Owner's* written acceptance of such changes.

1.4 Supplemental Instructions

- .1 The *Consultant* may issue *Supplemental Instructions* to provide clarifications to the *Contract Documents*, provide additional information, or make minor variations in the *Work* not involving adjustment in the *Contract Price* or *Contract Time*.
- .2 If the *Contractor* considers a *Supplemental Instruction* to require an adjustment in *Contract Price* or *Contract Time*, the *Contractor* shall promptly notify the *Consultant* and the *Owner* in writing and shall not proceed with any work related to the *Supplemental Instruction* pending receipt of a *Change Order*, a *Change Directive*, or, in accordance with the dispute resolution provisions of the General Conditions of *Contract*, a Notice in Writing of a dispute and instructions to proceed.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Payment Procedures

PART 1 - GENERAL

1.1 Section Includes

- .1 Schedule of values.
- .2 Cash flow projection.
- .3 Workers' compensation clearance.

1.2 Schedule of Values

- .1 Prior to the first application for payment, submit for *Consultant's* review an initial schedule of values. Modify the initial schedule of values if and as requested by *Consultant*. Obtain *Consultant's* written acceptance of the initial schedule of values prior to the first application for payment.
- .2 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of work performed and *Products* delivered to *Place of the Work*.
- .3 Provide the schedule of values in an electronic spreadsheet format acceptable to *Consultant* and *Owner* and that includes the following:
 - .1 Identifying information including title and location of the *Work*, name of *Contractor*, number and date of application for payment, and period covered by the application for payment.
 - .2 A work breakdown structure based on *Contractor*, *Subcontractor*, and sub-*Subcontractor* work, systems description, Specification sections, or material and labour breakdown, as appropriate.
 - .3 Provisions for approved unit price work, assignable contracts, *Change Orders*, and allowances, so that the breakdown amounts indicated in the schedule of values aggregate to the current total *Contract Price*. Also provide for indicating the estimated value of *Change Directives* within the schedule of values, separately from the current total *Contract Price*.
 - .4 Line items identifying full costs for the following:
 - .1 Preparation of coordination and interference drawings in accordance with the requirements of Section 01 31 00, with a value not less than 0.5% of the *Contract Price* or \$10,000.00, whichever is greater.
 - .2 To provide mock-ups in accordance with Section 01 45 00.
 - .3 Progressive cleaning, specified under Section 01 74 00, as distinct from final cleaning, also specified under Section 01 74 00.
 - .4 Final cleaning, specified under Section 01 74 00, as distinct from progressive cleaning, also specified under Section 01 74 00.
 - .5 Preparation and submission of closeout submittals in accordance with the requirements of Section 01 78 00, with a value not less than 0.5% of the *Contract Price* or \$10,000.00, whichever is greater.
 - .6 Preparation and submission of the deficiency list in accordance with the requirements of Section 01 77 00.

Payment Procedures

- .5 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:
 - .1 Breakdown Amount: A dollar amount, including an appropriate pro rata portion of *Contractor's* overhead and profit.
 - .2 Performed to Date: The value of *Work* performed and *Products* delivered to *Place of the Work* up to the date of the application for payment, stated as a percentage of the *Contract Price* and in dollars.
 - .3 Previously Performed: The value of *Work* performed and *Products* delivered to the *Place of the Work* for which payment has been previously certified, stated in dollars.
 - .4 Current Period: The value of *Work* performed and *Products* delivered to *Place of the Work* for which *Contractor* is currently applying for payment, stated in dollars.
 - .5 Balance to Complete: The value of *Work* not yet performed and *Products* not yet delivered to *Place of the Work*, stated in dollars.

1.3 Cash Flow Projection

- .1 Prior to the first application for payment submit, for *Consultant's* review, a forecast of approximate monthly progress payments for each month of the *Contract Time*.
- .2 Submit revised cash flow forecasts monthly. Submit additional revised cash flow forecasts when there are significant changes in rate of progress of the *Work* or significant changes in the *Contract Price* as determined by the *Consultant*. Submit additional revised cash flow forecasts when requested by *Consultant*.

1.4 Workers' Compensation Clearance

- .1 Submit Certificate of Clearance from the Workplace Safety and Insurance Board (WSIB) with each application for payment.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

PART 1 - GENERAL

1.1 Section Includes

- .1 Building dimension, templates, built-ins, and coordination.
- .2 Coordination and interference drawings.
- .3 Superintendent.
- .4 Discrepancies and clarifications.
- .5 Request for interpretation (RFI) procedures.

1.2 Building Dimension, Templates, Built-ins, and Coordination

- .1 Take necessary dimensions for the proper execution of the *Work*. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.
- .2 Verify dimensions at the *Place of the Work* before commencing *Shop Drawings*. Before fabrication commences report discrepancies to *Consultant* in writing. Incorporate accepted variances on shop drawings and as-built records.
- .3 Supply forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the *Work* and set in place or instruct separate *Subcontractors* as to their location.
- .4 Supply items to be built in, as and when required together with templates, measurements, shop drawings and other related information and assistance.
- .5 Pay the cost of extra work and make up time lost as a result of failure to provide necessary information and items to be built in.
- .6 Verify that the *Work*, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent work, as set out by requirements of the *Contract Documents*, and ensure that work installed in error is rectified before construction resumes.
- .7 Check and verify dimensions referring to interfacing of services. Verify such dimensions with interconnected portions of the *Work*.
- .8 Do not scale directly from drawings. Obtain clarification from *Consultant* if there is ambiguity or lack of information.
- .9 Details and measurements of any work which is to fit or to conform with work installed shall be taken at the *Place of the Work*.
- .10 Prepare and submit setting drawings, templates and other information necessary for the location and installation of material, holes, sleeves, inserts, anchors, accessories, fastenings, connections and access panels.
- .11 *Subcontractors* shall direct related *Subcontractors* on site of specific locations required for sleeves and openings.

Project Management and Coordination

1.3 Coordination and Interference Drawings

- .1 The *Contractor* shall be responsible for preparing and submitting to the *Consultant* for review, a consolidated set of installation coordination/interference drawings for the building showing how the building systems (including, but not limited to, domestic heating and cooling piping, air distribution systems, air control boxes, reheat coils, fire protection piping, electrical distribution, fire alarm systems, lighting, communication cabling, security cabling) will fit together above ceiling areas and in exposed ceiling, to allow ceiling heights required by the *Contract Documents* and by maintenance and control access.
 - .1 Each *Subcontractor* whose work is affected by the information presented on the coordination and interference drawings shall sign-off on the drawings prior to submission to the *Consultant* and thereby agrees to coordinate their parts of the *Work* to preserve the coordination and interference guidelines represented by the coordination and interference drawings.
- .2 Prepare sleeve drawings for work of Divisions 21, 22, and 23, and Divisions 26, 27, and 28 showing size and location of penetrations through load bearing elements. Submit sleeving drawings in electronic form to *Consultant* for review not less than 10 *Working Days* prior to construction of affected work.
- .3 Prepare embedded conduit drawings, showing size and location of penetrations through load bearing elements. Submit embedded conduit drawings in electronic form to *Consultant* for review not less than 10 *Working Days* prior to construction of affected work.
- .4 Prepare insert setting drawings for work to be cast into concrete and/or mortared into masonry elements. Submit insert setting drawings in electronic form to *Consultant* for review not less than 10 *Working Days* prior to construction of affected work.
- .5 Coordinate placement of equipment to ensure that components will be properly accommodated within spaces provided prior to commencement of *Work*. In areas where equipment and services are exposed care shall be taken to organize and layout services in an organized and orderly manner. Where possible services are to run parallel or at right angles to one another as required. *Consultant* may request that service layout be reconfigured to suit sightline concerns during the coordination drawings review phase. These drawing changes are to be executed at no additional cost to the *Owner*.
- .6 Take complete responsibility for remedial work that results from failure to coordinate the *Work* prior to fabrication and installation.
- .7 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are provided in layout of equipment and services.
 - .1 Indicate required access points, clearances, and sizes for equipment and pieces of equipment required in the *Work*. Note areas where access is compromised by interferences with other services for review by the *Consultant*. Do not proceed with installation of equipment in such compromised areas until a proposed means of providing access has been accepted by the *Consultant*.
- .8 Prepare and circulate coordination, interference and sleeving drawings prior to placing orders for equipment and materials.
- .9 Coordination and interference drawings shall be circulated for mark-ups by *Subcontractors* responsible for work of Divisions 3, 5, 6, 9, 11, 13, 14, Divisions 21, 22, and 23, and Divisions 26, 27, and 28, as applicable.
- .10 Coordinate preparation and submission of coordination and interference drawings with *Shop Drawings*.

Project Management and Coordination

- .11 Show cross sections in key areas, as required, and as defined by *Consultant*. Show re-bar, structural elements, piping, air handling and heating systems distribution, sprinkler system distribution, lighting, gypsum board wall and ceiling assemblies, acoustical isolation, *Products* and systems involving life safety, conveying systems, electrical distribution.
- .12 Show ductwork as 2 lines. Show cross sections in key areas, as required, and as directed by *Consultant*. Show re-bar, structural elements, air handling and heating systems distribution, gypsum board wall and ceiling assemblies, acoustical isolation, *Products* and systems involving life safety, conveying systems, and electrical distribution.
- .13 Coordination and interference drawings shall be produced in uniform scale on media that will allow overlays to be assembled. Upon incorporation of details, drawings shall be submitted to *Consultant* for review. Areas of conflict or interference shall be resolved in a mutually agreed manner between *Subcontractors* and resubmitted on coordination and interference drawings until accepted by *Consultant*.

1.4 Superintendent

- .1 Provide superintendent and necessary supporting staff personnel who shall be in attendance at the *Place of the Work* while *Work* is being performed, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.
- .2 The *Contractor* shall appoint superintendent at the *Place of the Work* who shall have overall authority at the *Place of the Work* and shall speak for the *Contractor* and represent the *Contractor's* interest and responsibilities at meetings at the *Place of the Work* and in dealings with the *Consultant* and the *Owner*.

1.5 Discrepancies and Clarifications

- .1 Advise *Consultant* of discrepancies discovered in requirements of the *Contract Documents* and request clarification in written form.
- .2 Advise *Consultant* when clarifications are required pertaining to meaning or intent of requirements of *Contract Documents* and request clarification from *Consultant* in written form.
- .3 Do not proceed with related work until written clarification is provided by *Consultant*.
- .4 Failure to notify *Consultant* shall result in *Contractor* incurring responsibility for resulting deficiencies and expense at no additional cost to the *Owner*.
- .5 Written requirements issued by *Consultant* for the purpose of clarification, implicitly supersede applicable and relevant aspects of the *Contract Documents* irrespective of whether or not these documents are explicitly or specifically cited in clarification requests or clarification requirements.

1.6 Request for Interpretation - RFI

- .1 A request for interpretation (RFI) is a formal process used during the *Work* to obtain an interpretation of the *Contract Documents* pursuant to GC 2.2.6 through GC 2.2.9 (inclusive).
 - .1 An RFI shall not constitute notice of claim for a delay.
- .2 Submittal procedures:

Project Management and Coordination

- .1 RFI form:
 - .1 Submit RFI on "Request for Interpretation" in form acceptable to the *Consultant*, an example of which is appended to this section. The *Consultant* shall not respond to an RFI except as submitted on this form.
 - .2 Where RFI form does not provide sufficient space for complete information to be provided thereon, attach additional sheets as required.
 - .3 Submit with RFI form necessary supporting documentation.
- .2 Submit RFI form as follows:
 - .1 Submit RFIs sufficiently in advance of affected parts of the *Work* so as not to cause delay in the performance of the *Work*. Costs resulting from failure to do this will not be paid by the *Owner*.
 - .2 RFIs shall be submitted only to the *Consultant*.
 - .3 RFIs shall be submitted only by *Contractor*. RFIs submitted by *Subcontractors* or *Suppliers* shall not be accepted.
 - .4 Number RFIs consecutively in one sequence in order submitted.
 - .5 Submit one distinct RFI per RFI form.
- .3 RFI log:
 - .1 Maintain log of RFIs sent to and responses received from the *Consultant*, complete with corresponding dates.
 - .2 Submit updated log of RFIs with each progress draw submittal.
- .4 *Consultant* shall review RFIs from the *Contractor* submitted in accordance with this section, with the following understandings:
 - .1 *Consultant's* response shall not be considered as a *Change Order* or *Change Directive*, nor does it authorize changes in the *Contract Price* or *Contract Time* or changes in the *Work*.
 - .2 Only the *Consultant* shall respond to RFIs. Responses to RFIs received from entities other than the *Consultant* shall not be considered.
- .5 Allow 5 *Working Days* for review of each RFI by the *Consultant*.
 - .1 *Consultant's* review of RFI commences on date of receipt by the *Consultant* of RFI submittal and extends to date RFI returned by *Consultant*.
 - .2 When the RFI submittal is received by *Consultant* before noon, review period commences that day; when RFI submittal is received by *Consultant* after noon, review period begins on the next *Working Day*.
 - .3 If, at any time, the *Contractor* submits a large enough number of RFIs such that the *Consultant* cannot process these RFIs within 5 *Working Days*, the *Consultant*, will confer with the *Contractor* within 1 *Working Day* of receipt of such RFIs, and the *Consultant* and the *Contractor* will jointly prepare an estimate of the time necessary for processing the RFIs and determine the order of priority between the RFIs submitted. The *Contractor* shall accommodate such necessary time at no increase in the *Contract Time* and at no additional cost to the *Owner*.

Project Management and Coordination

- .6 Undertake a review of the *Contract Documents* to determine that the matter in question relating to the interpretation of the *Contract Documents* cannot be resolved by direct reference to the *Contract Documents*. Describe this review in detail on the RFI form. RFI submittals that lack a detailed review description, or where the detail provided is insufficient, in the sole opinion of the *Consultant*, shall not be reviewed by the *Consultant* and shall be rejected.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Contractor's Request for Interpretation

Consultant's Supplemental Instructions

Date	# of Pages
To	From
Co.	Co.
Phone #	Phone #
Fax #	Fax #
Email	Email

Project: _____

Owner: _____

To: _____

(Consultant's
Representative)

Project No.: _____

**Consultant's Fax
No.:** _____

RFI No.: _____

Date of _____

Request: _____

Contractor: _____

**Contractor's
Representative:** _____

Fax No.: _____

Interpretation Requested: (Description of request for interpretation and references to relevant portions of *Contract Documents*)

Attachments: _____

Requested by: _____

Consultant's Supplemental Instruction:

Attachments: _____

Reply By: _____

The work shall be carried out in accordance with these *Supplemental Instructions* issued in accordance with the *Contract Documents* without change in *Contract Price* or *Contract Time*. Prior to proceeding with these instructions, indicate acceptance of these instructions as being consistent with the *Contract Documents* by returning a signed copy to the *Consultant*.

Supplemental Instruction Issued:

By: _____

Consultant

Date

Supplemental Instruction Accepted:

By: _____

Contractor

Date

Cc: ☐ Owner ☐ Consultant ☐ Contractor ☐ Field ☐ Other:

Project Meetings

PART 1 - GENERAL

1.1 Section Includes

- .1 Project meeting requirements.

1.2 Administrative

- .1 The *Contractor* shall schedule meetings as specified herein.
 - .1 Such scheduling shall be in consultation both with the *Owner* and with the *Consultant*.
- .2 The *Contractor* shall prepare agendas for meetings specified herein.
 - .1 Agendas shall include, as a minimum, the agenda items specified in the *Contract Documents*.
- .3 The *Contractor* shall distribute written notice of each meeting specified herein, complete with meeting agenda, 5 *Working Days* in advance of meeting date to the *Consultant* and the *Owner* and other affected parties.
- .4 The *Contractor* shall chair and record the minutes of meetings specified herein.
 - .1 *Contractor* shall distribute copies of minutes to the *Owner*, the *Consultant*, and all others in attendance within 3 *Working Days* after date of meeting.
- .5 Representatives of parties attending meetings shall be authorized to act on behalf of the parties they represent.
- .6 *Subcontractors* and *Suppliers* shall attend meetings only when directed by the *Consultant*, or when specifically called for in the *Contract Documents*.
- .7 The *Contractor* shall prepare, and distribute to the *Consultant* and the *Owner* 4 days in advance of next progress meeting date, the following:
 - .1 Monthly progress reports containing updated construction schedule, submittal logs, requests for interpretation logs, and budget.

1.3 Contract Start-Up Meeting

- .1 Within 5 days after award of *Contract*, request a meeting of parties in *Contract* to discuss and resolve administrative procedures and responsibilities prior to the commencement of the *Work*.
- .2 Attendees at *Contract* start-up meeting shall include the following:
 - .1 *Contractor*.
 - .2 *Contractor's* site superintendent(s).
 - .3 *Contractor's* waste management coordinator.
 - .4 *Consultant*.
 - .5 *Owner*.
 - .6 *Integrated testing coordinator*.
 - .7 Independent inspection and testing company.
- .3 Agenda to include the following:

Project Meetings

- .1 Owner's guidelines and policies.
- .2 Appointment of official representative of participants in the *Project*.
- .3 Status of permits, fees and requirement of authorities having jurisdiction. Action required.
- .4 Establishing a schedule for progress meetings.
- .5 Requirements for *Contract* modification and interpretation procedures, including, but not limited to: requests for interpretation, contemplated change orders, *Change Orders*, *Change Directives*, *Supplemental Instructions*, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
- .6 Submittal requirements and procedures.
- .7 Schedule of submission of samples, colour chips, and items for Owner's and/or *Consultant's* consideration.
- .8 Construction schedule and progress scheduling.
- .9 Delivery schedule of specified equipment.
- .10 Requirements for infection prevention and control.
- .11 Appointment of independent inspection and testing agencies or firms.
- .12 Requirements for notification for reviews. Allow a minimum of 48 hours' notice to *Consultant* for review of the *Work*.
- .13 Requirements for *Temporary Work*.
- .14 Requirements for firestopping coordination and preparation of firestopping manual (refer to Section 01 33 00).
- .15 Security requirements at and for the *Place of the Work*.
- .16 Owner supplied *Products*.
- .17 Integrated fire protection and life safety systems testing requirements and procedures (refer to Section 01 91 26).
- .18 As-built documents.
- .19 Operation and maintenance manuals.
- .20 Take-over procedures, acceptance, warranties.
- .21 Publication to be used for publishing certificate of substantial performance.
- .22 Progress claims, administrative procedures, holdbacks.
- .23 Insurances, transcripts of policies.
- .24 *Contractor's* safety procedures.
- .25 Certificate of Clearance from the Workplace Safety and Insurance Board (WSIB).

1.4 Pre-Installation Meetings

- .1 During the course of the *Work* prior to *Substantial Performance of the Work*, schedule pre-installation meetings as required by the *Contract Documents* and coordinated with the *Consultant*.

Project Meetings

- .2 As far as possible, pre-installation meetings shall be scheduled to take place on the same day as regularly scheduled progress meetings.
- .3 Attendees at pre-installation meetings shall include the following:
 - .1 *Contractor*.
 - .2 *Subcontractors* affected by the work for which the pre-installation meeting is being conducted.
 - .3 *Consultant*.
 - .4 Infection control representative.
 - .5 Manufacturer's representatives, as applicable.
 - .6 Independent inspection and testing company, as applicable.
- .4 Agenda to include the following:
 - .1 *Owner's* guidelines and policies.
 - .2 Appointment of official representatives of participants in the *Project*.
 - .3 Review of existing conditions and affected work, and testing thereof as required.
 - .4 Review of installation procedures and requirements.
 - .5 Review of environmental and site condition requirements.
 - .6 Review of infection prevention and control procedures.
 - .7 Schedule of the applicable portions of the *Work*.
 - .8 Schedule of submission of submittals, samples, mock-ups, and items for *Consultant's* consideration.
 - .9 Requirements for *Temporary Work*.
 - .10 Requirements for notification for reviews. Allow a minimum of 48 hours' notice to *Consultant* for review of the *Work*.
 - .11 Requirements for inspections and tests, as applicable. Schedule and undertake inspections and tests.
 - .12 Delivery schedule of specified equipment.
 - .13 Special safety requirements and procedures.
 - .14 Publication to be used for publishing certificate of substantial performance.

1.5 Progress Meetings

- .1 During the course of the *Work* prior to *Substantial Performance of the Work*, schedule regular progress meetings to occur every other week or as directed by the *Consultant*.
- .2 Attendees at progress meetings shall include the following:
 - .1 *Contractor*.
 - .2 *Contractor's* site superintendent(s).
 - .3 *Consultant*.
 - .4 *Owner*.
- .3 Agenda to include the following:

Project Meetings

- .1 Owner's guidelines and policies.
- .2 Review, approval of proceedings of previous meeting.
- .3 Review of items arising from proceedings.
- .4 Review of progress of the *Work* since previous meeting and *Contractor's* monthly progress report.
- .5 Field observations, problems, conflicts.
- .6 Update construction schedule.
- .7 Problems that impede compliance with construction schedule.
- .8 Review of off-site fabrication delivery schedules.
- .9 Review material and equipment delivery dates/schedule.
- .10 Corrective measures and procedures to regain construction schedule.
- .11 Revisions to construction schedule.
- .12 Progress, schedule, during subsequent period of the *Work*.
- .13 Review submittal schedules.
- .14 Review status of submittals.
- .15 Review of infection prevention and control procedures.
- .16 Maintenance of quality standards.
- .17 Pending changes and substitutions.
- .18 Review of *Contract* modifications and interpretations including, but not limited to: requests for interpretation and log, contemplated change orders, *Change Orders*, *Change Directives*, and *Supplemental Instructions* for effect on construction schedule and on *Contract Time*.
- .19 Review of status of as-built documents.
- .20 Other business.

1.6 Pre-Takeover Meeting

- .1 60 days prior to application for *Substantial Performance of the Work*, schedule a pre-takeover meeting.
- .2 Agenda to include the following:
 - .1 Review, approval of proceedings of previous meeting.
 - .2 Review of items arising from proceedings.
 - .3 Review of procedures for *Substantial Performance of the Work*, completion of the *Contract*, and handover of the *Work*.
 - .4 Field observations, problems, conflicts.
 - .5 Review of outstanding *Contract* modifications and interpretations including, but not limited to: requests for interpretation and log, contemplated change orders, *Change Orders*, *Change Directives*, and *Supplemental Instructions* for effect on construction schedule and on *Contract Time*.
 - .6 Problems which impede *Substantial Performance of the Work*.

Project Meetings

- .7 Review of procedures for deficiency review. Corrective measures required.
- .8 Review of arrangements for hydro, heating, and other services.
- .9 Review of integrated fire protection and life safety systems testing requirements and procedures (refer to Section 01 91 26).
- .10 Progress, schedule, during succeeding period of the *Work*.
- .11 Review submittal requirements for warranties, manuals, and all demonstrations and documentation required for *Substantial Performance of the Work*.
- .12 Review of keying and hardware requirements.
- .13 Review of status of as-built documents and record drawings.
- .14 Status of commissioning and training.
- .15 Review *Contractor's* deficiency list and status.
- .16 Cleaning for occupancy.
- .17 Other business.

1.7 Post-Construction Meeting

- .1 Prior to application for completion of *Contract*, schedule a post-construction meeting. 5 *Working Days* prior to date for meeting, *Consultant* shall confirm a date for meeting based on evaluation of completion requirements.
- .2 Agenda to include the following:
 - .1 Review, approval of proceedings of previous meeting.
 - .2 Confirmation that no business is arising from proceedings.
 - .3 Confirmation of completion of the *Contract*, and handover of reviewed documentation from the *Consultant* to the *Owner*.
 - .4 Confirmation of completion of contemplated change orders, *Change Orders*, *Change Directives*, and *Supplemental Instructions*.
 - .5 Problems that impede *Contract* completion.
 - .6 Identify unresolved issues or potential warranty problems.
 - .7 Confirmation of completion of deficiencies.
 - .8 Corrective measures required.
 - .9 Confirmation of arrangements for hydro, heating and other services.
 - .10 Confirm submittal requirements for warranties, manuals, and demonstrations and documentation for *Contract* completion are in order.
 - .11 Review of procedures for communication during post-construction period.
 - .12 Handover of reviewed record documents by the *Contractor* to the *Owner*.
 - .13 Submission of final application for payment.
 - .14 Review and finalize outstanding claims, pricing, and allowance amounts.
 - .15 Status of commissioning and training.
 - .16 Demobilization and the *Place of the Work* restoration.

Project Meetings

- .17 Review of requests for interpretation log.
- .18 Other business.

1.8 Special Meetings

- .1 *Owner and/or Consultant* reserves the right to require special meetings which may be held on short notice and at which attendance by *Contractor* and representatives of affected *Subcontractors* and *Suppliers* is mandatory. *Contractor* shall keep detailed and accurate meeting notes and distribute copies within 3 *Working Days* to all in attendance and those affected by agreements made at such meetings.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Construction Progress Documentation

PART 1 - GENERAL

1.1 Section includes

- .1 Construction progress schedule.
- .2 Submittals schedule.
- .3 Inspection and testing schedule.
- .4 Schedule management.
- .5 Recording actual site conditions on as-built documents.
- .6 Digital photographs.

1.2 Summary

- .1 This Section specifies *Contractor's* responsibilities for preparation and submission of schedules and other documentation related to tracking construction progress.
- .2 The schedule shall:
 - .1 Show actual progress versus planned progress.
 - .2 Demonstrate that scheduling issues are being proactively identified and addressed in a timely manner, and that planned progress is being maintained as closely as possible.

1.3 Schedule Format

- .1 Prepare schedules in the form of a Critical Path Method (CPM) Gantt chart method in accordance with GC 3.4.1.
- .2 Include horizontal time scale identifying the first *Working Day* of each week.
- .3 Include a separate bar for each trade, work package, or operation.
- .4 Format for listings: The chronological order of the start of each item or part of the *Work*.
- .5 Identification of listings: By systems description.

1.4 Construction Progress Schedule

- .1 Format and content:
 - .1 Include the complete sequence of construction activities, including provision for climate and weather.
 - .2 Provide a work breakdown structure identifying key activities, work packages, and major milestones at a sufficient level of detail to effectively manage construction progress, including:
 - .1 Long delivery *Products*.
 - .2 Dates for the commencement and completion of inspection and testing.
 - .3 Preparation and review of mock-ups.
 - .4 *Owner* decisions for cash allowances.
 - .5 Shutdown or closure activities.

Construction Progress Documentation

- .6 Delivery of items supplied by *Owner*.
- .7 *Owner* performed work.
- .8 Demonstration and training activities.
- .9 Dates for the commencement and completion of each major element of the *Work* parallel to the sections of the specifications.
- .10 Dates for *Ready-for-Takeover* and *Substantial Performance of the Work*.
- .11 Dates for delivery of *Products*, equipment, finish items, factory-finished manufactured items. Show last dates for order, shipment, and delivery in order to meet construction schedule.
- .3 Show projected percentage of completion for each item as of the first *Working Day* of each week.
- .2 Submission:
 - .1 Submit initial schedule to *Owner* and *Consultant* within 10 *Working Days* after *Contract* award.
 - .2 Submit schedule in pdf format to *Consultant* using the *Consultant's* document management system.
 - .3 *Consultant* will review format and content of initial schedule and request necessary changes, if any, within 10 *Working Days* after receipt.
 - .4 If changes are required, resubmit finalized initial schedule within 5 *Working Days* after return of review copy.
 - .5 Submit updated progress schedule to *Owner* and *Consultant* at each regularly scheduled progress meeting in accordance with Section 01 31 19. In addition to requirements specified in Section 01 32 00 for each submission of construction schedule, include a written report on the activities completed in the week preceding the progress meeting, and a summary indicating the activities planned to be undertaken in the 2 weeks subsequent to the progress meeting, including human resource loading.
 - .6 Submit updated progress schedule to *Owner* and *Consultant* with each application for progress payment, indicating actual and projected start and finish dates with report date line and progress. Submit more frequently if requested by *Owner* or *Consultant*.
 - .7 At each date of submission of construction schedule, indicate progress of each activity.
 - .1 Show changes occurring since previous submission of the construction schedule:
 - .1 Major changes in scope.
 - .2 *Change Orders* and *Change Directives*.
 - .3 Activities modified since previous submission.
 - .4 Revised projections of progress and completion.
 - .5 Other identifiable changes.
 - .2 Include a narrative report to define:

Construction Progress Documentation

- .1 Problem areas, anticipated delays, and the impact on the schedule.
- .2 Corrective action recommended and its impact on the schedule.
- .3 Include cash flow projection with minimum look ahead as directed by the *Consultant*.

1.5 Submittals Schedule

.1 Format and content:

- .1 Prepare a detailed schedule of submittals required by the *Contract Documents*, including samples required for testing, and including those for items supplied by *Owner*.
- .2 Provide a separate line for each required submittal, organized by *Specifications* section names and numbers, and further broken down by individual *Products* and systems as required.
- .3 Indicate dates for submitting, review time, resubmission time, float time, and last date for meeting construction schedule.
- .4 Schedule submissions of submittals well in advance of scheduled dates for installation, to provide lead time for reviews and possible resubmissions and for placing orders and securing delivery so as to avoid delays in the *Work*.
- .5 Make provisions in schedule for at least 10 *Working Days* for *Consultant's* review of submittals. When submittals have to be reviewed by one or more of *Consultant's* subconsultants, add 5 more *Working Days* for a total 15 *Working Days* review period.
- .6 If the *Consultant* requires resubmission of submittals, allow for an additional 10 *Working Days* review for each resubmission.
- .7 If, at any time, the *Contractor* submits a large enough number of submittals such that the *Consultant* cannot process these submittals within 10 *Working Days*, the *Consultant*, in consultation with the *Contractor* within 3 *Working Days* of receipt of such submittal, will provide the *Contractor* with an estimate of the time necessary for processing same. The *Contractor* shall accommodate such necessary time at no increase in the *Contract Time* and at no additional cost to the *Owner*.
- .8 Changes in the construction schedule shall maintain the minimum review periods for the *Consultant's* review specified above.

.2 Submission:

- .1 Submit initial schedule to *Consultant* within 15 *Working Days* after *Contract* award.
- .2 Submit schedule in pdf format to *Consultant* using the *Consultant's* document management system.
- .3 *Consultant* will review format and content of initial schedule and request necessary changes, if any, within 10 *Working Days* after receipt.
- .4 *Consultant* will review submittal schedule and advise *Contractor* if volume and timing of submittals will permit review of and response to submittals within timeframes specified under Section 01 32 00. *Consultant* may require modifications to submittals schedule in order to allow adequate time for review of submittals. Adjust submittals schedule and construction schedule as required to comply with *Consultant's* needs.

Construction Progress Documentation

- .5 If changes are required, resubmit finalized schedule within 5 *Working Days* after return of review copy.
- .6 Submit updated submittals schedule monthly to the *Consultant* or more frequently as directed by the *Consultant*.
- .7 Schedule shall be accompanied by a checklist, correlated to each of the schedule of submittals, the construction schedule, and the schedule of inspections and tests, listing the following:
 - .1 *Shop Drawings*.
 - .2 Samples.
 - .3 Mock-ups.
 - .4 Reviews, tests and inspections by:
 - .1 Manufacturers.
 - .2 Authorities having jurisdiction.
 - .3 The *Owner*.
 - .4 The *Consultant*.
 - .5 Independent inspection and testing companies.
 - .5 Demonstration and training.

1.6 Inspection and Testing Schedule

- .1 Prepare schedule for inspection and testing by advance discussion with the selected independent inspection and testing company to determine the time required for the independent inspection and testing company to perform its tests and to issue each of its findings, and allow for required time in the construction schedule.
- .2 Refer to Section 01 45 00 for additional requirements for inspection and testing scheduling.

1.7 Schedule Management

- .1 A schedule submitted as specified and accepted by *Consultant* shall become the baseline schedule and shall be used as the baseline for updates.
- .2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with *Consultant* and *Owner*, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.
- .3 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

1.8 Recording Actual Site Conditions on As-Built Documents

- .1 *Owner* will provide 1 set of *Contract Documents* to the *Contractor* for as-built documentation purposes. Record information and maintain as-built documents in clean, dry and legible condition.

Construction Progress Documentation

- .2 Clearly label each drawing as “AS-BUILT DRAWING” and each specification “AS-BUILT SPECIFICATION” and each schedule “AS-BUILT SCHEDULE”. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Accurately document as-built conditions and deviations from *Contract Documents* as the *Work* progresses.
- .4 Mark changes in red ink.
- .5 Document actual construction including:
 - .1 Field changes of dimensions/details.
 - .2 Changes by *Change Orders*, *Change Directives*, and *Supplemental Instructions*.
 - .3 References to *Shop Drawings*, where *Shop Drawings* show more detail.
 - .4 Locations of interior mechanical and electrical equipment and distribution.
 - .5 In specification as-builts: Document as-built *Products*, including manufacturer, manufacturer’s model or system number.
- .6 Do not use as-built drawings for construction purposes.

1.9 Digital Photographs

- .1 Provide photographic documentation in digital format and in accordance with procedures and submission requirements specified in this section.
 - .1 No other photographs of the *Place of the Work* or of any portion of the *Work* will be permitted without written approval of the *Owner*.
- .2 Equipment: Provide photographs using minimum 10 megapixel digital camera.
- .3 Submit the required photographs to the *Consultant* and to the *Owner*.
- .4 Output: Supply date stamped maximum resolution colour photos to *Consultant* in JPEG format, on USB Flash Drive or via file transfer.
- .5 Number of photos required:
 - .1 Prior to construction: Provide necessary number of photographs, as required to document existing conditions and verify damage to adjacent streets and property that may have existed prior to construction or demolition work: Minimum 50 photos.
 - .2 Each Progress draw: Provide 24 construction photographs each month to accompany each application for progress draw to document the stage of the *Work* from points selected by the *Consultant* showing as much as possible of the *Work* installed during the previous month.
 - .3 Provide minimum of 8 photographs on each meeting report and for each progress meeting.
 - .4 Completion: When the *Work* is completed, arrange to take final photographs of the *Work* from a minimum of 8 points of view.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Submittal Procedures

PART 1 - GENERAL

1.1 Section Includes

- .1 Administrative requirements.
- .2 Submission procedures.
- .3 Certificates and Certification Submittals
- .4 *Product* data sheets.
- .5 *Shop Drawings*.
- .6 Engineered Judgements.
- .7 Project firestopping manual and coordination.
- .8 Samples.

1.2 Administrative Requirements

- .1 Submit submittals as requested by the *Contract Documents*, as specified herein, and in accordance with the submittals schedule prepared in accordance with Section 01 32 00.
- .2 In addition to submittals specifically requested by the *Contract Documents*, submit other submittals as may be reasonably requested by the *Consultant*, or as are required to coordinate the *Work* and to provide the *Owner* with choices available, within the scope of *Contract Documents*.
- .3 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.
- .4 Make submittals with reasonable promptness and in an orderly sequence so as to cause no delay in the *Work*. Be solely responsible for delays, make up time lost, and pay added costs incurred because of not making submittals in due time to permit proper review by *Consultant*.
- .5 Once submitted, a submittal shall not be re-submitted until original submission has been reviewed by *Consultant* and returned to *Contractor*.
- .6 Submittals that contain substitutions will be rejected. Substitutions are permitted only in accordance with Section 01 25 00.
- .7 Do not proceed with work affected by a submittal, including ordering of *Products*, until relevant submittal has been reviewed by *Consultant*.
- .8 Prepare submittals using SI (metric) units.
- .9 *Contractor's* responsibility for deviations in submittal from requirements of *Contract Documents* is not relieved by *Consultant's* review of submittal, unless *Consultant* gives written acceptance of specific deviations.
- .10 Keep copies of reviewed submittals at the *Place of the Work* in an organized condition. Only submittals that have been reviewed by the *Consultant* and are marked with *Consultant's* review stamp, as applicable, are permitted at the *Place of the Work*.
- .11 The *Work* shall conform to reviewed submittals subject to the requirements of this section. Remove and replace materials or assemblies not matching reviewed submittals at no increase in the *Contract Time* and at no additional cost to the *Owner*.

Submittal Procedures

.12 *Contractor's* review of submittals:

- .1 Review submittals for conformity to *Contract Documents* before submitting to *Consultant*. Submittals shall bear stamp of *Contractor* and signature of a responsible official in *Contractor's* organization indicating in writing that such submittals have been checked and coordinated by *Contractor*. Review shall be performed by qualified personnel who have detailed understanding of those elements being reviewed and of the conditions at the *Place of the Work* proposed for installation.
- .2 Check and sign each submittal and make notations considered necessary before submitting to *Consultant* for review. Where submittal is substantially and obviously in conflict with requirements of *Contract Documents*, reject submittal without submitting to *Consultant* and request resubmission. Note limited number of reviews of each submittal covered under *Consultant's* services as specified below.
- .3 Assume sole responsibility for any conflicts occurring in the *Work* that result from lack of comparison and coordination of submittals required for the *Work*.
- .4 Assume sole responsibility for dimensions to be confirmed and correlated at the *Place of the Work* for information that pertains to fabrication processes or to techniques of construction and installation, and for coordination of the *Work*.
- .5 Submittals that have not been reviewed, checked, and coordinated by *Contractor* prior to submission to *Consultant*, or that do not bear the stamp and signature of *Contractor* as described above, will be stamped "REVISE AND RESUBMIT" and returned.
- .6 No changes to the *Work* or the *Contract Documents* shall be made by way of submittals.
 - .1 Changes to the *Work* shall only be made following procedures specified for changes in the *Work*.
 - .2 Submittals that include changes to the *Work* or the *Contract Documents* shall be stamped "REVISE AND RESUBMIT" and returned.

.13 *Consultant's* review of submittals:

- .1 Review of submittals by *Consultant* is for the sole purpose of ascertaining conformance with the general design concepts and the general intent of the *Contract Documents*. This review shall not mean that *Consultant* approves the detail design inherent in the submittals, responsibility for which shall remain with the *Contractor*. Such review shall not relieve the *Contractor* of responsibility for errors or omissions in the submittals, nor of responsibility for meeting requirements of *Contract Documents*.
- .2 As part of their scope of work, *Consultant* shall review *Shop Drawings* no more than twice. Should three or more reviews be required due to reasons of *Contractor* omissions causing resubmission requests, then *Contractor* shall reimburse the *Consultant* for time expended in these extra reviews. Time shall be invoiced to the *Owner* (to be deducted from monies due to the *Contractor* and paid to *Consultant* by *Owner*) at rates recommended by *Consultant's* professional association and disbursements shall be invoiced at *Consultant's* cost. The *Contractor* shall cover directly costs and administration associated with courier services and the like for these extra *Shop Drawings* reviews.

Submittal Procedures

- .3 *Consultant's* review and markings on submittals do not authorize changes in the *Work* nor in the *Contract Time*, and shall be accommodated at no additional cost to the *Owner*. If, in the opinion of the *Contractor*, the *Consultant's* markings on submittals constitute a change in the *Work* or will effect a change in the *Contract Time*, then the *Contractor* shall so notify the *Consultant* in writing and request an interpretation following the procedures for requests for interpretation in accordance with Section 01 31 00. If the *Consultant* finds that the *Consultant's* markings on submittals do constitute a change in the *Work* or will effect a change in the *Contract Time*, then a *Change Order* will be prepared therefore. The time taken to process such a request for interpretation shall not, in and of itself, constitute a change in the *Work* nor an increase the *Contract Time*.
- .4 Submittals that are not required by the *Contract Documents* or not requested by the *Consultant* will not be reviewed by the *Consultant* and will be marked 'NOT REVIEWED' by the *Consultant* and returned to the *Contractor*.
- .14 Engineered submittals:
 - .1 Submittals for items required to be sealed by professional engineer (engineered) shall be duly prepared, sealed, and signed under the direct control and supervision of a qualified professional engineer licensed in the jurisdiction in which the *Place of the Work* is located, having in force professional liability insurance with minimum coverage limit of \$2,000,000 per claim and annual aggregate.
 - .2 Include with engineered submittal, proof of insurance identifying insurer, policy number, policy term, and limit of liability, on duly signed letterhead and / or certificates of insurance.
 - .3 Design includes post disaster building, seismic design, life safety, sizing of supports, anchors, framing, connections, spans, and as additionally required to meet or exceed requirements of applicable codes, standards, regulations, authorities having jurisdiction, and design requirements of the *Contract Documents*.
 - .4 Engineered submittals shall include design calculations, complete with references to codes and standards used in such calculations, supporting the proposed design represented by the submittal.
 - .5 Professional engineer responsible for the preparation of engineered submittals shall undertake periodic field review, including review of associated mock-ups where applicable, at locations wherever the work as described by the engineered submittal is in progress, during fabrication and installation of such work, and shall submit a field review report after each visit. Field review reports shall be submitted to the *Consultant*, to authorities having jurisdiction as required, and in accordance with the building code.
 - .6 Field reviews shall be at intervals as necessary and appropriate to the progress of the work described by the submittal to allow the engineer to be familiar with the progress and quality of such work and to determine if the work is proceeding in general conformity with the *Contract Documents*, including reviewed shop drawings and design calculations.

Submittal Procedures

- .7 Upon completion of the parts of the *Work* covered by the engineered submittal, the professional engineer responsible for the preparation of the engineered submittal and for undertaking the periodic field reviews described above, shall prepare and submit to the *Consultant* and authorities having jurisdiction, as required, a letter of general conformity for those parts of the *Work*, certifying that they have been provided in accordance with the requirements both of the *Contract Documents* and of the authorities having jurisdiction over the *Place of the Work*.
- .8 Costs for such field reviews and field review reports and letters of general conformity are included in the *Contract Price*.

1.3 Submission Procedures

- .1 Coordinate each submittal with requirements of the *Work* and *Contract Documents*. Individual submittals shall include related information.
- .2 Distribute copies of submittals to parties whose work is affected by submittals except *Consultant* and *Owner* before final submission for review by *Consultant*.
- .3 Accompany submittals with transmittal letter containing:
 - .1 Date.
 - .2 *Project* title and number.
 - .3 *Contractor's* name and address.
 - .4 *Contractor's* review stamp.
 - .5 Identification and quantity of each submittal.
 - .6 Other pertinent data.
- .4 Each submittal shall be identified numerically by relevant *Specifications* section number with a numeric indicator for multiple submittals by that section followed by revisions number, for example 04 05 19-01-R0.
- .5 Submit original PDF documents only: scanned documents shall not be accepted.
 - .1 PDF submittals shall be bookmarked and linked to a Table of Contents or cover letter identifying the contents of the submission.
- .6 Make any changes in submittal that *Consultant* may require, consistent with *Contract Documents*, and resubmit as directed by *Consultant*.
- .7 Notify *Consultant*, in writing, when resubmitting, of any revisions other than those requested by *Consultant*.
- .8 After *Consultant's* review, distribute copies to affected parties.

1.4 Certificates and Certification Submittals

- .1 Certificates and certifications submittals: Provide a statement that includes signature of entity responsible for preparing certification.

1.5 Product Data Sheets

- .1 Submit *Product* data sheets as follows:
 - .1 1 copy digitally as a bookmarked PDF to *Consultant* using the *Consultant's* document management system.

Submittal Procedures

- .2 Submit *Product* data sheets as called-for by the *Contract Documents* or as the *Consultant* may reasonably request where shop drawings will not be prepared due to a standardized manufacture of a *Product*. Manufacturers' catalogue cuts will be acceptable in such cases, providing that they are 213 mm x 275 mm (8-1/2" x 11") originals, and that they indicate choices including sizes, colours, model numbers, options and other pertinent data, including installation instructions. Submissions showing only general information are not acceptable.
 - .1 In addition, submit written requirements for handling and storage and handling in accordance with Section 01 60 00.
- .3 Where requirements of *Contract Documents* are more stringent than design proposed on *Product* data sheets, the requirements of the *Contract Documents* take priority.
- .4 Upon completion of review by *Consultant*, 1 marked set of *Product* data sheets will be returned to *Contractor* in digital format for reproduction and distribution.
- .5 Retain 1 complete set of reviewed *Product* data sheets for issuance as part of closeout submittals in accordance with Section 01 78 00.

1.6 Shop Drawings

- .1 Submit *Shop Drawings* as follows:
 - .1 1 copy digitally as a bookmarked PDF to *Consultant* using the *Consultant's* document management system.
- .2 Lettering on *Shop Drawings* shall be not less than 3 mm (1/8") high.
- .3 Reproduction of construction *Drawings* to serve as background for *Shop Drawings* is not permitted.
- .4 Where requirements of *Contract Documents* are more stringent than design proposed on *Shop Drawings*, the requirements of the *Contract Documents* take priority.
- .5 *Consultant* markings and resulting action required:
 - .1 *Shop Drawings* requiring no changes will be marked 'REVIEWED', and shall be submitted for as-built drawings purposes.
 - .2 *Shop Drawings* requiring several changes will be marked 'REVIEWED as NOTED' and shall be revised and submitted for as-built drawings purposes.
 - .3 *Shop Drawings* requiring substantial changes will be marked 'REVISE AND RE-SUBMIT' and shall be revised and resubmitted until *Consultant* stamps *Drawings* with 'REVIEWED' or 'REVIEWED as NOTED'.
- .6 *Shop Drawings* size shall be multiple of 213 mm and 275 mm (8-1/2" and 11") excluding 38 mm (1-1/2") binding margin and not larger than 838 mm x 1117 mm (33" x 44"). Leave minimum 150 mm x 100 mm (6" x 4") clear space for *Consultant's* comments.
- .7 Upon completion of review by *Consultant*, 1 marked set of *Shop Drawings* will be returned to *Contractor* in digital format for reproduction and distribution.
- .8 Retain 1 complete set of reviewed *Shop Drawings* for issuance as part of closeout submittals in accordance with Section 01 78 00.
- .9 Submit copies of reviewed *Shop Drawings* to authorities having jurisdiction as required.
- .10 *Shop Drawings* shall include:

Submittal Procedures

- .1 Fabrication and erection dimensions.
- .2 Plans, sections, elevations, arrangements and sufficient full size details which indicate complete construction, components, methods of assembly as well as interconnections with other parts of the *Work*.
- .3 Design calculations for items that require design calculations.
- .4 Clear definition of the division of responsibility for the work described thereon. No *Products*, items or equipment, or description of work, shall be indicated to be supplied, or work to be done, "By Others" or "By Purchaser". *Shop Drawings* marked with either of these phrases shall be rejected without having been reviewed by the *Consultant*.
- .5 Location and type of exposed anchors, attachments and locations and types of fasteners, including concealed reinforcements to accept mounted fasteners.
- .6 Adhesives, joinery methods and bonding agents.
- .7 Kinds and grades of materials, their characteristics relative to their purpose, detailed description of finishes and other fabrication information.
- .8 Configurations, types and sizes required; identify each unit type on drawing and on *Product*.
- .9 Descriptive names of equipment and mechanical and electrical characteristics when applicable.
- .10 Data verifying that superimposed loads will not affect function, appearance and safety or work shown on shop drawings, as well as other interconnected work.
- .11 Assumed design loadings, dimensions of elements and material *Specifications* for load-bearing members.
- .12 Proposed chases, sleeves, cuts and holes in structural members.
- .13 Wall thicknesses of metals.
- .14 Location and types of welds. For structural welds use AWS symbols and clearly show net weld lengths and sizes.
- .15 Materials, gauges, and sizes being supplied including connections, attachments, reinforcement, anchorage and locations of exposed fastenings.
- .16 Installation instructions and details for *Products* to be installed by separate *Subcontractors*, including function of each part.
- .17 A list of *Products* covered by, or included on, the shop drawing. List of *Products* shall be complete and show manufacturer's name, *Product* name, generic description, standard certification where specified, manufacturer's complete installation data and precautions against wrong installation, operation and maintenance.
- .18 Refer to individual sections of the *Specifications* for more particular requirements for *Shop Drawings*.
- .19 Compatibility statement: Include with each *Shop Drawings* a statement that each *Product* and material indicated on the *Shop Drawings* is compatible with each *Product* and material with which it comes into contact.

Submittal Procedures

1.7 Engineered Judgements

- .1 When an engineered judgement is required by authorities having jurisdiction, such engineered judgement shall be prepared as an engineered submittal in accordance with Section 01 33 00.

1.8 Project Firestopping Manual and Coordination

- .1 The *Contractor* shall assign a firestopping and smoke seal firestopping coordinator to coordinate the firestopping details and systems required in the *Work*. Applicator shall designate a single individual as *Project* foreperson who shall be present at the *Place of the Work* throughout the *Work*.
- .2 Firestopping manual:
 - .1 *Contractor* and firestopping and smoke seal coordinator shall prepare a preliminary fire stopping manual, inclusive of all firestopping systems in the *Work*, to be submitted to the *Consultant* prior to the installation of any firestopping and smoke seal work.
 - .2 Manual shall include:
 - .1 Project key plans of each level, with enlarged key plans at areas where required, which identify and tag each anticipated penetration and fire stopping location and type (i.e. multiple metallic pipes through gypsum board wall assembly; single metallic pipe through concrete floor assembly, and the like).
 - .2 *Product* data sheets: data and installation instructions for *Products* providing descriptions sufficient for identification at the *Place of the Work*.
 - .1 Materials list of *Products* proposed for use in the *Work*; complying with listed systems designs.
 - .2 Listing agency's detailed drawing showing joint assemblies and firestopping materials, identified with listing agency's name and number or designation, fire rating achieved, and date of listing.
 - .3 Manufacturers' installation instructions and recommendations.
 - .3 *Shop Drawings*:
 - .1 Submit drawings indicating fire resistance rated assembly number, required temperature, hose stream, and flame rating, material thicknesses, installation methods and materials of firestopping and smoke seals, primers, supports, damming materials as applicable, reinforcements, anchorages, fastenings and methods of installation for each condition to be encountered.
 - .2 Designate on *Shop Drawings* static through penetrations and dynamic joint systems, relative positions, expansion and control joints in rated slabs and walls, and firestopping details.
 - .3 Engineered *Shop Drawings*; for engineering judgements:

Submittal Procedures

- .1 Where *Project* conditions require modification to an accredited third party testing agency's listed system design to address a particular firestopping condition that is not covered by a listed system, submit engineered shop drawings detailing the modifications to the listed system design as an engineering judgment or equivalent fire-resistance-rated assembly, for each *Project* location and condition.
- .2 Submit the manufacturer's engineering judgment identification number and *Shop Drawings* details prepared by a professional engineer. The engineering judgment submittal shall include both *Project* name, *Project* location, and *Subcontractor's* name who will install firestop system as described in engineering judgement *Shop Drawings*.
- .3 Provide complete details of specific application of listed system and its modifications upon which the engineered judgement is based upon.
- .4 For perimeter fire barrier systems:
 - .1 Submit engineered *Shop Drawings* for engineering judgements covering perimeter fire barrier systems. Identify each cladding assembly type in contact with each perimeter fire barrier system.
- .4 Fire resistance rating test listings for firestopping and smoke seal systems.
- .3 Firestopping manual shall be submitted within 4 weeks of *Contract* award.
- .4 Prior to concealment of firestopping conditions above a ceiling or by another assembly or finish, the *Contractor* shall submit an updated firestopping manual including as-built drawings that identify firestopping conditions and penetrations.
- .3 Closeout submittals:
 - .1 Submit closeout submittals in accordance with Section 01 78 00.
 - .2 Submit the following certification documents with closeout submittals:
 - .1 Manufacturer's certification: Submit manufacturer's certification that installed firestopping and smoke seal *Products* are suitable for the use indicated and comply with specified requirements.
 - .2 Installation certification: Installer shall submit certification that all joint firestopping system installations are completed and that installations comply with listed systems designs.
 - .3 As-built copy of the firestopping manual.

1.9 Samples

- .1 Except where a different amount is specified, submit a minimum of 3 samples. Otherwise submit the number of samples specified.
- .2 Deliver samples to the following location with expenses, including carrying costs, prepaid, unless otherwise instructed:
 - .1 *Consultant's* office.
- .3 Identify samples or assemblies by *Project* number and name, name of *Consultant*, *Contractor* and *Subcontractor*, and date of submission. Identify location, specified material reference and any other pertinent information. Show construction by layered method if necessary, clearly displaying textures and patterns.

Submittal Procedures

- .4 Where a required colour, pattern or texture has not been specified, submit full range of available *Products* meeting other specified requirements.
- .5 *Consultant* selection from samples is not intended to change the *Contract Price* or *Contract Time*. If a selection would affect the *Contract Price* or *Contract Time*, notify *Consultant* in writing prior to proceeding with the *Work*.
- .6 Resubmit samples until written acceptance is obtained from *Consultant*.
- .7 Reviewed and accepted samples will establish the standard against which installed *Work* will be reviewed.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

PART 1 - GENERAL

1.1 Section Includes

- .1 General scope and responsibility.
- .2 Temporary ventilation.
- .3 Existing facilities.
- .4 Existing services.
- .5 Dust tight partitions and enclosures.
- .6 Infection prevention and control procedures.
- .7 Protection of the existing building.
- .8 Emergency and fire protection.
- .9 Missing patient search.

1.2 General Scope and Responsibility

- .1 For the purposes of this section:
 - .1 The words “worker” or “workers” shall mean the *Contractor*, *Contractor’s* staff or employees, *Subcontractors*, *Subcontractor’s* staff or employees, *Suppliers*, *Supplier’s* staff or employees, or anyone engaged for the *Work*, directly or indirectly, by the *Contractor*, unless specifically noted otherwise.
 - .2 The working day of the healthcare facility is from 8:00 a.m. to 5:00 p.m. every day of the week.
- .2 Conform to the *Owner’s* Trillium Health Partners – Contractor Service Provider Orientation & Safety Handbook. In case of conflict between the *Owner’s* construction procedures and safety manual and the remainder of the *Contract Documents*, the *Owner’s* construction procedures and safety manual shall govern.
- .3 Operational limitations:
 - .1 The existing building will remain in full use and occupancy throughout the *Work*, except for such parts of the building that have been vacated for the *Work*.
 - .2 *Contractor’s* use of the *Place of the Work* is limited to permit regular use of *Owner’s* facilities to continue with the least amount of interference possible.
 - .3 In consultation with, and to acceptance of, the *Consultant* in the presence of the *Owner*, designate an entrance and a circulation route that workers shall use and that shall not be used by *Owner’s* staff, building occupants, or the public.
 - .4 Hours of Work:
 - .1 Execute work in existing building at times approved by *Consultant* and as mutually agreeable to the *Owner*, in a manner not to inconvenience building occupants or hinder their use of the building. Include for certain work as scheduled with the *Owner* to be done outside standard hours of work.
 - .2 Work shall be completed to meet the *Owner’s* prescribed dates and permitted hours of work.

Special Project Procedures for Healthcare Facilities

- .3 For *Work* performed outside of normal hours (8:00 a.m. to 4:00 p.m.), make prior arrangements with Maintenance & Engineering / Facilities Service Manager or the Project Manager.
- .4 The cost of premium time shall be included in the *Work*. No claim for additional cost due to work being done during premium time will be allowed.
- .5 Whenever the *Contractor* contemplates entering any occupied areas, of the building, to carry out work or to obstruct or take out of use, any area of the building, he shall make such request to the *Owner* in writing a minimum of 10 *Working days* before he intends to do the work.
- .6 Execute work as quietly as possible in and around existing building at all times.
- .7 For areas of *Work* requiring full access for hospital staff during normal hospital business hours, ensure all ceiling areas are enclosed with no obstructions to mechanical and electrical devices in the ceiling in order to maintain appropriate infection control.
- .8 Notify *Owner* 72 hours in advance prior to any work outside of the hoarded area and in the existing building.
- .9 Noisy Work:
 - .1 Submit a two-week look ahead schedule of the work being performed along with a noise rating on a scale out of "10" for the work being conducted each day.
 - .2 Hours when noisy work can be performed shall be verified with the *Owner* prior to commencement. Noisy work shall be included in the look ahead schedule.
- .10 Dust tight enclosure and partition doors or flaps and entrance doors to the *Place of the Work* shall remain closed.
- .5 Deliveries and Waste Removal:
 - .1 Storage space is not available in the hospital. Coordinate and arrange for materials delivery as required, unless otherwise arranged. All materials and equipment deliveries into the hospital building will pass through the Receiving area.
 - .2 Normal receiving hours of operation are Monday through Friday, 7:30 am through 3:30 pm.
 - .3 For materials and equipment deliveries outside of normal receiving hours, pre-arrangements shall be made with the Project Office or Maintenance & Engineering/Facilities Services along with Security.
 - .4 Make arrangements with Maintenance & Engineering/Facilities Services before any tools, equipment or materials are brought on site to determine acceptable storage and internal delivery routes to the work area.
 - .5 Transport waste in containers with tightly fitting lids or cover waste with a wet sheet. Do not transport waste through occupied areas of existing building.
 - .6 Remove waste as it is created. Debris shall be contained and covered if it cannot be removed immediately.

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- .7 Remove waste at the end of each *Working Day* through construction access routes.
 - .8 All tools and equipment must be thoroughly cleaned before transporting them through the hospital.
 - .9 If an alternate elevator or route is required, a request must be submitted to the *Owner's Project Team* for approval. Once submitted the *Owner's Project Manager* will coordinate time with the appropriate *Owner* stakeholders. Once approved the *Owner's Project Manager* will review times and required path for the movement of material.
 - .10 Hours that *Contractor* can move material and debris through hospital between area of work and loading area: between 7 pm and 5 am daily. All bins shall be covered and floors cleaned after movement.
- .4 Dust tight enclosure and partition doors or flaps and entrance doors to the *Place of the Work* shall remain closed.
 - .5 Areas of the existing building adjacent to the *Place of the Work* or areas affected by the *Work*, including circulation and access routes, shall be maintained in a clean state equivalent to the level of cleanliness maintained in the existing building, and as follows:
 - .1 Clean and vacuum the *Place of the Work* and areas surrounding the *Place of the Work* daily or more frequently as required.
 - .2 Provide tack mats at access doors to the *Place of the Work* so that workers can remove dust and debris from their footwear when exiting the *Place of the Work*. Replace or clean daily, or more frequently as required.
 - .3 Wet mop floor areas in vicinity of access doors to the *Place of the Work* daily, or more frequently as required.
 - .4 Vacuum carpeted areas daily or more frequently as required.
 - .5 Wet clean carpets in accordance with manufacturer's recommendations once work in such areas is complete.
 - .6 Final cleaning shall be in accordance with Section 01 74 00.
 - .6 Document condition of the existing building in areas immediately adjacent to the *Place of the Work* by means of construction photographs in accordance with Section 01 32 00.
 - .7 Workers shall remove dust from body and clothing by vacuum cleaning prior to traversing patient care areas.
 - .8 In areas designated by the *Owner*, workers shall be required to wear protective clothing as directed by the *Owner*. Protective clothing shall be removed upon exiting designated areas.
 - .9 Cellular phones for personal use shall not be used in the existing building.
 - .10 Walkie-talkies shall not be used in the existing building without the express, written approval of the *Owner*.
 - .11 Safety clearances are required before any cutting, welding, core drilling, or open flame work is done. A request in writing to the *Owner* must be made and approved a minimum of 1 *Working Day* prior to commencing such work.

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1.3 Temporary Ventilation

- .1 Provide temporary ventilation in accordance with Section 01 51 00 supplemented as follows:
 - .1 Provide negative pressure air ventilation as described below.
 - .2 Ensure quality of intake air to existing building through existing intake louvers is not compromised by dust or noxious or odorous fumes.

1.4 Existing Facilities

- .1 Badges:
 - .1 Security badges are required for all *Contractor's* personnel. In addition to requirements of THP Procedures, *Contractor* shall be responsible for initial charge as dictated by hospital.
- .2 Restrict access, parking, material deliveries, execution of work, operations and procedures to designated locations and times and do not deviate from designated procedures without prior acceptance by the *Consultant* in the presence of the *Owner*.
- .3 Periodically review proposed construction operations with the *Consultant* in the presence of the *Owner* and cooperate as required to ensure that *Owner's* interests and requirements are not unduly compromised with regard to the normal operation and function of occupied areas on the existing building.
- .4 While working in the existing hospital, workers shall not remain in areas in which they are working for meals and breaks. Workers shall not be permitted to have meals or take breaks in the existing hospital. Meals shall and breaks shall be taken in the site office, or away from the *Place of the Work*.
- .5 Traffic through existing occupied areas of the hospital shall be kept to a minimum. Travel within existing occupied areas of the hospital shall be via the most direct route that does not pass through patient wards or sensitive areas.
- .6 Noise, dust and debris, and odours shall be minimized to ensure hospital staff and patients in adjacent areas are disturbed as little as possible. Corrective action to cease or limit disagreeable annoyances to hospital staff and patients shall be implemented immediately upon notification by the *Consultant* or the *Owner*.
- .7 Use of existing containers and garbage bins shall not be permitted.
- .8 A service elevator will be made available during the construction phase of the *Project*.
- .9 Existing fire protection equipment:
 - .1 Existing fire protection equipment, such as fire extinguishers and hoses, shall only be used in an emergency situation.
 - .2 Do not remove existing fire protection equipment.
 - .3 If any existing fire protection equipment is used or interfered with in any way, the *Owner's* fire equipment inspector shall be retained to inspect, test, recharge, and otherwise repair such equipment at no additional cost to the *Owner*.
- .10 Sanitary facilities: in accordance with Section 01 52 00.

Special Project Procedures for Healthcare Facilities

1.5 Existing Services

.1 Service interruptions:

- .1 Connection or disconnection of services that will interfere with the operation of the *Owner's* facilities shall not be done without the prior written acceptance of the *Consultant* in the presence of the *Owner* and during the times designated by the *Owner*. Premium charges associated with such work shall be included in the *Contract Price*.
 - .2 Provide at least 10 *Working Days*' prior written notice to the *Consultant* and the *Owner* of requirement or intention to interrupt services, and obtain written permission of the *Consultant* in the presence of the *Owner* prior to commencing such interruption.
 - .3 In no instance shall interruptions affect the entire existing building.
 - .4 As far as possible, coordinate interruptions with the *Owner's* regular maintenance of building services and systems.
 - .5 Areas adversely affected by changes in air flows outside the construction areas as a result of a required shut-down of portions of the existing HVAC system within the construction areas are to be re-balanced to comfortable levels as advised by the *Consultant*.
- .2 Should existing services be interrupted in breach of the above, make good immediately and provide protection against further such disruptions. Costs resulting from such interruptions and for making good shall be the responsibility of the *Contractor* at no additional cost to the *Owner*.

1.6 Dust Tight Partitions and Enclosures

- .1 Dust tight partitions and enclosures shall be in accordance with Section 01 56 00 and Section 01 57 00, as supplemented herein.
- .2 Dust tight partitions:
 - .1 Provide dust tight partitions to localize dust generating activities, and for the protection of workers, hospital staff, patients, the public, and finished areas of the *Work*.
 - .2 Dust tight partitions shall be temporary, weather tight, dust, tight, and lockable partitions between occupied areas of the existing hospital and areas where the *Work* is being performed, and shall include treatment of joints, cracks, and openings in partitions to prevent dust from entering occupied areas of the hospital.
 - .3 Dust tight partitions shall be assemblies with 1 hour fire resistance rating complete with doors and frames having 3/4 hour fire resistance ratings.
 - .4 Construct dust tight partitions as follows:
 - .1 Provide 92 mm (3-5/8") steel studs at 400 mm (16") on centre, with 2 rows of bracing between studs and additional bracing for gypsum board finish. Steel studs shall be in accordance with Section 09 22 00.
 - .2 Provide fire resistance rated tarpaulins fastened to studs on the side of the partition opposite to the occupied areas of the hospital. Lap joints 100 mm (4") minimum, and seal laps and perforations dust tight with 75 mm (3") wide plastic film tape.

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- .3 Provide 1 layer of 12.7 mm (1/2") thick square edge fire resistant gypsum board over both side of partition. Seal joints with 75 mm (3") wide plastic film tape. Gypsum board and installation shall be in accordance with Section 09 29 00.
- .4 Provide felt gaskets around perimeter of partitions.
- .5 Paint sides of partitions exposed to occupied areas of the existing building in accordance with Section 09 91 00, colour as to later selection by the *Consultant*.
- .3 Dust tight enclosures:
 - .1 Where minor isolated alteration work occurs in the existing building and a dust tight partition is not feasible, provide a mobile containment system, extending floor to ceiling.
 - .2 Mobile containment system shall be fabricated of an adjustable aluminum frame, vinyl enclosure with pressure porthole, wheel base platform, and disposable plastic liner, and sized as required.
 - .3 Provide HEPA filter vacuum device and manometer and connect to pressure porthole.
 - .4 Acceptable *Product*: Kontrol Kube Topsider or Kontrol Kube Topsider Jr., as manufactured by Fiberlock Technologies Inc., or approved alternate.
- .4 Maintain and relocate dust tight partitions and enclosures until dust generating work is complete, or until directed otherwise in writing by the *Consultant* in consultation with the *Owner*.
- .5 Provide "Construction Zone" signage outside dust tight partitions and enclosures, manufactured by signage company, with minimum 75 mm (3") letters.

1.7 Infection Prevention and Control Procedures

- .1 Infection prevention and control procedures shall be in accordance with CAN/CSA Z317.13-22, and Health Canada document "Construction-Related Nosocomial Infections in Health Care Facilities".
- .2 Training:
 - .1 Provide workers with training in infection prevention and control procedures.
 - .2 Training shall be provided a specialized infection prevention and control consultant approved by the *Owner*.
 - .3 The *Contract Price* includes the cost for the required number of training sessions to adequately cover the duration of the *Project*.
 - .4 Proof of successful completion of such training shall be submitted to the *Owner* in the form of a certificate issued by the infection prevention and control consultant providing the training. Training certificate shall be submitted before a worker undertakes any work at the *Place of the Work*.

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- .3 The *Owner* specialized infection prevention and control consultant shall assess the risks related to the *Project* utilizing the Risk Assessment and Preventative Measures Checklist contained in Health Canada Document "Construction-Related Nosocomial Infections in Health Care Facilities". The determination of risk will guide the need for barriers and other infection prevention and control measures required in the *Work*. The *Owner* will advise the *Contractor* of the results of the assessment. The specialized infection prevention and control consultant shall advise the *Owner* and the *Contractor* of the results of the assessment.
 - .1 The *Consultant* shall have no authority or role under the *Contract* with regard to infection prevention and control procedures.
- .4 Field review of the *Work* and on-going infection prevention and control procedures shall be undertaken on a regular basis by the specialized infection prevention and control consultant in the presence of the *Contractor*. Procedures for such field reviews shall be the same as those for inspection and testing in accordance with Section 01 45 00.
- .5 At *Contract* start-up meeting, convened in accordance with Section 01 31 19, review infection prevention and control procedures. The specialized infection prevention and control consultant shall attend the *Contract* start-up meeting. Subjects to be reviewed include, but are not limited to, the following:
 - .1 General information on infection prevention and control procedures.
 - .2 Identification of patient populations that may be at risk.
 - .3 Prevention measures for essential services that may be disrupted.
 - .4 The integrity of the facility's exterior structure, spatial separations, ventilation and water supplies for any infection control problems.
 - .5 Methods for dust containment and removal of construction debris.
 - .6 Traffic patterns for construction workers and supply delivery routes to minimize risks to patients, staff and visitors.
 - .7 The need for increased filter changes during the *Work*.
 - .8 The need to close down dampers temporarily to reduce circulation of contaminated air or fumes.
 - .9 Systems that can provide the required air exchange rates and pressure relationships in critical areas near construction activity.
 - .10 Schedule of field reviews by the specialized infection prevention and control consultant.
- .6 Vacuum cleaners:
 - .1 Vacuums shall be commercial grade complete with HEPA filters.
 - .2 HEPA filter shall be changed as recommended by the manufacturer or required by use. Maintain a filter change log at the *Place of the Work*, available for review by the *Owner*.
- .7 The following precautions, as a minimum, shall be taken when working on existing walls, ceilings, floor spaces, ducts and piping systems as the dust and dirt collected in these areas may contain disease causing germs:

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- .1 Prior to work being done or the removal of ceiling tiles, or opening of ceiling access hatches, erect floor to ceiling dust tight partitions and enclosures as described above to completely enclose the area where such work is being performed.
- .2 Remove acoustical ceiling panels keeping horizontal, and vacuum clean the panels immediately prior to removal.
- .3 Existing air ducts, conduits, and spaces above the ceiling shall be vacuum cleaned prior to the start of work in such areas.
- .4 Remove dust tight partitions and enclosures when work is finished or prior to the start of hospital working day, and remove marks left by tape or studs, and enclose ceiling areas with no obstructions to mechanical and electrical devices in the ceiling space.
- .5 Vacuum clean interior of dust tight partitions and enclosures prior to their removal.
- .6 Vacuum clean area enclosed by dust tight partitions and enclosures after removal of the dust tight partitions and enclosures.
- .8 Negative pressurization
 - .1 Areas where work is being undertaken shall be isolated from occupied areas of the hospital using dust tight partitions and enclosures as described above.
 - .2 The *Place of the Work* will be maintained under negative pressure at all times in relation to the occupied areas of the existing building to prevent dust and airborne pathogens from entering the occupied areas of the existing building.
 - .3 Negative pressure shall be achieved through the use of dedicated (window or otherwise) exhaust units or, if direct access cannot be achieved, by HEPA filtered recirculation units that transfer filtered air from the *Place of the Work* into the occupied areas. Exhaust points will be reviewed with the *Owner* to ensure that the exhaust air from the *Place of the Work* is not affecting pedestrian routes and is not re-entrained back into the existing building through fresh air intakes.
 - .4 Provide construction exhaust/HEPA units and remove at the completion of the *Work*.
 - .5 Air systems serving only the *Place of the Work* will be shut down and all supply, return and exhaust openings shall be sealed to prevent dust and construction debris from entering the air system. As a further precaution, the air system will be reviewed at the end of the *Work* to determine if cleaning is required.
 - .6 Supply and return air ducts entering the *Place of the Work* are to be fitted with a pre-filter unit and sealed within the *Place of the Work* near point of entry or exit prior to the start of disruptive activity to prevent dust and construction debris from entering the air system. As a further precaution, the air system will be reviewed at the end of the *Work* to determine if cleaning is required.
 - .7 During construction, the seal only on the supply air duct may be removed after demolition and clean-up to permit ventilation within the construction area provided no other means is available.

1.8 Protection of the Existing Building

- .1 Protection requirements shall be in accordance with Section 01 56 00, as supplemented herein.

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- .2 Keep *Place of the Work* safe and secure, denying access to unauthorized personnel.
- .3 Protect existing work from damage. Make good any damage caused. The onus is on the *Contractor* to substantiate that damage existed prior to commencement of the *Work*.
- .4 Do not overload the existing structure due to the *Work*.
- .5 Take special measures to protect existing work from damage when moving heavy loads or equipment. Protect areas used as passageways or through which materials are moved. Use resilient tired conveyances only when moving materials and equipment inside building. Provide coverings as required to protect existing work from damage.
- .6 Separate exterior access, work and storage areas from *Owner* occupied existing areas, with fencing and hoarding as specified in Section 01 56 00. Rearrange fencing/hoarding as *Work* progresses to suit extent and configuration of the *Work*.
- .7 Provide guards, barricades and other temporary protection to prevent injury to persons.
- .8 Protect existing building components and contents from damage by weather, when executing *Work* affecting integrity of the building envelope. provide temporary insulated and air tight weatherproof closures to protect openings made in existing building envelope. *Make Good* existing building components and contents damaged by weather resulting from inadequate temporary protection measures.
- .9 Protection of existing occupied areas:
 - .1 Existing exterior walls with windows of plain glazing, when exposed to the *Work*, shall be protected with 16 mm (5/8") gypsum board for interior surfaces and 9.5 mm (3/8") exterior grade plywood for exterior surfaces, mounted on suitable framing.
 - .1 Plywood: in accordance with Section 06 10 53.
 - .2 Metal framing: in accordance with Section 09 22 00.
 - .3 Gypsum board: in accordance with Section 09 29 00.
 - .2 Maintain such protection throughout the *Work*.
 - .3 Other openings in the existing exterior walls, such as doors and louvres, shall be similarly protected or replaced with doors of solid core wood or hollow steel construction.

1.9 Emergency and Fire Protection

- .1 Provide and maintain ready access to fire protection equipment, in accordance with Section 01 52 00.
- .2 Immediately implement any request or instruction made by the hospital's fire marshal.
- .3 Provide temporary fire resistant closures at existing areas openings exposed to construction areas for the *Work* to maintain fire and life safety of existing building.
- .4 *Contractor* shall coordinate the work with the *Owner* in order to ensure no disruption to the existing fire detection and annunciation systems. Failure to provide such coordination shall result in the *Contractor* incurring the responsibilities and expenses associated with disruption to the existing fire detection and annunciation systems at no additional cost to the *Owner*.

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- .1 Provide fire watch when existing fire detection and annunciation systems are not operational or on bypass.
- .2 Whenever a changeover time occurs, which is an outage time of at least a portion of the fire alarm system, the municipal fire department shall be notified of the temporary shutdown and alternative measures shall be devised.
- .5 *Contractor* shall coordinate the work with the *Consultant* in the presence of the *Owner* in order to prevent unapproved disruptions to the existing sprinkler system, standpipe system, or other fire protection systems.
 - .1 Where temporary shut-down is necessitated, such shut down shall be in accordance with the requirements of authorities having jurisdiction and the building code.
- .6 Obtain 'Hot Work Permit' from *Owner* prior to hot work operation, which may cause the building's fire alarm system to be activated or create an unwarranted fire risk condition. The prevention of fires and false fire alarms caused by hot work operations is the primary goal of this procedure. Gas hoses, backflow preventers, fire resistive tarpaulins, curtains and other cutting and welding equipment must be in good repair before the permit is issued.
 - .1 'Hot Work' is defined as work using open flames or sources of heat that could ignite materials in the work area.
- .7 Fire separations:
 - .1 Maintain the integrity of fire separations, fire protection systems, and fire rated assemblies.
 - .2 Make good fire separations, fire protection, and fire rated assemblies compromised as a result of the *Work*.
- .8 Maintaining existing building exit facilities:
 - .1 Maintain exit facilities serving the existing building.
 - .2 Where an exit is blocked-off or deleted as a result of the *Work*, an alternative exit shall be provided that is acceptable to the *Consultant*, the *Owner*, and authorities having jurisdiction.
 - .3 Where it is necessary for access to be gained to an exit through the *Place of the Work*, the access shall be clearly defined and protected so that it is separated from construction areas by a smoke tight fire separation equivalent to a minimum of 1 hour fire resistance rating, unless otherwise indicated.
- .9 Intersecting corridors:
 - .1 Provide temporary fire separations between existing corridors on occupied floor areas and new corridors under construction.
 - .2 Construct temporary fire separations out of steel studs and gypsum board to provide a construction equivalent to a minimum of 1 hour fire resistance rating, unless otherwise indicated.
 - .1 Firestopping and smoke sealant: in accordance with Section 07 84 00.
 - .2 Steel studs: in accordance with Section 09 22 00.
 - .3 Gypsum board: in accordance with Section 09 29 00.

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- .3 Where access is required, the doorway shall be protected by a door of solid core wood or hollow steel construction.
- .4 Finish hardware equivalent to a minimum of 1 hour fire resistance rating, unless otherwise indicated.
- .10 Fire department access:
 - .1 Do not obstruct access route designated for fire department equipment.
 - .2 If it is necessary that existing access routes be obstructed or deleted, alternative access routes acceptable to the fire department and in accordance with the requirements of the *Contract Documents* and authorities having jurisdiction shall be provided prior to commencement of work that will obstruct or delete existing access.
- .11 Combustible materials:
 - .1 Stockpiling of combustible materials adjacent to or inside the existing building shall not be acceptable.
- .12 Temporary protection of openings in fire separations:
 - .1 Openings in existing floor assemblies and vertical fire rated assemblies required by the *Work*, shall be temporarily protected with materials as required to maintain continuity of the required fire resistance rating for existing fire rated assembly.

1.10 Missing Patient Search

- .1 In the event that the *Owner* is required to undertake a missing patient search, undertake a detailed search of the *Place of the Work*, under the direction of the *Owner*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Quality Requirements

PART 1 - GENERAL

1.1 Section Includes

- .1 *Contractor's* quality assurance program.
- .2 *Contractor's* field quality control.
- .3 Subcontractor Qualification Statements
- .4 Independent inspection and testing – *Owner's* Quality Assurance.
- .5 Inspection and testing schedule.
- .6 Reports and documents.
- .7 Manufacturer's field review.
- .8 Mock-ups.

1.2 Contractor's Quality Assurance Program

- .1 Submit to the *Owner* and the *Consultant* for their information, a quality assurance program (the "Quality Assurance Program").
- .2 The Quality Assurance Program shall meet the requirements of Canadian Standards Association CSA CAN3-Z299.3 or such other requirements as set out in the *Contract Documents*.
 - .1 The Quality Assurance Program shall be designed so that quality requirements are obtained by progressive implementation of the controls and inspection functions stated in the Quality Assurance Program.
 - .2 Make any modifications to the Quality Assurance Program as reasonably requested by the *Owner* and/or the *Consultant*.
 - .3 The Quality Assurance Program shall include, but shall not be limited to, the following:
 - .1 A system by which changes to the *Contract Documents* and correspondence with *Subcontractor* and other correspondence is handled in a controlled manner.
 - .2 A system for purchased or manufactured materials to be identified, inspected to the specified standard, and covered by a material test report.
 - .3 A system by which measuring and testing equipment is properly stored, handled, and calibrated to a known standard.
 - .4 A system by which incoming materials are: inspected to the specified standard; accepted; allocated safe storage; and properly recorded.
 - .5 A system by which process inspection requirements shall be clearly stated for operations and carried out by qualified personnel.
 - .6 A system by which final inspections will be carried out and accepted by authorized personnel prior to release for shipping or major assembly.
 - .7 A system by which non-conformance to requirements of the *Contract Documents* shall be recorded and solutions proposed by the *Owner* or the *Consultant* are also recorded.

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- .8 A system by which instructions for handling and storage of equipment shall be given.
 - .9 A system by which SBO items can be inspected and received in a manner which allows replacement or correction.
 - .10 A system by which a record of quality inspections, tests, and actions shall be kept, including field quality control.
 - .11 A system by which the *Owner* and the *Consultant* shall be afforded access to manufacturing areas and quality records and issued with copies of pertinent drawings and manufacturing schedules.
- .3 Provide the *Owner* and the *Consultant* with regular Quality Assurance Reports for their information according to an agreed schedule.

1.3 Contractor's Field Quality Control

- .1 Provide and be responsible for field quality control throughout the *Work*, including quality control of *Subcontractors* and major *Suppliers*.
- .2 Ensure that the only specified or approved *Products* and materials are used.
- .3 Provide and maintain an effective quality control program, in accordance with the Quality Assurance Program, and perform inspections and tests to ensure compliance with *Contract Documents*.
- .4 Furnish appropriate facilities, instruments, and testing devices required for performance of the quality control function.
- .5 Deliver inspection testing reports or approvals in accordance with the requirements of Section 01 45 00.
- .6 Develop a field quality control manual covering field installation. The form of the manual shall be acceptable to the *Owner* and the *Consultant*. This manual will document field quality control practices of the *Contractor*, *Subcontractors*, and major *Suppliers*. The manual shall include, but not be limited to:
 - .1 Concrete slab moisture and pH testing and surface preparation, including flatness and levelness.
 - .2 Surface preparation.
 - .3 Fastener and anchor installation.
 - .4 Material compatibility testing.
 - .5 On line fabrication quality control practices.
 - .6 Shipping.
 - .7 Field installation.
 - .8 Field inspection and testing by *Contractor*.
 - .9 Field inspection and testing independent.
- .7 Inspection and testing shall be performed by company qualified to perform the inspections or tests specified or required by the building code, regulations, by-laws, or authorities having jurisdiction.

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- .8 Retain and pay for inspection and testing that is for *Contractor's* own quality control or is required by regulatory requirements
- .9 Maintain a logbook (copies to be provided to the *Consultant* at completion of fabrication) documenting date, time, results, and significance of in-plant testing carried out, where applicable, linked to daily production. The form of this logbook shall be acceptable to the *Owner* and the *Consultant*.

1.4 Subcontractor Qualification Statements

- .1 Upon request by the *Consultant*, submit proof, in the form of CCDC 11 - Contractor's Qualification Statement, of qualifications of *Subcontractors* to verify *Subcontractor's* qualifications and experience meet or exceed the requirements of the *Contract Documents*.
 - .1 If, upon review of the Contractor's Qualification Statement, it is found that the *Subcontractor* does not meet the qualification requirements specified in the *Contract Documents* pertaining to the parts of the *Work* for which the *Subcontractor* has been retained, the *Contractor* shall replace the unqualified *Subcontractor* with a qualified *Subcontractor*, satisfactory to the *Contractor* and the *Owner*, at no additional cost to the *Owner* and at no increase in the *Contract Time*.

1.5 Independent inspection and Testing – Owner's Quality Assurance

- .1 Independent inspection and testing services are used by the *Owner* to verify compliance with requirements of the *Contract Documents*.
- .2 Employment of inspection and testing agencies by *Contractor* or *Owner* does not relieve *Contractor* from responsibility to perform the *Work* in accordance with *Contract Documents*.
 - .1 Independent inspection and testing services do not relieve the *Contractor* of responsibility for normal shop and site inspection, and quality control of manufacturing and installation.
 - .2 Specified tests, inspections, and related actions do not limit the *Contractor's* other quality assurance and control procedures that facilitate compliance with the *Contract Documents* requirements.
 - .3 Requirements for the *Contractor* to provide quality control services required by the *Contract Documents*, *Consultant*, *Owner*, or authorities having jurisdiction are not limited by *Owner's* independent inspection and testing services.
 - .4 Inspections and tests specified or required that are not specified as independent inspection and testing are the responsibility of the *Contractor* and are not covered under the *Owner's* quality assurance requirements.
 - .5 Magnetic and RF shielding:
 - .1 An independent inspector (ETS-Lindgren) will inspect and test the magnetic & RF shielding once installed. Electrical inspections of the halcyon are the responsibility of the *Contractor* and are to be coordinated through them.
- .3 The *Owner* will appoint independent inspection and testing companies, representing, reporting and responsible to the *Owner*. Payment will be by *Owner*, unless otherwise specified.

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- .4 Additional inspection and testing required because of changes in materials proposed by *Contractor* or *Subcontractors*, by lack of proper notice for inspection and testing specified, or required as a result of failure of such materials to meet requirements of the *Contract Documents* when originally tested, shall be carried out at no additional cost to the *Owner*.
- .5 Inspection and testing required by codes or ordinances, or by an authority having jurisdiction, and made by a legally constituted authority, shall be the responsibility of the *Contractor* and shall be paid for by the *Contractor*, is not part of the *Owner's* quality assurance requirements, and shall not be paid by *Owner*, unless otherwise specified in the *Contract Documents*.
- .6 Inspection or testing performed exclusively for *Contractor's* convenience shall be sole responsibility of *Contractor*, is not part of the *Owner's* quality assurance requirements, and shall not be paid by *Owner*.
- .7 Independent inspection and testing shall be performed by company qualified to perform the inspections or tests specified or required.
- .8 Requirements of regulatory companies:
 - .1 Testing shall be conducted in accordance with requirements of the building code.
 - .2 Obtain certification where required by the building code and standards.
- .9 Cooperation with independent inspection and testing companies:
 - .1 Provide independent inspection and testing companies with materials and installation information as required and/or requested.
 - .2 Submit test samples required for testing.
 - .3 Cooperate with independent inspection and testing companies and give adequate notification of any changes in source of supply, additional work shifts, and other proposed changes.
 - .4 Provide access to the *Work* for independent inspection and testing companies wherever the *Work* is in progress, or wherever *Products*, materials, or equipment are stored prior to shipping.
 - .5 Provide labour, *Construction Equipment*, and temporary facilities required to assist independent inspection and testing companies in sampling and making tests.
- .10 Inspection and test specimens:
 - .1 Inspection and testing will, generally, consist of procedures listed in the following paragraphs, but additional tests may be performed as required to verify conformance to *Contract Documents*.
 - .2 Specimens and samples for testing, unless otherwise specified in the *Contract Documents*, shall be taken by the independent inspection and testing company; sampling equipment and personnel shall be provided by the independent inspection and testing company; and deliveries of specimens and samples to the testing company shall be performed by the testing company unless otherwise specified.
 - .3 Independent inspection and testing company shall take samples necessary to verify quality as specified. Taking of samples shall not endanger the structure or life safety, and shall be taken so as to best represent the *Work* as a whole.

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- .4 Samples shall be handled, packaged, stored and delivered in accordance with specified tests. Sample handling where required shall duplicate conditions at the *Place of the Work* (such as site-cured concrete cylinders).
- .11 Where evidence exists that defective workmanship may have occurred, or that the *Work* may have been carried out incorporating defective materials, or where tests demonstrate that installed conditions do not comply with the requirements of the *Contract Documents*, the *Consultant* reserves the right to have additional inspections, tests, analysis, and surveys performed in order to help determine the extent of defect and whether such work must be replaced. Inspections, tests, and surveys carried out under these circumstances will be made at the *Contractor's* expense, and will not be paid by *Owner*, unless the results indicate that the work so tested, inspected or surveyed is not defective or that, in *Consultant's* opinion, the work so tested, inspected, or surveyed may be accepted, in which case tests, inspections or surveys will be paid by *Owner*.
- .12 Repair work damaged as a result of independent inspection and testing work.

1.6 Inspection and Testing Schedule

- .1 Prepare schedule for inspection and testing company services in accordance with Section 01 32 00 and as follows:
 - .1 Establishing schedule:
 - .1 By advance discussion with the selected independent inspection or testing company, determine the appropriate time necessary to perform the required services and to issue related reports.
 - .2 Allow for required time within construction schedule.
 - .2 Adherence to schedule:
 - .1 *Contractor* shall advise independent inspection and testing companies in advance when inspection and testing of the *Work* is required.
 - .1 Amount of advance notice shall be as required by the independent inspection and testing company, but shall be no less than 2 *Working Days*.
 - .2 When independent inspection and testing company is ready to perform inspection and testing according to predetermined schedule, but is prevented from inspection and testing or taking specimens due to incompleteness of the parts of the *Work* scheduled for inspection and testing, extra costs for inspection and testing attributable to the delay may be back-charged to *Contractor* at no additional cost to the *Owner*.
 - .3 Notify independent inspection and testing company at least 3 *Working Days* before work required to be inspected commences, and arrange for a meeting at the *Place of the Work*, to be held 1 *Working Day* before the work starts with the following present:
 - .1 The *Contractor*, and the *Subcontractor* responsible for the work to inspected and/or tested, the inspection and testing company representatives, the product manufacturer's representative when required, and the *Consultant*.
 - .4 For inspection and testing required by *Contract Documents* or by authorities having jurisdiction, provide *Consultant* and inspection and testing agencies with timely notification in advance of required inspection and testing.

Quality Requirements

- .5 Give 2 *Working Days*' prior notice to independent inspection and testing company of the commencement of each phase of the *Work* requiring inspection, and provide independent inspection and testing company with materials and installation information.

1.7 Reports and Documents

- .1 Inspection and testing company, whether for Owner's quality assurance or for *Contractor's* quality assurance, shall submit shop inspection and site inspection reports within 5 *Working Days* of each inspection.
- .2 Distribute reports digitally as follows:
 - .1 *Owner*.
 - .2 *Consultant*.
 - .3 *Contractor*.
 - .4 Consulting engineers, as applicable.
- .3 Inspection and testing companies, whether for *Owner's* quality assurance or for *Contractor's* quality assurance, shall submit a written report for each inspection or test, including pertinent data such as conditions at the *Place of the Work*, dates, test references, locations of tested materials, actual *Product* identification, testing methodology, procedures, and descriptions, site instructions given, recommendations and/or any other information required by standard applicable to reporting of tests and inspections.
 - .1 Report shall clearly indicate failure of *Product* or procedures to meet applicable standards, give recommendations for retesting or correction. Inspector shall contact *Contractor* and *Consultant* immediately when *Product* or assembly fails to meet requirements of the *Contract Documents*.
- .4 Upon completion of portions of the *Work* subject to inspection and testing, whether for *Owner's* quality assurance or for *Contractor's* quality assurance, submit to the *Consultant* duplicate certificates of acceptance of the installation issued by the inspection and testing company.

1.8 Manufacturer's Field Review

- .1 Where manufacturer's field review is specified, manufacturer's representative shall review the relevant parts of the *Work* at the *Place of the Work*, or wherever such affected work is in progress, to verify that the relevant parts of the *Work* are being executed in accordance with manufacturer's written requirements and verify their product is fit for the purpose intended.
- .2 Manufacturer's field review is to verify that the *Products* specified are being used in the *Work* and are being applied on surfaces prepared in accordance with manufacturer's written requirements and the requirements of the *Contract Documents*.
- .3 Unless otherwise indicated, manufacturer's representative shall undertake a minimum of 3 field reviews, with additional reviews as required by the manufacturer, to verify that the relevant parts of the *Work* are in accordance with the manufacturer's written requirements.
- .4 Manufacturer's representative shall submit a type-written report on manufacturer's letterhead after each field review following procedures for reports and documents specified in Section 01 45 00. Report shall document manufacturer's representative's field observations and recommendations.

Quality Requirements

1.9 Mock-Ups

- .1 Provide field or shop erected example of work complete with specified materials and workmanship.
- .2 Provide field or shop erected mock-ups of *Work* as specified in the *Specifications*. If a mock-up location is not indicated in the *Drawings* or *Specifications*, locate where directed by *Consultant*.
- .3 Do not proceed with work for which mock-ups are required prior to *Consultant's* review of mock-ups.
- .4 Modify mock-up as required until *Consultant* written acceptance is obtained.
- .5 Protect and maintain mock-ups until directed to be removed.
- .6 Commence work demonstrated in mock-up only after review and acceptance of workmanship.
- .7 Remove mock-ups only when the *Work* they represent is complete or when otherwise directed by *Consultant*.
- .8 If possible, mock-up may become part of finished work, at sole discretion, and with prior written acceptance of *Consultant*.
- .9 Reviewed and accepted mock-ups shall be the standard of workmanship and material against which installed work will be compared.
- .10 Remove and replace materials or assemblies appearing in the finished work that do not match reviewed and accepted mock-ups.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Temporary Utilities

PART 1 - GENERAL

1.1 Section Includes

- .1 Temporary utilities - general.
- .2 Temporary electrical services.
- .3 Temporary water supply.
- .4 Temporary heating and ventilation.

1.2 Temporary Utilities - General

- .1 Provide temporary utilities as specified and as otherwise necessary to perform the *Work* expeditiously.
- .2 Remove temporary utilities after use.
- .3 Existing services:
 - .1 Do not use any existing services and facilities during construction unless specific written permission is provided by *Owner*.
 - .2 Connections to existing services will be made and monitored by *Owner*.
 - .3 Protect and maintain without interruption, existing water, heating, drainage, and other services within the *Place of the Work* to existing buildings not within the scope of the *Work* of this *Contract*. Obtain written permission of the *Owner* for services required to be temporarily shut off, at least 2 full *Working Days* in advance.
 - .4 Do not use permanent mechanical, or electrical systems during the course of the *Work* unless specific written permission is provided by the *Consultant*. Use of permanent services for temporary construction service shall not prejudice warranties.

1.3 Temporary Electrical Services

- .1 Provide and maintain an adequate temporary electrical service for performance of the *Work* including, but not limited to, operation of electric pumps, motors, vibrators and other power tools, hoisting and related construction and general illumination during the *Work*.
 - .1 Use existing electrical service into building. *Owner* will pay electrical bills.
 - .2 Do not use new building power systems during construction without prior written authorization from *Consultant* and *Owner*.
- .2 Provide and maintain any components and equipment necessary to transform supply power to necessary temporary power voltage.

1.4 Temporary Water Supply

- .1 Provide and maintain a temporary supply of water for use in the *Work*.
 - .1 Use existing water supply. *Owner* will pay water bills.
- .2 Extend supply pipe or pipes from nearest available sources and maintain in good condition until permanent system is installed and ready for use.

Temporary Utilities

1.5 Temporary Heating and Ventilation

- .1 Provide and pay for temporary heating, cooling and ventilating required for the *Work*, including attendance, maintenance and fuel.
- .2 Provide temporary heat and ventilation as required to:
 - .1 Facilitate continuous uninterrupted progress of the *Work*.
 - .2 Protect the *Work* and *Products* against damage and defacement caused by weather, harmful levels of temperature, humidity, and moisture.
 - .3 Protect the *Work* against dampness and cold.
 - .4 Prevent moisture condensation on surfaces, freezing, or other damage to finishes or stored *Products*.
 - .5 Provide ambient temperatures and humidity levels for proper storage, installation and curing of materials, in accordance with specified standards and manufacturer's requirements.
 - .6 Provide adequate ventilation to meet health regulations for safe working environment.
- .3 Prior to enclosing building, maintain work areas at not less than 7°C. After enclosing, keep premises heated to at least 13°C using temporary heating devices that do not cause moisture and humidity build-up within the facility. Increase temperatures in isolated areas to 20°C as required by various sections of the *Specifications* or by *Product* manufacturers.
- .4 Solid fuel salamanders will not be permitted.
- .5 Provide temporary heat or adequate protection by means of straw or other coverings to floor slabs, footings, or any part of building not specifically designed to withstand frost penetration.
- .6 Furnish other temporary heating as required by various sections of the *Specifications* or by *Product* manufacturers.
- .7 Ventilate to the exterior of the building work areas as required when toxic materials are being utilized or cured.
- .8 Replace with new, any work damaged due to failure to provide adequate heat at no cost to *Owner*.

PART 2 - PRODUCTS

Not applicable.

PART 3 – EXECUTION

Not applicable.

END OF SECTION

Temporary Facilities

PART 1 - GENERAL

1.1 Section Includes

- .1 General scope and responsibility.
- .2 Parking.
- .3 Temporary sanitary facilities.
- .4 Temporary site office.
- .5 Temporary telephone and Wi-Fi.
- .6 Fire protection.
- .7 Temporary site storage.
- .8 Traffic Control and Road Maintenance.
- .9 Signs and notices.

1.2 General Scope and Responsibility

- .1 Temporary facilities specified in this section shall be supplemented as applicable in accordance with Section 01 35 13.
- .2 Arrange, obtain and pay cost for permits required for temporary facilities and controls.
- .3 Provide and maintain temporary facilities for the *Work* and remove them from the *Work* upon issuance of certificate of *Substantial Performance of the Work*.
- .4 Do not use permanent facilities during the course of the *Work* unless specific written permission is provided by the *Consultant*. Where use of permanent facilities is granted for temporary construction service, such use of permanent facilities shall not prejudice warranties.

1.3 Construction Parking

- .1 Parking for workers shall not be made available by the *Owner*.
- .2 Do not interfere with the operation of existing premises. Keep existing parking areas and road system remain free and clear of obstructions resulting from the *Work*.
- .3 Illegally parked vehicles that are ticketed and/or towed shall be the sole responsibility of the vehicle owner.

1.4 Temporary Sanitary Facilities

- .1 The *Owner* will designate existing washrooms for use of workers.
 - .1 Regularly maintain and clean these washroom facilities, in compliance with applicable regulations, codes and by-laws, for the duration of the *Work*.
 - .2 At *Substantial Performance of the Work*, turn over to *Owner*, clean washroom facilities, in same condition facilities were prior to commencement of the *Work*. Arrange and pay for repairs, making good and replacement if necessary, as directed by *Consultant*.

Temporary Facilities

- .3 Provision of such access to existing washrooms does not relieve the *Contractor* of the responsibility to provide and maintain, in compliance with applicable regulations, codes and by-laws, sufficient sanitary temporary water closets and washbasins for use of workers as required by applicable regulations, codes and by-laws. Additional sanitary temporary water closets and washbasins for use of workers, as required, shall be provided by the *Contractor* at no increase in the *Contract Price*.

- .2 Use of new sanitary facilities by workers is prohibited.

1.5 Temporary Site Offices

- .1 *Owner* might make available to *Contractor* a designated space within existing building for use as temporary site office of sufficient size to accommodate site meetings. Coordinate with the *Owner* the availability and location of site office. If the space within existing building is not available, provide heated, lighted, air conditioned and ventilated site office, of sufficient size to accommodate site meetings. Furnish with meeting table and chairs, drawing layout table, filing cabinets, telephone, and Wi-Fi as described below.

1.6 Temporary Telephone and Wi-Fi

- .1 Provide and maintain a telephone in temporary site office for exclusive use of *Consultant*, *Contractor*, and *Subcontractors*. Pay phone is not acceptable.
- .2 Superintendent shall be equipped with mobile telephone device.
- .3 Long distance charges shall be paid by party making call.
- .4 Provide and maintain internet access for the *Consultant* and other guests through a high bandwidth WiFi hub capable of supporting traffic with 50 connected devices simultaneously; provide for the use of the *Consultant* a WiFi enabled colour printer capable of printing 11" x 17" format.

1.7 Fire Protection

- .1 Provide and maintain temporary fire protection systems and equipment during construction.

1.8 Temporary Site Storage

- .1 Handle and store materials so as to prevent damage or defacement to the *Work* and surrounding property.
- .2 Construct weather-tight storage sheds for storage of materials that may be damaged or defaced by weather. Provide floors raised 150 mm (6") clear of ground for storage of *Products*.
- .3 *Owner* is not responsible for securing *Products* or materials at the *Place of the Work*.

1.9 Traffic Control and Road Maintenance

- .1 Provide and maintain adequate access to *Place of the Work*.
- .2 Do not block roads or impede traffic. Keep construction traffic to designated roads only. Provide flagperson to direct traffic as required.
- .3 Provide a hard surface area at the *Place of the Work* for cleaning down trucks prior to entry onto municipal roads or private roads outside of the *Place of the Work*.

Temporary Facilities

- .4 Keep public and private roads free of dust, mud and debris resulting from truck, machinery and vehicular traffic related specifically to this *Project*, for the duration of *Work*.
- .5 Clean roads regularly, public or private. Wash down and scrape flush roads at least daily when earth moving operations take place. Maintain public property in accordance with requirements of authorities having jurisdiction.

1.10 Signs and Notices

- .1 *Consultant* signs:
 - .1 Install at the *Place of the Work* corporate signs as provided by *Consultant*.
 - .2 Location of sign: In prominent location to *Consultant's* acceptance.
 - .3 Mount sign on suitable supports.
- .2 No other signs or advertisements, other than safety, warning, or directional signs, are permitted without *Consultant's* prior approval.

PART 2 - PRODUCTS

Not applicable.

PART 3 – EXECUTION

Not applicable.

END OF SECTION

Temporary Barriers and Enclosures

PART 1 - GENERAL

1.1 Section Includes

- .1 General scope and responsibility.
- .2 Temporary enclosures and protection.
- .3 Protection of the public.
- .4 Protection of the *Work*.

1.2 General Scope and Responsibility

- .1 Temporary facilities and controls specified in this section shall be supplemented as applicable in accordance with Section 01 35 13.
- .2 Provide and maintain signs, guard-rails, barriers, warning lights and other protection as required by authorities having jurisdiction for safety of the *Place of the Work*. Be responsible for adequacy of protection.
- .3 Plant, Machinery and Scaffolding:
 - .1 Provide formwork, scaffolding, equipment, tools, machinery and incidental appurtenances necessary for the proper execution of the *Work*.
 - .2 Erect plant, machinery and scaffolding to permit access to building and the *Work*.
 - .3 Use scaffolds in such manner as to interfere as little as possible with other trades' operations.
 - .4 Support scaffolds from finished surfaces only after taking precautions to prevent damage. No supports, clips, brackets, or similar devices shall be welded, bolted, or otherwise affixed to any finished member or surface without prior permission.
- .4 Maintain temporary barriers and enclosures in good condition for the duration of the *Work*.
- .5 Remove temporary barriers and enclosures from *Place of the Work* when no longer required.

1.3 Temporary Enclosures and Protection

- .1 Provide temporary enclosures and protection of adequate construction to prevent dispersion of dust and dirt into other areas of existing building and to prevent dispersion of dust and dirt beyond the *Place of the Work*.
- .2 Provide temporary weather-tight enclosures and protection for exterior openings in building as soon as walls, floors and roofs are built so as to protect the *Work* from weather and vandalism. Provide doors in enclosures as necessary to maintain fire exits.
- .3 Erect, maintain, and relocate enclosures as required to facilitate construction operations and *Owner's* operational requirements.
- .4 Temporary enclosure and protection shall be of finished appearance and painted to colour approved by *Owner*.
- .5 Provide dust seal and sound resistant enclosures to protect existing building and operations as indicated. Include temporary doors, fastenings and keys.
- .6 Insulate and airseal exterior enclosures to prevent condensation and drafts.

Temporary Barriers and Enclosures

1.4 Protection of the Public

- .1 Provide fencing, barricades, hoarding, notices and warning boards and maintain lights and signals for protection of workers engaged on the *Work*, for protection of adjoining property and for protection of the public.
- .2 Where any special hazard exists from which it is not possible to protect the public safety by other means, watchpersons shall be employed to preserve public safety until the area of special hazard no longer poses a risk to public safety.

1.5 Fire Routes

- .1 Maintain fire access routes, including overhead clearances, for use by emergency response vehicles.

1.6 Protection of the Work

- .1 Protect the *Work* from damage, discolouring, and defacement. Maintain protection until the *Work* is complete.
- .2 Provide necessary temporary barriers and enclosures to protect existing surfaces from damage during performance of the *Work*.
- .3 Have damaged or defaced work corrected by workers meeting qualification requirements of the *Contract Documents*.

PART 2 - PRODUCTS

Not applicable.

PART 3 – EXECUTION

Not applicable.

END OF SECTION

Temporary Controls

PART 1 - GENERAL

1.1 Section Includes

- .1 General scope and responsibility.
- .2 Security.
- .3 Moisture control.
- .4 Pest control.
- .5 Dust, debris and noise control.
- .6 Pollution control.

1.2 General Scope and Responsibility

- .1 Temporary controls specified in this section shall be supplemented as applicable in accordance with Section 01 35 13.
- .2 Arrange, obtain and pay cost for permits required for temporary controls.
- .3 Provide temporary controls as necessary for performance of the *Work* and in compliance with applicable regulatory requirements.
- .4 Maintain temporary controls in good condition for the duration of the *Work*.
- .5 Remove temporary controls and *Construction Equipment* used to provide temporary controls from *Place of the Work* when no longer required.

1.3 Security

- .1 The *Contractor* shall be solely responsible for securing the *Place of the Work* and the *Work*, and for securing areas used for the storage of *Products* or construction machinery and equipment. The *Owner* shall have no responsibility in this regard.
 - .1 Provide and maintain security lighting.
 - .2 Provide and maintain temporary locks. Premises to be locked after working hours.
- .2 Provide security for the *Place of the Work* by methods compatible with the security system for the existing building.
 - .1 *Contractor* shall coordinate the work carefully with the *Owner* in order to ensure no disruption to the existing building's security system.
 - .2 Where existing building's security system is breached due to *Contractor's* negligence, be responsible for any damage or theft of property, regardless if area where damage or theft occurred is under *Contractor's* control or not.

1.4 Moisture Control

- .1 Concrete slabs shall be properly cured and dried before installation of finished flooring assemblies.
 - .1 Allow for one of the following methods:
 - .1 Drying time.
 - .2 Drying action by mechanical methods.

Temporary Controls

- .3 Moisture mitigation coating as specified below.
- .4 Drying action by other method and/or materials as approved by affected flooring manufacturer.
- .2 Before installation of weather barriers, when materials are subject to wetting, protect as follows:
 - .1 Protect porous materials from water damage.
 - .2 Protect stored and installed material from flowing or standing water.
 - .3 Keep porous and organic materials from coming into prolonged contact with concrete.
 - .4 Remove standing water from decks.
 - .5 Keep deck openings covered or dammed.
- .3 After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture, protect as follows:
 - .1 Do not load or install gypsum board or other porous materials or components, or items with high organic content, into partially enclosed building.
 - .2 Keep interior spaces reasonably clean and protected from water damage.
 - .3 Periodically collect and remove waste containing cellulose or other organic matter.
 - .4 Discard or replace water-damaged material.
 - .5 Do not install material that is wet.
 - .6 Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- .4 After completing and sealing of the building enclosure but prior to the full operation of permanent heating, ventilation, and air conditioning systems, maintain as follows:
 - .1 Control moisture and humidity inside building by maintaining effective drying conditions.
 - .2 Use permanent heating, ventilation, and air conditioning system to control humidity subject to the prior written approval of the *Consultant*.
 - .3 Comply with manufacturer's written requirements for temperature, relative humidity, and exposure to water limits.

1.5 Pest Control

- .1 Provide rodent control and other pest control programs during the *Work* in accordance with the requirements of authorities having jurisdiction.

1.6 Dust, Debris and Noise Control

- .1 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .2 Control dust and dirt produced during the *Work* to prevent dispersion beyond the immediate work areas.
- .3 Prevent materials from contaminating air beyond application area, by providing temporary enclosures and ventilation/filtration.

Temporary Controls

- .4 Implement and maintain dust and particulate control measures in accordance with applicable regulatory requirements.
- .5 Execute *Work* by methods that minimize dust from construction operations and spreading of dust on site or to adjacent properties.
- .6 Provide temporary enclosures to prevent extraneous materials resulting from sandblasting or similar operations from contaminating air beyond immediate work area.
- .7 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .8 Use appropriate covers on trucks hauling fine, dusty, or loose materials.
- .9 Limit noise levels in accordance with requirements of authorities having jurisdiction and the *Owner*.
- .10 Prevent abrasive-blasting, pressure-washing spray, and other extraneous materials from contaminating air beyond application area.

1.7 Pollution Control

- .1 Prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.
- .2 Be prepared, by maintaining appropriate materials, equipment, and trained personnel on site, to intercept, clean up, and dispose of spills or releases that may occur. Promptly report spills and releases that may occur to:
 - .1 Authority having jurisdiction.
 - .2 Person causing or having control of pollution source, if known.
 - .3 *Owner* and *Consultant*.
- .4 Take immediate action to contain and mitigate harmful effects of the spill or release.

PART 2 - PRODUCTS

Not applicable.

2.1 Moisture Mitigation Coating

- .1 100% solids epoxy one coat system, 0 VOC, suitable for application to 100% RH floors per ASTM F2170-19a, designed to protect moisture sensitive adhered flooring systems from elevated moisture and alkalinity levels, warranted by manufacturer to cover subsequent flooring materials and labour, compatible with finish flooring products.
- .2 ASTM E96/E96M-16 water vapour transmission (wet methods) performance shall be documented by independent testing laboratory at a minimum 97% for water vapour transmission reduction compared to untreated concrete.
- .3 ASTM E96/E96M-16 perm rating shall not exceed a 0.10 Perm rating.
- .4 ASTM D1308-02(2013) insensitivity to alkaline environment up to, and including, pH 14 in a 14 day bath test.
- .5 Manufacturer certifies acceptance and exposure to continuous topical water exposure after final cure.

Temporary Controls

- .6 Water vapour reduction system shall be a single coat, stand alone system with no requirements for additional components such as sand broadcast for adhesion of flooring systems.
- .7 System shall reduce Calcium Chloride readings of up to 25lbs/1000 ft²/24 hrs by 97% in one coat. System must be able to perform as required with RH Probe readings of 100%.
- .8 Acceptable manufacturers that provide *Products* which are known to meet above performance criteria as follows:
 - .1 Koster American Corporation as distributed by DRE Industries.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

Not applicable.

3.1 Moisture Mitigation Coating

- .1 Preparation and installation shall be in accordance with manufacturer's written requirements.
- .2 Field quality control:
 - .1 Conduct quality control in accordance with Section 01 45 00
 - .1 Field tests and inspections:
 - .1 Test for moisture vapour transmission in accordance with ASTM F710-22 and ASTM F1869-23 or ASTM F2170-19a in accordance with manufacturer's written flooring installation requirements. Results must not exceed 170 µg/m² (3 pounds per 1,000 square feet) in 24 hours when tested to ASTM F1869-23, or exceed 75% when tested to ASTM F2170-19a.
 - .2 Test for surface pH. Levels of pH shall not exceed the written recommendations of the flooring manufacturer and adhesive manufacturer. Test in accordance with ASTM F710-22.
 - .3 For each test type: Conduct 3 tests for flooring applications up to 93 m² (1000 square feet) in area, and 1 additional test for each additional 93 m² (1000 square feet) of flooring area.
 - .4 Testing shall be conducted by independent inspection and testing company and in accordance with Section 01 45 00.
 - .2 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

Product Requirements

PART 1 - GENERAL

1.1 Section Includes

- .1 Availability of *Products*.
- .2 *Product* handling.
- .3 *Product* requirements and quality.

1.2 Availability of Products

- .1 Promptly upon *Contract* award and periodically during construction, review and confirm *Product* availability and delivery times. Order *Products* in sufficient time to meet the construction progress schedule and the *Contract Time*.
 - .1 Failure to order a specified *Product* or to order a *Product* by a specified manufacturer in adequate time to meet construction progress schedule shall not be considered a valid reason for a *Product* substitution in accordance with Section 01 25 00.
 - .2 In the event of delays in supply of *Products* as a result of failure to order a specified *Product* or order a *Product* by a specified manufacturer in adequate time to meet construction progress schedule, and should it appear that the *Work* may be delayed for such reason, *Consultant* reserves the right to substitute more readily available *Products* of similar character, at no additional cost to the *Owner*.
- .2 If a specified *Product* is no longer available, promptly notify the *Consultant*. The *Consultant* shall take action as required.

1.3 Product Handling

- .1 Handle and store *Products* in accordance with manufacturer's and *Supplier's* written requirements to prevent damage, adulteration, deterioration, and soiling and to preserve their quality and fitness for the *Work*.
 - .1 Submit manufacturer's and *Supplier's* written requirements for handling and storage of their *Products*.
 - .2 Where manufacturer or *Supplier* does not have written handling and storage requirements already published, submit written requirements for handling and storage of their *Products* prepared for the *Work* by the *Product* manufacturer or *Supplier*, as applicable.
 - .3 Submit following procedures for submittal of *Product* data sheets in accordance with Section 01 33 00.
- .2 Protect stored *Products* from vandalism and theft.
- .3 Store packaged or bundled *Products* in original and undamaged condition with manufacturer's seals and labels intact, facing to outside. Do not remove from packaging or bundling until required in the *Work*.
- .4 Store materials susceptible to environmental damage in a weathertight enclosure raised clear of ground so that they are protected from weather, dampness, and deterioration. Do not use materials which have been damaged by exposure to moisture.

Product Requirements

- .5 Keep sand, when used as ingredients for grout, mortar, or similar mixed materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber, and other similar *Products* on flat, solid supports and keep clear of ground or slab. Slope to shed moisture.
- .7 Handle materials to prevent damage to existing surfaces and work of others.
- .8 Remove damaged *Products* and replace with new undamaged *Products*.
- .9 Transportation:
 - .1 Pay cost of transportation of *Products* required in performance of *Work*.
 - .2 Transportation cost of *Products* supplied by *Owner* will be paid for by *Owner*. Unload, handle and store such *Products* at the *Place of the Work*.
 - .3 Reject *Products* damaged during transport.
 - .4 Transportation of *Products* shall be undertaken to suit construction schedule.

PART 2 - PRODUCTS

2.1 *Product Requirements and Quality*

- .1 Compatibility of options: If given option of selecting between two or more *Products*, select *Product* compatible with products previously selected, even if previously selected products were also options.
 - .1 Unless otherwise indicated in the *Contract Documents*, maintain uniformity of *Product* and manufacturer for any like item, material, equipment or assembly for the duration of the *Work*.
- .2 *Products* used for temporary facilities may have been previously used, providing they are sound in structural qualities.
- .3 *Products* and *Product* installation shall be in compliance with building code, regulations and requirements of authorities having jurisdiction.
- .4 Specified options: The *Work* is based on materials, *Products* and systems specified by manufacturer's catalogued trade names, references to standards, by prescriptive *Specifications* and by performance *Specifications*.
 - .1 Wherever a *Product* or manufacturer is specified by a single proprietary name, provide the named *Product* only.
 - .2 Wherever more than one *Product* or manufacturer is specified by proprietary name for a single application, provide any one of the named *Product*.
 - .3 Wherever a *Product* is specified by reference to a standard only, provide any *Product* that meets or exceeds the specified standard. If requested by *Consultant*, submit information verifying that the proposed *Product* meets or exceeds the specified standard.
 - .4 Wherever a *Product* is specified by descriptive or performance requirements only, provide any *Product* that meets or exceeds the specified requirements. If requested by *Consultant*, submit information verifying that the proposed *Product* meets or exceeds the specified requirements.

Product Requirements

- .5 The onus is on the *Contractor* to prove compliance with governing published standards, prescriptive *Specifications* and with performance *Specifications*.
- .6 Visual selection *Specifications*:
 - .1 Where *Specifications* include the phrase "as selected by *Consultant* from manufacturer's full range" or similar phrase, select a product that complies with requirements. *Consultant* will select colour, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- .7 Visual matching *Specifications*:
 - .1 Where *Specifications* require "match *Consultant's* sample", provide a product that complies with requirements and matches *Consultant's* sample. *Consultant's* decision will be final on whether a proposed product matches.
- .5 Provide *Products* that are not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by *Consultant*, furnish evidence as to type, source and quality of *Products* provided.
 - .1 Defective *Products*, whenever identified prior to completion of the *Work*, will be rejected, regardless of previous reviews. Review of the *Work* by the *Consultant* or independent inspection and testing companies does not relieve the *Contractor* of the responsibility for executing the *Work* in accordance with the requirements of the *Contract Documents*, but is a precaution against oversight or error.
- .6 Basis of design:
 - .1 Where *Contract Documents* list "basis of design", this indicates the *Product* or system that was used in the preparation of the design included in the *Contract Documents*, and which shall be an acceptable *Product*.
 - .2 The basis of design establishes the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products from other manufacturers.
 - .3 The term "basis of design" does not preclude the use of other *Products* or systems in the *Work*, provided the proposed *Product* or system complies with the design and performance requirements contained in the *Contract Documents*.
 - .4 Proposals for use of *Products* or systems in the *Work* that are not the named "basis of design" must be submitted in accordance with the following procedures:
 - .1 Do not order or install any proposed *Products* or systems without a Supplemental Instruction.
 - .2 Provided a proposal includes the information specified in Section 01 60 00, *Consultant* will review submission, but in any case with the understanding that neither the *Contract Time* nor the *Contract Price* will be altered due to the time required by the *Consultant* to review the submission and by the *Contractor* to incorporate the proposed *Products* or systems in the *Work*.
 - .3 The proposed *Products* or systems shall be accepted by the *Consultant* if:

Product Requirements

- .1 The proposed *Products* or systems are the same type as, are capable of performing the same functions as, interfaces with adjacent work the same as, and meets or exceeds the standard of quality, performance and, if applicable, appearance and maintenance considerations, of the specified *Product* or system.
- .2 The manufacturer of the proposed *Products* or systems has capabilities comparable to the specified manufacturer.
- .4 If the proposed *Products* or systems are accepted, the change in the *Work* will be documented in the form of a *Supplemental Instruction*.
- .5 If the proposed *Products* or systems are accepted, *Contractor* shall not revert to an originally specified *Product* or manufacturer without *Consultant's* prior written acceptance.
- .6 Proposed *Product* or system submitted on *Shop Drawings* without following requirements of this section prior to submission of the affected *Shop Drawings* will cause the *Shop Drawings* to be rejected.
- .7 Include with each proposal the following information:
 - .1 Identification of the proposed *Product* or system, including *Product* name and manufacturer's name, address, telephone numbers, and web site.
 - .2 A statement verifying that the proposed *Product* or system will affect neither the *Contract Price* nor the *Contract Time*.
 - .3 A statement verifying that the proposed *Product* or system will not affect the performance or warranty of other parts of the *Work*.
 - .4 Manufacturer's *Product* literature for the proposed *Product* or system, including material descriptions, compliance with applicable codes and reference standards, performance and test data, compatibility with contiguous materials and systems, and environmental considerations.
 - .5 *Product* samples as applicable.
 - .6 A detailed comparison of the physical properties and performance characteristics of the basis of design *Product* or system and the proposed *Product* or system, with any significant variations clearly highlighted.
 - .7 Availability of maintenance services and sources of replacement materials and parts for the proposed *Product* or system, as applicable, including associated costs and time frames.
 - .8 Details of other projects and applications where the proposed *Product* or system has been used.
 - .9 Identification of any consequential changes in the *Work* to accommodate the proposed *Product* or system and any consequential effects on the performance of the *Work* as a whole. A later claim for an increase to the either the *Contract Price* or the *Contract Time* for other changes in the *Work* attributable to the proposed *Product* or system will not be considered.
 - .10 Confirmation of delivery schedule of the proposed *Product* or system, in writing by *Product* manufacturer.
 - .11 Compliance with the building codes and requirements of authorities having jurisdiction.

Product Requirements

- .12 Copy of manufacturer's warranty for any *Product* or system for which an extended warranty has been specified, along with copy of manufacturer's warranty for specified *Product* or system with differences highlighted.
- .7 Where *Contract Documents* require design of a *Product* or system, and minimum material requirements are specified, the design of such *Product* or system shall employ materials specified within applicable section. Where secondary materials or components are not specified, augment with materials meeting applicable code limitations, and incorporating compatibility criteria with adjacent work.
- .8 Should dispute arise as to quality or fitness of *Products*, the decision rests strictly with *Consultant* based upon the requirements of the *Contract Documents*.
- .9 *Products* exposed in the finished work shall be uniform in colour, texture, range, and quality, and be from one production run or batch, unless otherwise indicated.
- .10 *Owner* retains right to select from choices available within specified *Products* for colours, patterns, finishes or other options normally made available. Submit full range of *Product* options in accordance with Section 01 33 00 for such selection.
- .11 Exposed to weather: *Products* and materials in environments not protected by the building's HVAC and/or climate control systems shall be considered exposed to weather.

PART 3 – EXECUTION

Not applicable.

END OF SECTION

Examination and Preparation

PART 1 - GENERAL

1.1 Section Includes

- .1 Examination of the *Place of the Work*, documents, surfaces and conditions.
- .2 Public utilities and services.

1.2 Examination of the *Place of the Work*, Documents, Surfaces and Conditions

- .1 Examine the *Place of the Work* and investigate matters relating to the nature of the *Work*, means of access and egress, obstacles, rights and interests of other parties which may be interfered with during the execution of the *Work*, conditions and limitations including obstructions, existing structures or facilities, local conditions, actual levels, character and nature of the *Work*, documents related to existing building or buildings, as applicable and when available, and other consideration which may affect performance of the *Work*.
- .2 Examine the extent of work to be performed and matters which are referred to in the *Contract Documents* prior to start of the *Work*.
- .3 Examine work to which work is to be applied, anchored or connected, and relevant as-built conditions.
- .4 Each work operation following on a previous work operation of a differing *Subcontractor*, shall include a thorough examination of the condition of the previous work to verify that work is complete and in a condition suitable to receive the subsequent work. Conditions found unacceptable, either for the commencement of the new work or its satisfactory completion, shall be reported in writing to the *Consultant*.
- .5 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of *Products* used.
- .6 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.
- .7 Do not commence work until unsatisfactory conditions are corrected. Commencement of work shall mean acceptance of surfaces, tolerances, and conditions, and existing conditions will not be accepted as a contributing factor to subsequent failure or unacceptability of the *Work*.

1.3 Setting Out the *Work*

- .1 Assume full responsibility for and execute complete layout of the *Work* to required locations, lines and elevations.
- .2 Arrange meeting with *Consultant* to discuss critical setting out assumptions for the *Work* and establish limiting conditions for setting out the *Work*. *Consultant* shall chair and prepare minutes of the meeting, and prepare and submit sketches recording understanding of key setting out principles.
- .3 Provide devices needed to lay out and construct the *Work*.

PART 2 - PRODUCTS

Not applicable.

PART 3 – EXECUTION

Not applicable.

END OF SECTION

PART 1 - GENERAL

1.1 Section Includes

- .1 Concealed services.
- .2 Trademarks and labels.
- .3 Interferences.
- .4 Publicity releases and photographs.
- .5 Manufacturer's instructions.
- .6 Galvanic/dissimilar metal corrosion.
- .7 Workmanship.
- .8 General construction tolerances.

1.2 Inserts, Anchors, and Fasteners

- .1 Use only factory made, threaded or toggle type inserts as required for supports and anchors, properly sized for load to be carried.
- .2 Where inserts cannot be placed, use factory made expansion shields for light weights only.
- .3 Supply and locate inserts, holes, anchor bolts and sleeves during placement or fabrication of structural elements.
- .4 Fasteners stressed in withdrawal are not acceptable, except where otherwise indicated.
- .5 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to prevent direct contact.
- .6 Use non-corrosive fasteners and anchors for securing exterior work and in spaces where high humidity levels are anticipated.
- .7 Space anchors within individual load limit or shear capacity and install such that they provide positive permanent anchorage.
- .8 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .9 Fastenings for prefinished materials shall be of concealed type unless otherwise indicated, and when exposed finish is required, of matching prefinishing materials.
- .10 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.
- .11 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .12 Bolts shall not project more than one diameter beyond nuts.
- .13 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials being fastened.
- .14 Power actuated fasteners:

Execution

- .1 Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E1190-21 conducted by a qualified independent testing agency.
- .2 Do not use power actuated fasteners which are stressed in withdrawal in finished work.
- .3 Do not use power actuated fasteners within 100 mm (4") of the edge of concrete or masonry, unless otherwise accepted in writing by *Consultant*.
- .4 Do not use power actuated fasteners in post-tensioned concrete.

1.3 Penetrations

- .1 Holes or voids created in assemblies or partitions for penetrating mechanical, electrical, or sprinkler service items, shall be of sufficient size to accommodate the penetrating item as well as additional required fill materials, such as sealants, firestopping and smoke sealants, insulation, and the like, without exceeding the maximum opening allowable by the manufacturer of the additional required fill material.
- .2 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with firestopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

1.4 Concealed Services

- .1 Unless otherwise indicated, conceal pipes, ducts, and wiring in floors, walls, and ceilings in finished areas. Do not conceal until after:
 - .1 Review by *Consultant* and authority having jurisdiction.
 - .2 Recording actual locations on as-built drawings where locations differ from those shown on *Drawings*.
- .2 Provide incidental furring or other enclosures as required.
- .3 Notify *Consultant* in writing of interferences before installation.

1.5 Trademark and Labels

- .1 Trademarks and labels, including applied labels, shall not be visible in finished work in finished areas, unless otherwise accepted or indicated by *Consultant*, and except for trademarks and labels:
 - .1 That are essential to identify materials, systems, assemblies, and equipment for maintenance and replacement purposes.
 - .2 That are essential for life safety, fire resistance, and temperature rise ratings.

1.6 Interferences

- .1 Coordinate placement of equipment to ensure that components will be properly accommodated within spaces provided prior to commencement of the *Work*.
- .2 Take complete responsibility for remedial work that results from failure to coordinate aspects of work prior to its fabrication/installation.

Execution

- .3 Maintain accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment in layout of equipment and services, Notify *Consultant* if indicated clearances are in conflict.
- .4 Prepare coordination and interference drawings in accordance with Section 01 31 00.

1.7 Publicity Releases and Photographs

- .1 No press or publicity releases, including photographs of the *Place of the Work*, will be permitted without prior written approval of the *Owner*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Manufacturer's Instructions

- .1 Install, erect, or apply *Products* in accordance with manufacturer's written requirements. Do not rely on labels or enclosures supplied with *Products*. Obtain written requirements directly from manufacturers.
- .2 Notify *Consultant*, in writing, of conflicts between *Contract Documents* and manufacturer's instructions where, in *Contractor's* opinion, conformance with *Contract Documents* instead of the manufacturer's instructions may be detrimental to the *Work* or may jeopardize the manufacturer's warranty.
- .3 Improper installation or erection of *Products*, due to failure in complying with these requirements, shall result in removal and re-installation of such *Products* as part of the *Work* at no additional cost to the *Owner*.
- .4 Provide manufacturer's representatives with access to the *Work* at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

3.2 Galvanic/Dissimilar Metal Corrosion

- .1 Insulate dissimilar metals from each other by suitable plastic strips, washers or sleeves, or other method in accordance with manufacturer's written requirements to prevent galvanic corrosion where conductive liquid or electrolyte exists or may reasonably be expected to exist.

3.3 Workmanship

- .1 General:
 - .1 Execute the *Work* using workers experienced and skilled in the respective duties for which they are employed.
 - .2 Do not employ an unfit person or anyone unskilled in their required duties.
 - .3 Remove *Products* or materials that have been broken, chipped, cracked, discoloured, abraded, or damaged during construction period and provide undamaged *Products* or materials meeting the requirements of the *Contract Documents*.
- .2 Coordination:

Execution

- .1 Ensure cooperation of workers in layout of the *Work*. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.
- .3 Backer plates:
 - .1 Provide backer plates to support and provide anchorage base to carry loads from surface or recessed applied materials.
- .4 Cutting and remedial work:
 - .1 Perform cutting and remedial work required to make parts of the *Work* come together. Coordinate the *Work* to ensure this requirement is maintained. Comply with requirements of Section 01 73 29.
 - .2 Notify *Consultant* of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required.
- .5 Location of fixtures:
 - .1 Locations of fixtures, access panels, outlets, and mechanical and electrical items indicated on *Drawings* are approximate only.
 - .2 Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements. Architectural drawings will relate these items to known dimensions, such as ceiling tile grid or wall locations and the like.
 - .3 Obtain *Consultant's* acceptance for precise locations of fixtures, access panels, outlets, mechanical, and electrical items.
 - .4 *Consultant* reserves the right to relocate electrical outlets and mechanical fixtures at a later date, but prior to installation, without cost, provided that the relocation per outlet does not exceed 3050 mm (10') from the original location.
 - .5 Promptly notify *Consultant* in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.
- .6 Protection of work in progress:
 - .1 Provide protection required by authorities having jurisdiction.
 - .2 Protect parts of the *Work* completed or in progress from soiling, abrasion, punctures, damage, and defacement, and maintain protection until the surrounding or overhead work is complete.
 - .3 Remove and replace materials damaged or defaced as a result of failure to provide adequate protection.
 - .4 Do not cut, drill, or sleeve any load bearing structural member without written permission of *Consultant*. Comply with requirements of Section 01 73 29.
 - .5 Do not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the safety or integrity of the *Work*.

Execution

- .6 Protect finished flooring from damage. Take special measures when moving heavy loads or equipment on them.
- .7 Keep surfaces free of oils, grease or other materials that may damage or deface them or affect bond of applied *Products*.
- .8 Protect existing buildings, curbs, roads and lanes. If, during the *Work*, any buildings, curbs, roads or lanes are damaged, bear costs for repairs.
- .7 Protection of mechanical and electrical *Products* or materials:
 - .1 Wrap in protective plastic and seal mechanical and electrical items and equipment prior to and during shipment, storage at the *Place of the Work* and after installation.
 - .2 Remove protective coverings only to the extent required for installation of the items. Re-install protection immediately following installation.
 - .3 Remove protective coverings in stages, as work areas are completed, or when directed by *Consultant*.
- .8 Operational requirements:
 - .1 Operable *Products* shall be provided fully operational and ready for intended use.
 - .2 Adjust operating hardware and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts for smooth squeak-free function, in accordance with manufacturer's requirements.
- .9 Alterations:
 - .1 Restore new or existing work which is altered as a result of the *Work* and *Make Good*.
 - .2 Materials and workmanship shall match existing materials and workmanship. Exposed materials shall match and blend in with the appearance of the existing undamaged surfaces in all respects including colours, textures, layout, jointing, and material types so as to not vary in appearance when compared to adjacent materials from a viewing distance of 1830 mm (6').

3.4 General Construction Tolerances

- .1 Match existing tolerances in every respect unless otherwise specified.
- .2 Where tolerances are not defined elsewhere in the *Contract Documents* or building code, construct the *Work* to the following tolerances:
 - .1 Maximum variation from plumb in vertical lines, surfaces of columns, walls, and arrises:
 - .1 6.4 mm (1/4") in 3 m (10 ft)
 - .2 9.6 mm (3/8") in a storey height not to exceed 6 m (20 ft)
 - .3 12.7 mm (1/2") in 12 m (40 ft) or more
 - .2 Maximum variation from plumb for external corners, expansion joints, and other conspicuous lines:
 - .1 6.4 mm (1/4") in any storey or 6 m (20 ft)
 - .2 12.7 mm (1/2") in 12 m (40 ft) or more

Execution

- .3 Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
 - .1 6.4 mm (1/4") in any bay or 6 m (20 ft)
 - .2 12.7 mm (1/2") in 12 m (40 ft) or more
- .4 Maximum variation from drawing location of columns, walls, and partitions:
 - .1 12.7 mm (1/2") in any storey or 6 m (20 ft)
 - .2 19 mm (3/4") in 12 m (40 ft) or more.
- .5 Maximum variation in cross-sectional dimension of columns and thicknesses of wall from dimensions indicated:
 - .1 Minus 6 mm (1/4")
 - .2 Plus 12.7 mm (1/2")
- .6 Maximum variation from plane or from straight:
 - .1 3.2 mm (1/8") in 3 m (10 ft) under a 3 m (10 ft) straight edge.
- .7 Maximum variation from angle indicated:
 - .1 10 seconds.
- .8 Tolerances shall be non-cumulative.

END OF SECTION

Cutting and Patching

PART 1 - GENERAL

1.1 Section Includes

- .1 Cutting, patching and remedial work.

1.2 Request for Cutting, Patching and Remedial Work

- .1 Submittal Items:
 - .1 Comply with administrative requirements of Section 01 33 00.
 - .2 Submit written request in advance of cutting, coring, and alteration that affects or is likely to affect:
 - .1 Structural integrity of any element of *Work*.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight-exposed elements.
 - .5 *Owner* or work of other contractors.
 - .6 Warranty of *Products* affected.
 - .3 Include in request:
 - .1 Identification of *Project*.
 - .2 Location and description of affected work, including drawings or sketches as required.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed work, and *Products* to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on *Owner* or work of other contractors.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be performed.
 - .9 Non-destructive structural survey: Location of reinforcement in concrete structure confirmed by non-destructive, positive method other than X-ray.
 - .4 Do not commence cutting, patching, or remedial work until request has been reviewed by *Consultant*.

PART 2 - PRODUCTS

2.1 Materials

- .1 Unless otherwise specified, when replacing existing or previously installed *Products* in the course of cutting and patching work, use replacement *Products* of the same character and quality as those being replaced.
- .2 If an existing or previously installed *Product* must be replaced with a different *Product*, submit request for substitution in accordance with Section 01 25 00.

Cutting and Patching

PART 3 - EXECUTION

3.1 Preparation

- .1 Inspect existing conditions in accordance with Section 01 71 00, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of the *Work*.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to maintain structural integrity of surroundings. Provide devices and methods to protect other portions of the *Work* from damage.
- .5 Provide protection from elements for areas which may be exposed by uncovering work.
- .6 Where uncovering of area exposes local deterioration, cracking, evidence of water infiltration, structural settlement, previous modifications, or other unexpected conditions, advise *Consultant* immediately in writing and leave conditions exposed until receipt of *Consultant's* written instructions. If area is exposed to the exterior, provide temporary protection from inclement weather.

3.2 Existing Services and Utilities

- .1 Protect, relocate, or maintain existing active services or utilities except where breaking into or connecting to them. When inactive services are encountered, cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service. Record location of services, including depth, on as-built drawings.
- .2 When breaking into or connecting to existing active services or utilities, execute the *Work* at times approved by *Owner*, with a minimum of disturbance to *Owner's* ongoing operations, the *Work*, and traffic. Give notice to authorities having jurisdiction as required by such authorities.
- .3 Keep duration of interruptions to a minimum.
- .4 Carry out interruptions outside regular working hours of occupants unless *Owner's* prior written approval is obtained.
- .5 Construct or erect barriers in accordance with Section 01 56 00 as required to protect pedestrian and vehicular traffic.

3.3 Cutting and Patching

- .1 Coordinate and perform the *Work* so that cutting and patching work is kept to a minimum.
- .2 Execute cutting, fitting, and patching to complete the *Work*. Under no circumstances will overcutting of corners of opening be accepted. Ensure corners of openings to be cut are predrilled or sawed.
- .3 Remove and replace defective and non-conforming work.
- .4 Remove samples of installed work for testing if directed by *Consultant*.
- .5 Provide openings in non-structural elements of the *Work* for penetrations of mechanical and electrical work.
- .6 Perform work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

Cutting and Patching

- .7 Employ qualified installer with at least 3 years of relevant experience to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the *Products* affected, in a manner that neither damages nor endangers the *Work*.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed to be used anywhere within existing buildings unless approved by *Consultant*.
- .10 Restore work with new *Products* in accordance with requirements of *Contract Documents*.
- .11 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and with suitable allowance for deflection, expansion, contraction, and firestopping.
- .12 Enclose pipes, ducts, conduit and wires passing through floors at areas where faucets occur in a 100 mm (4") high metal sleeve and make air and watertight with water resistant firestopping.
- .13 Completely seal voids of penetrations of fire rated wall, ceiling, and floor constructions with firestopping and smoke seals.
- .14 Execute cutting, patching, and remedial work in manner that does not jeopardize manufacturers' warranties.
- .15 Refinish surfaces to match adjacent finishes. Refinish continuous surfaces to nearest intersection. Refinish entire assembly units.

END OF SECTION

Cleaning and Waste Management

PART 1 - GENERAL

1.1 Section Includes

- .1 Waste management.
- .2 Storage, handling, and protection.
- .3 Coordination.
- .4 Cleaning.
- .5 Disposal of waste.

1.2 Waste Management

- .1 Comply with requirements of authorities having jurisdiction.
- .2 Remove waste material from the *Place of the Work* daily. If waste is collected in bins, bins to be removed from site once full.
- .3 Arrange and pay for removal of debris and waste from the *Place of the Work*.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Pay fees.

1.3 Storage, Handling and Protection

- .1 Store, materials to be reused, recycled and salvaged in locations to prevent contamination of materials being diverted from landfill.
- .2 Prevent contamination of materials to be salvaged and recycled, and handle such materials, in accordance with requirements for acceptance by designated facilities.

1.4 Coordination

- .1 Coordinate waste management and disposal procedures and requirements with other activities at the *Place of the Work* so that there is no delay in the *Work*, and at no increase in either the *Contract Time* or the *Contract Price*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Cleaning

- .1 General cleaning requirements:
 - .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - .2 Store volatile wastes in covered metal containers, and remove from *Place of the Work* daily.
 - .3 Prevent accumulation of wastes which create hazardous conditions.
 - .4 Provide adequate ventilation during use of volatile or noxious substances. Do not rely on building ventilation systems for this purpose.

Cleaning and Waste Management

- .5 Prevent cross-contamination during the cleaning process.
- .6 Notify the *Consultant* of the need for cleaning caused by *Owner* or other contractors.
- .2 Materials:
 - .1 Use only cleaning materials in accordance with written requirements of manufacturer of surface to be cleaned and in accordance with written requirements of cleaning material manufacturer.
- .3 Cleaning during construction/progressive cleaning:
 - .1 Clean-up the *Place of the Work* daily. Maintain clean and clear egress routes at all times.
 - .2 Maintain *Place of the Work*, grounds and public properties free from accumulations of waste materials and rubbish.
 - .3 Provide appropriate, clearly marked containers at the *Place of the Work* for collection of waste materials and rubbish. Remove waste materials and rubbish from the *Place of the Work* when containers become full.
 - .4 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.
 - .5 Vacuum and clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until *Substantial Performance of the Work*.
 - .6 Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces nor contaminate building systems.
 - .7 Promptly as the *Work* proceeds, on a daily basis and upon completion, clean up and remove rubbish, surplus materials and equipment.
 - .8 Remove as the work of this section progresses, corrosive and foreign materials which may set or become difficult to remove at time of final cleaning or which may damage members.
 - .9 Wash exposed surfaces with a cleaning solution approved by *Product* manufacturers.
 - .10 Debris and waste not permitted within cavities of *Work*.
- .4 Cleaning prior to *Ready-for-Takeover*:
 - .1 Immediately prior to *Consultant's* review to determine if *Ready-for-Takeover* has been achieved, remove surplus *Products* and construction machinery and equipment not required for the performance of the remaining *Work* and clean in accordance with Final Cleaning paragraphs in Section 01 74 00 to the greatest extent practicable given work remaining to be completed. Cleaning shall be to a sufficient extent to permit the *Consultant's* review to be performed properly and reasonably.
- .5 Final cleaning:
 - .1 Provide professional cleaning company for final cleaning.

Cleaning and Waste Management

- .2 Before final cleaning, arrange a meeting at *Place of the Work* to determine the acceptable standard of cleaning. Ensure that cleaning company, *Owner*, *Consultant*, and *Contractor* are in attendance.
- .3 Remove from *Place of the Work* surplus *Products*, waste materials, recyclables, *Temporary Work*, and *Construction Equipment* not required to perform any remaining work and other than that caused by the *Owner*, and leave the *Work* clean and suitable for occupancy by *Owner*.
- .4 Remove waste material and debris from crawlspaces and other accessible concealed spaces.
- .5 Clean and polish prefinished and finished surfaces including: glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or otherwise damaged glass.
- .6 Clean exterior and interior window glass and frames.
- .7 Remove stains, spots, marks and dirt from decorative parts of the *Work*, electrical and mechanical fixtures, furniture fittings, walls, and floors.
- .8 Vacuum clean and remove dust from building interiors, exposed wall, floor, and ceiling surfaces, behind grilles, louvres, and screens, and above suspended ceiling tiles and panels. Vacuum clean interior of electrical equipment.
- .9 Clean floor finishes in accordance with manufacturer's written requirements.
- .10 Remove non-permanent labels.
- .11 Remove dirt and residue from surfaces.
- .12 Inspect finishes, fittings and equipment and ensure specified workmanship and operation.
- .13 Remove protective coatings, clean surfaces and remove excess compounds and sealant materials. Make good defective, scratched or damaged work.
- .14 Clean equipment and fixtures to a sanitary condition,
- .15 Remove seal wrap and protective coverings from mechanical and electrical *Products* and materials and clean as required.
- .16 Clean mechanical, electrical, and other equipment. Replace filters for mechanical equipment.
- .17 Clean and/or replace lighting reflectors, lamps, light fixtures, lenses, bulbs, and other lighting surfaces, and grilles.
- .18 Clean architectural concrete to remove surface discolouration, efflorescence, and the like. Use a suitable cleaning agent which will not stain the surfaces or mar the texture.
- .19 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.
- .20 Re-clean as necessary areas that have been accessed by *Contractor's* workers prior to *Owner* occupancy.

Cleaning and Waste Management

3.2 Disposal of Waste

- .1 Perform waste management in accordance with waste reduction workplan.
- .2 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each *Working Day*. Collect packaging materials for recycling or reuse.
- .3 Handle waste materials not reused, salvaged or recycled in accordance with appropriate regulations and codes.
- .4 Do not bury rubbish and waste materials at the *Place of the Work*.
- .5 Do not dispose of waste or volatile materials into waterways or storm or sanitary sewers.
- .6 Do not burn waste materials at the *Place of the Work*.
- .7 Comply with waste disposal requirements of authorities having jurisdiction.
- .8 Deliver to nearest appropriate depot materials accepted for recycling by region or municipality having jurisdiction over the *Place of the Work*, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot scrap and excess gypsum wallboard for recycling of this material. Costs for this work are included in the *Contract Price*.
- .9 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Pay fees.

END OF SECTION

Closeout Procedures

PART 1 - GENERAL

1.1 Section Includes

- .1 General *Contract* closeout procedures.
- .2 *Substantial Performance of the Work*.
- .3 *Ready-for-Takeover*.
- .4 Inspection and review before *Ready-for-Takeover*
- .5 Early occupancy by the *Owner*.
- .6 Final inspection for completion of the *Contract*.
- .7 Warranty period.

1.2 General Contract Closeout Procedures

- .1 The procedures for completing *Contract* and acceptance by the *Owner* shall be in accordance with the methods described in OAA/OGCA Document 100 (July 1, 2018, and reissued January 8, 2019) and any additional requirements described below.
- .2 Stages will be reviewed at the *Contract* start-up meeting to ensure that parties understand their responsibilities. Refer to Section 01 31 19 for procedures and requirements for *Contract* start-up meeting.
- .3 Within 4 weeks of commencement of the *Work*, submit to the *Consultant* a list of closeout submittals required by the *Contract Documents*.

1.3 Substantial Performance of the Work

- .1 The prerequisites to, and the procedures for, attaining *Substantial Performance of the Work*, or similar such milestone as provided for in the Construction Act, shall be:
 - .1 As described in Section 01 77 00.
 - .2 Independent of those for attaining *Ready-for-Takeover* of the *Work*.
 - .3 In accordance with the Construction Act.
- .2 Deficiency review:
 - .1 Neither *Owner* nor *Consultant* will be responsible for preparation or issuance of extensive lists of deficiencies. *Contractor* assumes prime responsibility for ensuring that items shown and described in the *Contract Documents* are complete. Any reviews to approve the certificate of *Substantial Performance of the Work* will be immediately cancelled if it becomes obvious to the *Consultant* that extensive deficiencies are outstanding.
 - .2 The *Contractor* shall conduct an inspection of the *Work* to identify deficiencies and defects, which shall be repaired. When the *Contractor* considers that the *Work* is substantially performed, the *Contractor* shall prepare and submit to the *Consultant* a comprehensive list of items to be completed or corrected (the deficiency list) and apply for a review of the *Work* by the *Consultant* to determine if *Substantial Performance of the Work* has been achieved.

Closeout Procedures

- .3 The *Contractor's* request described above shall include a statement by *Contractor* that the *Work* to be reviewed by *Consultant* for deficiencies is, to the best of the *Contractor's* knowledge, in compliance with *Contract Documents*, reviewed *Shop Drawings*, and samples, and that deficiencies and defects previously noted by *Consultant* have been repaired.
- .4 No later than 10 *Working Days* after the receipt of the *Contractor's* request described above, but contingent upon the prior receipt, by the *Consultant*, of the closeout submittals in the manner and form specified in Section 01 78 00, the *Consultant* and the *Contractor* will review the *Work* to identify any defects or deficiencies. If necessary, the *Contractor* shall tabulate a list of deficiencies to be corrected prior to *Substantial Performance of the Work* being certified by the *Consultant*. During review, the *Consultant* and the *Contractor* will decide which deficiencies or defects must be rectified before *Substantial Performance of the Work* can be certified, and which defects are to be treated as warranty items.
- .5 Provide a schedule of planned deficiency review having regard to the foregoing.
- .3 Certification of *Substantial Performance of the Work*:
 - .1 When the *Consultant* considers that the deficiencies and defects have been completed and that it appears that the requirements of the *Contract Documents* have been substantially performed, the *Consultant* shall issue a certificate of *Substantial Performance of the Work* to the *Contractor*, stating the date of *Substantial Performance of the Work*.
 - .2 The certificate of *Substantial Performance of the Work* shall be prepared and issued in accordance with the Construction Act.
 - .1 Inform *Owner*, *Consultant*, *Subcontractors*, and *Suppliers* which publication is to be used for publishing certificate of substantial performance in accordance with Section 01 31 19.

1.4 **Ready-for-Takeover**

- .1 The prerequisites to attaining *Ready-for-Takeover* of the *Work* are described in the General Conditions of the *Contract*.

1.5 **Inspection and Review Before Ready-for-Takeover**

- .1 *Contractor's* Inspection: Before applying for the *Consultant's* review to establish *Ready-for-Takeover* of the *Work*:
 - .1 Ensure that the specified prerequisites to *Ready-for-Takeover* of the *Work* are completed.
 - .2 Conduct an inspection of the *Work* to identify defective, deficient, or incomplete work.
 - .3 Prepare a comprehensive and detailed list of items to be completed or corrected.
 - .4 Provide an anticipated schedule and costs for items to be completed or corrected.

Closeout Procedures

- .2 *Consultant's Review*: Upon receipt of the *Contractor's* application for review, together with the *Contractor's* list of items to be completed or corrected, the *Consultant* will review the *Work*. The *Consultant* will advise the *Contractor* whether or not the *Work* is *Ready-for-Takeover* and will provide the *Contractor* with a list of items, if any, to be added to the *Contractor's* list of items to be completed or corrected. Provide the *Consultant* with a copy of the *Contractor's* revised list.
- .3 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The *Contractor's* inspection and *Consultant's* review procedures specified above shall be repeated until the *Work* is *Ready-for-Takeover* and no items remain on the *Contractor's* list of items to be completed or corrected.
- .4 When the *Consultant* determines that the *Work* is *Ready-for-Takeover*, the *Consultant* will notify the *Contractor* and the *Owner* in writing to that effect.

1.6 Early Occupancy by the Owner

- .1 If early occupancy by the *Owner* is required, the provisions of this Section shall apply, to the extent applicable, to those parts of the *Work* that the *Owner* intends to occupy.

1.7 Final Inspection for Completion of the Contract

- .1 Deficiencies and defects shall be made good before the *Contractor* submits a written request for final review of the *Work* and before the *Contract* is considered complete.
- .2 When *Contractor* is satisfied that the *Work* is complete, and after the *Contractor* has reviewed the *Work* to verify its completion in accordance with the requirements of the *Contract Documents*, the *Contractor* shall submit a written request for a final review by the *Consultant*, who in turn will notify the *Owner*.
- .3 If there are any deficiencies identified as a result of this review, they shall be listed by the *Consultant* and submitted to the *Contractor*. This list shall be recognized as the final deficiency list for purposes of acceptance of the *Work* under the *Contract*.
- .4 Such deficiencies shall be corrected by a date mutually agreed upon between *Consultant* and the *Contractor*, unless a specific date is required by *Contract*, and a further review by the *Consultant* shall be called for by the *Contractor* following his own review to take place within 7 days from date of request.
- .5 *Contractor* shall thereafter submit invoice for final payment.
- .6 Money withheld for deficiency work shall be released only when all deficiencies have been completed. No partial payment to be recognized until all work is completed.

1.8 Warranty Period

- .1 Provide on-going review and attendance to building call-back, maintenance and repair problems during the warranty periods.
- .2 At the beginning of the 12th month after *Ready-for-Takeover*, the *Owner*, *Contractor* and *Consultant*, along with key *Subcontractors* as designated, shall carry out a complete review of building and its systems to determine which deficiencies are to be rectified under the warranty. *Contractor* shall be responsible for timely written notification of *Owner*, and *Consultant* prior to such end of warranty period inspection and any delay in such notification shall extend such warranty period until proper notification is received by *Owner*, and *Consultant*.

Closeout Procedures

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Closeout Submittals

PART 1 - GENERAL

1.1 Section Includes

- .1 As-built documents.
- .2 Operation and maintenance manuals.
- .3 Operation and maintenance book.
- .4 *Project* data book.
- .5 Shop drawing book.
- .6 Warranty book.
- .7 Posted operating instructions.
- .8 Spare parts, maintenance materials, and special tools.

1.2 Administrative Requirements

- .1 Collect reviewed submittals, and assemble required closeout submittals executed by *Subcontractors*, *Suppliers*, and manufacturers. Prior to submitting closeout submittals to the *Consultant*:
 - .1 Review maintenance manual contents (operating, maintenance instructions, as-built drawings, materials) for completeness.
 - .2 Review supply and completeness of spare parts required by *Contract Documents* and manufacturers.
 - .3 Review in relation to *Contract Price*, *Change Orders*, *Change Directives*, holdbacks and other adjustments to the *Contract Price*.
 - .4 Review inspection and testing reports to verify conformance to intent of *Contract Documents* and that changes, repairs or replacements have been completed.
 - .5 Execute transition of performance bond and labour and materials payment bond to warranty period requirements.
 - .6 Submit a final statement of accounting giving total adjusted *Contract Price*, previous payments, and monies remaining at time of application for completion of the *Contract*. *Consultant* will issue a final change order reflecting approved adjustments to *Contract Price* not previously made.
- .2 No later than 10 *Working Days* prior to submitting request for *Consultant's* review to determine if *Substantial Performance of the Work* has been achieved, submit to the *Consultant* the closeout submittals specified in this section and elsewhere in the *Contract Documents*.
- .3 For equipment put into use with *Owner's* permission during the *Work*, submit required closeout submittals within 10 *Working Days* after start-up.
- .4 For items of the *Work* delayed materially beyond date of *Substantial Performance of the Work*, provide updated closeout submittals within 10 *Working Days* after acceptance, listing date of acceptance as start of warranty period.

Closeout Submittals

- .5 Neither the *Consultant's* review to determine if *Substantial Performance of the Work* has been achieved, nor acceptance of the *Work*, will take place until receipt, by the *Consultant*, of acceptable copies of the closeout submittals required herein and by the *Contract Documents*.

1.3 As-Built Documents

- .1 Prepare as-built documents in accordance with Section 01 32 00.
- .2 Submit as-built documents as follows:
 - .1 Submit digital CAD and bookmarked PDF copy of as-built documents. Submit using digital storage medium or transfer process acceptable to the *Consultant* and the *Owner*.

1.4 Operation and Maintenance Manuals

- .1 Prepare a comprehensive operation and maintenance manual, in the language of the *Contract*, using personnel qualified and experienced for this task.
- .2 Submit an initial draft of the operation and maintenance manual for *Consultant's* review. If required by *Consultant's* review comments, revise manual contents and resubmit for *Consultant's* review. If required, repeat this process until *Consultant* accepts the draft manual in writing.
- .3 Submit operation and maintenance manuals as follows:
 - .1 Submit 1 copy of operation and maintenance manuals in hard copy.
 - .2 In addition, submit digital copies ("PDF" files) of operation and maintenance manuals. Submit using digital storage medium or transfer process acceptable to the *Consultant* and the *Owner*.

1.5 Operation and Maintenance Manual Format

- .1 Organize operation and maintenance manuals into the following general components:
 - .1 Operation and maintenance book.
 - .2 *Project* data book.
 - .3 Shop drawing book.
 - .4 Warranty book.
- .2 Organize data in the form of an instructional manual.
- .3 Bind each general component of the operation and maintenance books in separate vinyl hard covered, 3 ring loose leaf binders.
- .4 Enclose title sheet, labelled as applicable, with project name, date and list of contents.
- .5 Organize contents into applicable sections of work to parallel project *Specifications* breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .6 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .7 Cover: Identify each binder with typed or printed title "Operation and Maintenance Manual", name of *Project* or facility, and subject matter of contents.

Closeout Submittals

- .8 Text: Manufacturer's printed data, or typewritten data.

1.6 Operation and Maintenance Book

- .1 Operation and maintenance books shall contain operating and maintenance data and information specified below for supplied *Products*.
- .2 Neatly type lists and notes. Use clear drawings, diagrams of manufacturers' literature.
- .3 Each Item of Equipment and Each System: include description of unit or system and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .4 Panel Board Circuit Directories: provide electrical service characteristics, controls, and communications.
- .5 Include installed colour coded wiring diagrams.
- .6 Description, operation and maintenance instructions for equipment and parts list. Indicate nameplate information such as make, size, capacity, serial number.
- .7 Operating Procedures: include start up, break in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .8 Maintenance Requirements: include routine procedures and guide for trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .9 Provide servicing and lubrication schedule, and list of lubricants required.
- .10 Include manufacturer's printed operation and maintenance instructions.
- .11 Include sequence of operation by controls manufacturer.
- .12 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .13 Provide installed control diagrams by controls manufacturer.
- .14 Provide *Contractor's* coordination drawings, with installed colour coded piping diagrams.
- .15 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .16 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .17 Include testing and balancing reports.
- .18 Include additional content as specified in technical *Specifications* sections.

1.7 Project Data Book

- .1 *Project* Data Book shall include the following information supplemented by additional required data specified elsewhere in the *Contract Documents*:
 - .1 Maintenance instructions for finished surfaces and materials.
 - .2 Copy of hardware and paint schedules.

Closeout Submittals

- .3 Names, addresses and phone numbers of *Subcontractors* and *Suppliers*, as applicable.
- .4 Additional material used in the *Work* listed under various sections showing name of manufacturer and source of supply.
- .5 Report recording demonstration and instruction provided to *Owner* for operation and maintenance of building systems as described in Section 01 79 00.
- .6 Key construction photos.
- .7 Permits and forms:
 - .1 Certificate of Clearance from the Workplace Safety and Insurance Board (WSIB).
 - .2 Certificates of approval of the *Work* by local building department (if available).
 - .3 Electrical authority certificate of inspection.
- .8 Waste management and disposal reports, prepared in accordance with Section 01 74 00.
- .9 *Integrated fire protection and life safety systems tests* final test report prepared in accordance with Section 01 91 26.

1.8 Shop Drawing Book

- .1 Submit one copy of each final accepted *Shop Drawings* issued for the *Work* on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.
- .2 Engineered *Shop Drawings* shall include copies of the certificate of insurance, the engineer's field review reports, and the engineer's letters of general conformity that were provided as part of the engineered submittal in accordance with Section 01 33 00 appended to the pertinent engineered *Shop Drawings* in the shop drawing manual.

1.9 Warranty Book

- .1 Submit copies of bonds, guarantees, warranties and extended warranties together, complete with an indexed summary list of warranties and expiration dates. Warranties to be in accordance with Section 01 78 36.
- .2 Separate each warranty with index tab sheets keyed to Table of Contents listing.
- .3 List each warrantor with complete contact information.
- .4 Verify that documents are in proper form and contain full information. Warranties shall be for the correct duration and shall be in *Owner's* name.
- .5 Include maintenance bond(s).

1.10 Posted Operating Instructions

- .1 Prepare operating instructions in English for posting near equipment and systems. Posted instructions to be glass covered, framed and mounted.
- .2 Posted instructions to consist of simplified, consolidated equipment, control and power diagrams graphically representing the entire system, including concise instructions on how to start and stop systems, what settings and conditions are to be observed by the operators, and what control adjustments are to be made or maintained by the operator.

Closeout Submittals

- .3 Posted instructions shall include control diagrams with added specific operating instructions, controls, interlocks, and the like.
- .4 Posted instructions shall include:
 - .1 HVAC controls for each system.
 - .2 One line schematic diagrams of water supply.
 - .3 One line isometric diagrams of sanitary drainage.
 - .4 One line diagrams of steam distribution, hot and cold water systems, including risers, valves, control devices, etc.

1.11 Spare Parts, Maintenance Materials, and Special Tools

- .1 Provide overage, extra stock, and maintenance materials, including keys, in quantities specified in the *Contract Documents*.
- .2 Submit to *Consultant* a typed inventory list of maintenance materials prior to application for *Substantial Performance of the Work*. List all items, complete with quantities, and storage locations. Include *Consultant* reviewed inventory listing in final submission to *Owner*.
- .3 Prepare and submit a master list identifying maintenance materials and maintain a log of when materials are turned over to *Owner* and signing authority for acceptance of materials on behalf of *Owner*.
- .4 Provide tags for special tools identifying their function and associated *Product*.
- .5 Supply spare parts, maintenance materials, and special tools in quantities specified in technical *Specifications* sections.
- .6 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed *Products*.
 - .1 Replace incorrect or damaged maintenance materials.
- .7 Deliver to and store items at location and time directed by *Owner*. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.
 - .1 Clearly mark cartons or packaging as to contents, project name, and *Supplier*.
 - .2 If applicable give colour and finish, room number or area where material is used.
 - .3 Include necessary information for re-ordering of materials as part of packaging of materials.
- .8 Catalogue all items and submit to *Consultant* an inventory listing organized by *Specifications* section. Include *Consultant* reviewed inventory listing in operation and maintenance manual.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Warranties

PART 1 - GENERAL

1.1 Warranties

- .1 Warranties shall be in accordance with GC 12.3, as amended.

1.2 Extended Warranties

- .1 Extended warranties shall be in accordance with GC 12.3, as amended, and as follows:
 - .1 Where specifically identified in the *Contract Documents*, extended warranties shall be furnished by individual manufacturer for particular product/system/assembly.
 - .2 Extended warranties shall include for proper performance of the portion of the *Work* as defined by the scope of the applicable *Specifications* section to the extent that the design and *Contract Documents* permit such performance.
 - .3 The *Owner* shall promptly give the warrantor notice in writing of observed defects and deficiencies which occur during the warranty period.
 - .4 Subject to GC 12.2.3.3, as amended, extended warranties shall commence at date of *Ready-for-Takeover*.
 - .5 Extended warranties specified shall be in addition to, and run concurrent with, other warranties required by the *Contract Documents*. Manufacturer's disclaimers and limitations on product warranty do not relieve *Contractor* of obligations under requirements of the *Contract Documents*.
 - .6 Submit extended warranty on warrantor's standard form specifically endorsed by the warrantor to the *Owner* and shall include the following information:
 - .1 Name and address of *Project*.
 - .2 Warranty commencement date.
 - .3 Warranty period.
 - .4 Specific warranty terms as required in applicable portion of *Contract Documents*.
 - .5 Name and title of authorized signing officer and seal of warrantor.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Demonstration and Training

PART 1 - GENERAL

1.1 Section Includes

- .1 Systems demonstration and training.

1.2 Preparation

- .1 Prior to scheduling demonstration and training:
 - .1 Review condition of equipment or systems for which demonstration and training is required and that have been used in the course of the *Work* to ensure turning over at completion in "as new condition", with warranties dated and certified from time specified.
 - .2 When partial occupancy of uncompleted project is required by *Owner*, coordinate *Owner's* uses, requirements, access, and the like, with requirements to complete the *Work*.

1.3 Submittals

- .1 Submit proposed dates, times, durations, and locations for demonstration and training of each item of equipment and each system for which demonstration and training is required. Allow sufficient time for training and demonstration for each item of equipment or system, or time as may be specified in technical *Specifications*.
 - .1 Correlate with construction schedule in accordance with Section 01 32 00.
- .2 *Consultant* and *Owner* will review submittal and advise *Contractor* of any necessary revisions.
- .3 Submit report(s) within 5 *Working Days* after completion of demonstration and training:
 - .1 Identifying time and date of each demonstration and training session.
 - .2 Summarizing the demonstration and training performed.
 - .3 Including a list of attendees.

1.4 Demonstration and Training

- .1 Perform system demonstration work no later than 15 *Working Days* prior to submitting request for *Consultant's* review to determine if *Substantial Performance of the Work* has been achieved.
 - .1 Provide *Owner* with 5 *Working Days* prior written notice of dates scheduled for demonstration and training.
- .2 Submit required certificates of approval or acceptance from authorities having jurisdiction.
- .3 Prerequisites to demonstration and training:
 - .1 Testing, adjusting, and balancing has been performed in accordance with *Contract Documents*.
 - .2 Equipment and systems are fully operational.
 - .3 Copy of completed operation and maintenance manual is available for use in demonstration and training.

Demonstration and Training

- .4 Conditions for demonstration and training comply with requirements specified in technical *Specifications*.
- .4 Demonstration and training:
 - .1 Demonstrate and provide training to *Owner's* personnel.
 - .2 Instruct *Owner's* personnel in operation and maintenance of equipment and systems, using operation and maintenance data provided as the basis for instructions. Arrange and coordinate instruction of *Owner's* staff in care, maintenance, and operation of building systems and finishes
 - .3 *Contractor*, manufacturer's representatives, and responsible personnel from *Subcontractors* whose work is being demonstrated shall be present at these demonstrations, as well as *Owner's* personnel.
 - .4 *Owner* shall provide list of personnel to receive training and shall coordinate their attendance at agreed upon times.
 - .5 Demonstration shall include start up, operation, control, adjustment, troubleshooting, servicing, and maintenance of each item of equipment and system.
 - .6 Review operation and maintenance manual in detail to explain all aspects of operation and maintenance.
 - .7 Instruct *Owner's* representative on use of software required for operation and maintenance of building systems and provide a toll-free telephone number or website address for further assistance to the *Owner*.
 - .8 Prepare and insert additional data in the operation and maintenance data manuals when the need for additional data becomes apparent during demonstration or instruction.
- .5 Correct deficiencies and defects identified during demonstration, instruction, or commissioning.
- .6 Attend 'end-of-work' testing and break-in or start-up demonstration.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

PART 1 - GENERAL

1.1 Section Includes

- .1 Procedures for verifying and documenting that interconnections between systems provided for *integrated fire protection and life safety systems* functions are installed and operating in conformance with their *design criteria* and in accordance with CAN/ULC S1001-11.
- .2 This specification is limited to testing of the interconnections between life safety and fire protection systems. Refer to separate technical specification sections for the individual testing and commissioning requirements for those systems.

1.2 Administrative Requirements

- .1 Definitions:
 - .1 Terms presented here in italic font are defined either in the Definitions of CCDC 2 – 2020, or in CAN/ULC S1001-11.
 - .2 The *Consultant* shall be considered the *design professional* for the purposes of the *Contract*.
- .2 Coordination:
 - .1 Coordinate the applicable *Subcontractors* whose equipment or systems are part of the *integrated fire protection and life safety systems test*.
- .3 Conduct a pre-installation meeting in accordance with Section 01 31 19 and as follows:
 - .1 Attendees at pre-installation meeting shall include *Subcontractors* whose equipment or systems are part of the *integrated fire protection and life safety systems test*.
 - .2 Review requirements of authorities having jurisdiction, as well as requirements of, and roles and responsibilities for, each participant in the development of the *integrated test plan* and the execution of the *integrated fire protection and life safety systems test*.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Integrated test plan*:
 - .1 Develop the *integrated test plan* in accordance with Section 5 of CAN/ULC S1001-11.
 - .2 Submit the *integrated test plan* for review by the *Consultant* at least 30 days prior to commencement of the first *integrated fire protection and life safety systems test*. The *integrated testing plan* shall comply with the requirements of CAN/ULC S1001-11 and as specified herein.

Integrated Fire Protection and Life Safety Systems Testing

- .3 Distribute final copy of plan digitally as follows:
 - .1 Authorities having jurisdiction.
 - .2 One copy to be maintained at the *Place of the Work*.
 - .3 *Owner*.
 - .4 *Consultant*.
 - .5 *Contractor*.
 - .6 Consulting engineers, as applicable.
- .3 Final test report:
 - .1 Upon successful completion of the *integrated fire protection and life safety systems tests*, submit a final test report in accordance with Section 7 of CAN/ULC S1001-11.
 - .2 Distribute reports digitally as follows:
 - .1 Authorities having jurisdiction.
 - .2 One copy to be maintained at the *Place of the Work*.
 - .3 *Owner*.
 - .4 *Consultant*.
 - .5 *Contractor*.
 - .6 Consulting engineers, as applicable.

1.4 Quality Assurance

- .1 *Integrated testing coordinator* qualifications:
 - .1 The *integrated testing coordinator* services shall be provided by a firm or individual certified under the CAN/ULC-S1001 Certification of Integrated Testing Service Providers program.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Integrated Systems Testing Requirements

- .1 Conduct *integrated fire protection and life safety systems* testing in accordance with Section 6 of CAN/ULC S1001-11 and the accepted *integrated testing plan*.

3.2 Demonstration and Training

- .1 Conduct demonstration and training in accordance with Section 01 79 00.

Integrated Fire Protection and Life Safety Systems Testing

- .1 Demonstrate the operation of, and providing training on, the integration of *fire protection and life safety systems*.
- .2 Demonstration and training to include:
 - .1 The function of the integration.
 - .2 The method of integration: hardwired, network communication, operating protocols.
 - .3 The type of information: data, commands, monitoring.
 - .4 Any temporary measures to be taken to retest in the future.

END OF SECTION

Demolition

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Demolition and removal of selected non-structural portions of building.
 - .2 Salvage:
 - .1 Salvaging of designated items for reuse by *Owner*
 - .2 Salvage of designated items to be reused or recycled.
 - .3 Removal of surplus materials from the *Place of the Work*.
 - .4 Related mechanical and electrical work and demolition requirements are covered under Divisions 21, 22, and 23 and Divisions 26, 27, and 28 respectively.
- .2 Section excludes:
 - .1 Demolition, removal, remediation, or abatement of designated substances or materials and toxic and hazardous substances.

1.2 Administrative Requirements

- .1 Pre-demolition meeting:
 - .1 Schedule a pre-demolition meeting following the procedures specified for pre-installation meetings in accordance with Section 01 31 19.
 - .2 Review existing conditions at the *Place of the Work* thoroughly to establish full extent of items to be removed and items to remain. Commencement of demolition work will be considered to be acceptance of existing conditions at the *Place of the Work* and removal of such items.
 - .3 Examine adjacent properties to determine extent of protection required.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Special procedures submittals:
 - .1 Existing conditions documentation:
 - .1 Document existing conditions of adjoining construction and site improvements, including pre-existing damage to finish surfaces that might be misconstrued as damage caused by demolition operations.
 - .2 Comply with Section 01 32 33.
 - .3 Submit existing conditions documentation before demolition work begins.
 - .2 Inventory of items to be salvaged:
 - .1 Prepare typed inventory of items to be salvaged and cross-reference to drawing showing existing elevations.
 - .2 Provide temporary marking to salvaged items correlated to this inventory.
 - .3 Submit inventory following procedures for submittal of *Shop Drawings* in accordance with Section 01 33 00.

Demolition

1.4 Quality Assurance

.1 Qualifications:

.1 Subcontractor:

- .1 Shall have 5 years' specialized demolition experience, minimum.
- .2 Shall be able to deploy adequate equipment and skilled personnel to complete work expediently in an efficient and orderly manner.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that utilities have been disconnected and capped.
- .2 Observe existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to *Consultant*.
- .5 Survey of existing conditions: Record existing conditions by use of photographs in accordance with Section 01 32 33.

3.2 Utility Services and Mechanical / Electrical Systems

- .1 Refer to Divisions 21, 22, and 23 and Divisions 26, 27, and 28 respectively.

3.3 Selective Demolition, General

- .1 Demolish and remove existing construction only to the extent required by new construction, and as otherwise indicated. Use methods required to complete the work within limitations of governing regulations and as follows:
 - .1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - .2 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - .3 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

Demolition

- .4 Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
- .5 Maintain adequate ventilation when using cutting torches.
- .6 Remove decayed, infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- .7 Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- .8 Dispose of demolished items and materials promptly.
- .2 Dispose of demolished materials from *Project* site except where noted otherwise and in accordance with authorities having jurisdiction. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- .3 Do not sell demolished material at the *Place of the Work*.
- .4 Clean existing surfaces specified to receive new applied finishes to assure proper adherence.

3.4 Selective Demolition Procedures for Specific Materials

- .1 Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

3.5 Salvage

- .1 Remove and store items indicated or directed for salvage. Remove, handle and transport such items to storage area designated in the *Contract Documents*, to an area within the *Place of the Work* designated by *Consultant*, or to an area away from the *Place of the Work* as directed by the *Consultant*. Perform such work to prevent damage to the items during removal and in storage.
- .2 The *Owner* shall review *Place of the Work* prior to commencement of demolition and instruct the *Contractor* of the items to be retained for re-use or be turned over to the *Owner*.
- .3 Remove and store indicated items for future use by *Owner*. Remove, handle and transport such items to storage area indicated in the *Contract Documents* or to an area within the *Place of the Work* designated by *Consultant*. Perform such work carefully and with diligence to prevent any damage to the items during removal and in storage.

3.6 Protection

- .1 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades and parts of existing building to remain. Make good damage caused by demolition.
- .2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify demolition engineer, *Contractor* and *Consultant*.
- .3 Provide temporary weather enclosures in accordance with Section 01 35 13 and Section 01 56 00.
- .4 Prevent debris from obstructing active services and drainage systems.

Demolition

- .5 Protect work to remain against damage. Repair or replace damaged work at no additional cost to the *Owner*.

END OF SECTION

Masonry Unit Assemblies

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Masonry unit assemblies, including temporary bracing.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Submit shop drawings for masonry unit wall assemblies indicating:
 - .1 Types of masonry units, grade, typical dimensions, special shapes and shape dimensions.
 - .2 Submit engineered shop drawings for the following:
 - .1 Non-axial-load bearing masonry assemblies (post disaster applications).
 - .2 Masonry reinforcement.
 - .3 Masonry connectors.
 - .4 Seismic design, connections and restraint of wall assemblies.
 - .5 Masonry unit wall assemblies for walls that are to act as guards.
- .4 Samples:
 - .1 2 of each type of concrete masonry unit specified.
 - .2 2 of each type of each masonry unit specified.
 - .3 1 of each type of masonry accessory specified.
 - .4 1 of each type of masonry reinforcement proposed for use.
 - .5 Pigmented mortar samples for each mortar colour for colour match verification by *Consultant*.
- .5 In-situ carbon dioxide mineralization verification:
 - .1 Provide concrete masonry producer's verification of in-situ mineralization of carbon dioxide.
- .6 Test and evaluation reports:
 - .1 Submit test results confirming compliance of aggregates with CAN/CSA A179-14.

Masonry Unit Assemblies

1.4 Quality Assurance

.1 Qualifications:

- .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.

1.5 Site Conditions

.1 Cold weather construction requirements:

- .1 Comply with requirements of CAN/CSA A371-14, and as follows:

Air Temperature, °C	General requirements during construction
0 to 4	Sand or mixing water shall be heated to a minimum of 20°C and a maximum of 70°C.
-4 to 0	Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C.
-7 to -4	(1) Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. (2) Source heat shall be provided on both sides of the walls under construction. (3) Windbreaks shall be employed when the wind speed exceeds 25 km/h.
-7 and below	(1) Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. (2) Enclosures and supplementary heat shall be provided to maintain an air temperature above 0°C. (3) The temperature of the unit when laid shall be not less than 7°C.

- .2 Place grout in masonry at a minimum temperature of 20°C and a maximum temperature of 50°C.
- .3 Mortar temperature shall not exceed 50°C to avoid flash set.
- .4 Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in winter.

.2 Cold weather protection requirements:

- .1 Comply with requirements of CAN/CSA A371-14, and provide protection requirements for completed masonry or sections not in progress shall be as follows:

Mean daily air temperature, °C	Protection
0 to 4	Masonry shall be protected from rain or snow for 48 h
-4 to 0	Masonry shall be completely covered for 48 h
-7 to -4	Masonry shall be completely covered with insulating blankets for 48 h
-7 and below	The masonry temperature shall be maintained above 0 °C for 48 h by enclosure and supplementary heat

.3 Hot weather construction requirements:

- .1 Comply with requirements of CAN/CSA A371-14, and as follows:

- .1 Limit spreading of mortar beds to 1.2 m, and set masonry units within 1 minute of spreading the mortar, when the air temperature is above:
 - .1 38°C; or
 - .2 32°C, with a wind velocity greater than 13 km/h.

Masonry Unit Assemblies

- .2 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

1.6 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 10 years.

PART 2 - PRODUCTS

2.1 Mortar Materials

- .1 Mortar: in accordance with CAN/CSA A179-14.
- .2 Portland cement:
 - .1 In accordance with CAN/CSA A3001-13, GU (Type 10)/ASTM C150/C150M-22.
 - .2 For exposed mortar: maintain uniformity of cement manufacturer and batch for colour uniformity.
- .3 Hydrated lime: in accordance with ASTM C207-18, Type S.
- .4 Sand: in accordance with CAN/CSA A179-14.
- .5 Maintain uniformity of mortar material manufacturers, mortar materials and source of aggregate throughout the *Work*.
- .6 Mortar types:
 - .1 Foundation walls and other exterior masonry at or below grade: Type S.
 - .2 Exterior masonry above grade:
 - .1 Loadbearing: Type S.
 - .2 Non-loadbearing: Type N.
 - .3 Exposed masonry veneer: Type N, 1 part Portland Cement/1 part Type S hydrated lime/6 parts clean angular (sharp) sand.
 - .3 Interior masonry:
 - .1 Loadbearing: Type S.
 - .2 Non-loadbearing: Type N.
 - .4 Mortar colour: Grey.

2.2 Grout

- .1 Grout following masonry components:
 - .1 Lintels and bond beams.
 - .2 Grouted walls and piers.
- .2 Place and grout reinforcing and bearing in accordance with CAN/CSA A371-14 and structural drawings. Use concrete of minimum 20 MPa compressive strength unless otherwise indicated.

Masonry Unit Assemblies

- .3 Grout for block cores: in accordance with CAN/CSA A179-14.

2.3 Reinforcing and Connectors

- .1 Conform to minimum requirements of CAN/CSA A370-14 unless otherwise indicated.
- .2 Corrosion protection; metal materials: in accordance with building code and CAN/CSA A370-14:
 - .1 Hot dipped after fabrication to ASTM A1064/A1064M-22, and ASTM A153/A153M-09 Class B2 (457 g/m²).
 - .1 Exterior to air barrier location: Use hot dip galvanized after fabrication.
 - .2 Interior to air barrier location: Use mill galvanized.
 - .2 For metal located exterior to the air barrier membrane: Stainless steel Type 304/316.
- .3 Joint reinforcement:
 - .1 Acceptable manufacturers:
 - .1 Blok-Lok.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Exterior wall assemblies: 4.75 mm (3/16") wire, welded rod, ladder design unless otherwise indicated.
 - .3 Interior wall assemblies: 9 gauge mill galvanized wire ladder reinforcement.

2.4 Masonry Accessories

- .1 Deflection space filler (non-fire rated walls):
 - .1 Acceptable *Products*:
 - .1 Johns Manville 'MinWool Sound Attenuation Fire Batts'.
 - .2 Rockwool 'AFB'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .2 Deflection space filler (fire rated walls): in accordance with Section 07 84 00.
- .3 Movement (control) joint filler; concrete block wythes: PVC.
 - .1 Acceptable *Products*:
 - .1 Blok-Lok 'VS Series'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .4 Masonry flashing:
 - .1 Sheet Membrane:
 - .1 Acceptable *Products*:
 - .1 Bakor 'Blueskin TWF'.
 - .2 Tremco 'ExoAir TWF'.
 - .3 Substitutions: in accordance with Section 01 25 00.
 - .2 Primer: as per manufacturer's installation requirements.

Masonry Unit Assemblies

- .3 SBS rubberized asphalt compound integrally laminated to cross laminated polyethylene film.
- .4 Overall thickness: 1 mm (40 mils).
- .5 Film thickness: 0.203 mm (8 mils).
- .6 Service temperature: -40 °C to 70 °C.
- .2 Lap sealant:
 - .1 Acceptable Product:
 - .1 Bakor 'Air-bloc-21'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.5 Brick

- .1 Clay brick:
 - .1 Exterior kiln fired clay brick veneer: in accordance with CAN/CSA A82-14.
 - .1 Grade EG.
 - .2 Type:
 - .1 S.
 - .2 Size:
 - .1 Match existing.
 - .3 Colour:
 - .1 Match existing.

2.6 Concrete Masonry Units

- .1 In accordance with CAN/CSA A165 SERIES-14.
 - .1 In-situ carbon dioxide mineralization:
 - .1 In-situ carbon dioxide mineralization in concrete masonry units: Supply concrete masonry units that have undergone in-situ carbon dioxide mineralization, such that post-industrial carbon dioxide (CO₂) is injected into the concrete during mixing and chemically converted into a mineral.
 - .2 Acceptable technologies:
 - .1 Carbi-Crete.
 - .2 CarbonCure Technologies Inc.
 - .3 Carboclave.
 - .2 Include shapes, such as end, bond, sash groove, ledge and lintel units, required to complete the *Work*, with uniform appearance.
 - .1 *Provide* open end blocks where vertical reinforcing occurs in walls.
 - .2 *Provide* knock-out blocks where horizontal reinforcing bars occur in walls.
 - .3 Solid concrete masonry units may be used where grouted block is indicated, whenever reinforcing is not indicated, in lieu of grouted solid installation method.

Masonry Unit Assemblies

- .4 Size: Match existing.
- .3 Normal weight units:
 - .1 Hollow units: H/15/A/M, H/20/A/M and H/25/A/M.
 - .2 Semi-solid units: SS/15/A/M, SS/20/A/M and SS/25/A/M.
 - .3 Full solid units: SF/15/A/M, SF/20/A/M and SF/25/A/M.
 - .4 Colour: grey.
 - .5 Profiles: as indicated.
- .4 Light weight units:
 - .1 Hollow units: H/15/C/M.
 - .2 Semi-solid units: SS/15/C/M.
 - .3 Full solid units: SF/15/C/M.
 - .4 Colour: grey.
 - .5 Profiles: as indicated.

PART 3- EXECUTION

3.1 Preparation

- .1 Prior to commencing masonry work, verify that conditions at the *Place of the Work* will allow construction of masonry within required limitations for wall heights, wall thicknesses, openings, bond, anchorage, lateral support, and compressive strengths of masonry units and mortars.
- .2 *Provide* protection where required at mixing areas to prevent damage attributed to mortar materials.

3.2 Workmanship

- .1 Build masonry plumb, level, and true to line, with vertical joints in proper alignment. Lay masonry to tolerances specified in CAN/CSA A371-14.
- .2 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.
- .3 Masonry mortar and grout work in accordance with CAN/CSA A179-14 except where specified otherwise.
- .4 Masonry work in accordance with CSA S304-14, CAN/CSAA370-14, and CAN/CSAA371-14 except where specified otherwise.

3.3 Measurement and Mixing

- .1 Mix mortars as specified in CAN/CSA A179-14. Use only dry aggregate. Test for bulking to determine accurate proportioning.
- .2 Fine grout: mix one part Portland cement and three parts sand with water.
- .3 Coarse grout: ready mixed high slump pea gravel concrete.
- .4 Adjust water in mortar mix to suit absorption rates of masonry units.
- .5 Laying Masonry Units to match existing stack bond unless otherwise indicated.

Masonry Unit Assemblies

- .6 Installation and materials shall meet or exceed that of accepted samples and mock-up.
- .7 Units shall be cut only upon acceptance of *Consultant*. Walls are to be laid-up with full size masonry units.
- .8 Where masonry surfaces serve as substrate for thin-set tile and direct applied coatings, build to tolerance of 1:500 (1/8" in any 6'-0") (3 mm in any 1.83 m) under a straight edge.
- .9 Remove loose and foreign materials from supporting bed surfaces to ensure bonding.
- .10 Stop off horizontal runs of walls by racking back a half unit in each horizontal course. Do not tooth.
- .11 Do not install defective, cracked, and broken masonry units.
- .12 Do not install masonry units with face or faces exhibiting chips, blemishes, texture variation, and other imperfections detracting from appearance when viewed from distance of 4600 mm (15 ft.).
- .13 Do not lay concrete masonry units that will appear smooth or slick where exposed to view, whether painted or not finished.
- .14 Mixing and blending: Mix units from a minimum of 3 pallets to achieve uniform blend of colour and texture and comply with manufacturer's recommended installation requirements. Distribute masonry units of varying textures to avoid spotty appearance over wall surfaces exposed to view. Do not use units which contrast too greatly with overall range.
- .15 Maintain bracing of walls and piers continuously during construction until structure provides support.
- .16 Locate bearings and piers as indicated. *Provide* solid masonry units at bearings. Grout under bearing plates installed on masonry with non-shrink grout.
- .17 Extend walls and partitions to deck, slab or structural members, as applicable, except where otherwise noted in the *Contract Documents*. Incorporate both lateral support and deflection space at termination of walls as required by this section.
- .18 Lay masonry level, true to line, square, plumb, and as indicated. Lay masonry courses in vertical alignment to ensure vertical joints align for full height of masonry and full height of building face.
- .19 Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
- .20 Fully bond intersections, and external corners.
- .21 Do not adjust masonry units after laying. Where resetting of masonry is required, remove, clean units and reset in new mortar.
- .22 Extend masonry to construction above, except where otherwise indicated. Cut and fill around obstructions.
- .23 Build chases, do not cut them.
- .24 Exposed cuts shall be made clean and true with a suitable masonry saw.

Masonry Unit Assemblies

3.4 Jointing

- .1 Form tooled mortar joints whenever exposed to view, and behind cabinets, fitments, and wall accessories. Tool when mortar is thumb-print hard by tools having long bearing surface to avoid uneven depressions. Close cracks and crevices.
- .2 Concealed masonry: strike flush joints concealed in walls and joints in walls to receive plaster, acrylic stucco, tile, insulation, resilient base, or other applied material except paint or similar thin finish coating. Ensure that no mortar protrudes from joints on wall surfaces to receive materials and coatings.
- .3 Tool with round non-staining pointing tool to provide smooth, compressed, uniformly concave joints except if specified or shown otherwise.
- .4 Joint thickness:
 - .1 Maintain mortar joint thickness of 10 mm (3/8"), unless otherwise specified or indicated.
 - .2 At masonry cut around obstructions: maximum joint size of 13 mm (1/2").
- .5 Make joints of uniform thickness with vertical joints in alignment.
- .6 Trowel point joints in unparged masonry in contact with earth.
- .7 Form reglets where indicated for metal flashing in masonry.
- .8 Remove loose or defective mortar when masonry is removed and replace.
- .9 Rake out joints at junctions of masonry with concrete walls and columns, and at intersection of masonry walls and partitions where joint reinforcement is installed. Seal these joints by Section 07 92 00.
- .10 Cut out defective mortar joints and repoint.

3.5 Joining of Work

- .1 Where necessary to temporarily stop horizontal runs of masonry, and in building corners;
 - .1 Step-back masonry diagonally to lowest course previously placed.
 - .2 Do not "tooth" new masonry.
 - .3 Fill in adjacent courses before heights of stepped masonry reach 1220 mm (48").

3.6 Cutting

- .1 Cut out neatly using a wet diamond blade saw for electrical switches, outlet boxes, and other recessed or built-in objects.
- .2 Make cuts straight, clean, and free from uneven edges.

3.7 Built-In Work

- .1 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
- .2 Coordinate and cooperate in the provisions for setting, anchorage and alignment of built-in work.
- .3 Metal door frames:

Masonry Unit Assemblies

- .1 Build masonry around metal door frames supplied and set in accordance with the various parts of the *Contract Documents*.
- .2 Secure anchors solidly, and verify that frames are true and plumb.
- .3 Fill back void of frames with mortar unless otherwise indicated.
- .4 Protect frame with protective covering and leave no mortar on exposed frame faces.

3.8 Support of Loads

- .1 Use 20 MPa concrete in accordance with Structural specifications, where concrete fill is used in lieu of solid units.
- .2 Install building paper below voids to be filled with concrete; keep paper 25 mm (1") back from faces of units.

3.9 Reinforced Masonry

- .1 Conform to requirements of CAN/CSA A371-14.
- .2 Grouting beneath bearing plates: Completely fill voids beneath steel bases bearing on masonry with an approved non-shrink grout having a compressive strength at 28 days of at least 35 MPa. Where grout is exposed to view or weather, use non-ferrous expansion agents.
- .3 Reinforced block lintels:
 - .1 Install reinforced block lintels over doorways, other openings and recesses as indicated.
 - .2 Support masonry units of reinforced block lintels built in place. *Provide* a level platform, true to the proper elevation and of sufficient strength to support the load without visible deflection. Maintain supports in place for a minimum of 7 days and for a period sufficient to permit the concrete to cure and gain sufficient strength to safely support all loads.
- .4 Lay masonry units with full mortar coverage on all abutting edges with joints shoved tight. Where masonry construction is continued above the lintel, place the first course of masonry units on the lintel in a full mortar bed.
- .5 Reinforce masonry lintels and bond beams as indicated. Make joints in lintels and bond beams to match adjacent walls.
- .6 Reinforce masonry walls as indicated.
- .7 Grouted reinforced masonry: Construct masonry to meet indicated requirements.
- .8 Place 100% solid block at each jamb under lintels.

3.10 Provision for Movement

- .1 Deflection space:
 - .1 Incorporate deflection space between tops of non-load-bearing walls/partitions and structure to prevent transference of structural loads to masonry.
 - .1 Exterior masonry wall deflection space: 12.7 mm (1/2").
- .2 Coordinate work of this section with installation of lateral supports.

Masonry Unit Assemblies

3.11 Deflection Space Filler

- .1 Non-fire rated walls: Fill deflection space with deflection space filler. Where deflection space is exposed, tamp filler into deflection space 25 mm (1").
- .2 Fire-rated walls: Refer to requirements of Section 07 84 00.

3.12 Masonry Flashing

- .1 Install flashings in masonry in accordance with CAN/CSAA371-14 and as follows:
 - .1 Install continuous flashings at exterior masonry, on foundation walls, slabs, shelf angles, window sills and at steel angles over openings. Install flashings under weep vent courses. Install flashings elsewhere as indicated, including below sills and copings.
 - .2 Remove or suitably repair damaged flashing membrane.
 - .3 Refer to drawings for arrangement of metal and membrane flashings. Mechanically fasten metal flashing with corrosion resistant fasteners.
 - .4 Carry flashings under outer masonry veneer, then up backing not less than 200 mm (8") unless otherwise indicated, and as follows:
 - .1 For masonry backing, turn flashing 25 mm (1") into horizontal mortar joint.
 - .2 At masonry and concrete backing, bond self-adhesive thru-wall sheet membrane flashing to air barrier membrane as recommended by membrane manufacturer, and seal top of lap joint with lap sealant.
 - .5 Overlap flashing joints 64 mm (2-1/2"). Roller membrane self-adhesive flashing joints. Seal non-self-adhering flashing and metal flashing lap joints with lap sealant.
 - .6 Install flashings to shed water in masonry cavity to exterior. Make flashings watertight.
 - .7 Dam ends of flashing at head and sill of glazing water tight.
 - .8 Keep flashing back 12 mm (1/2") from outside face of wall or veneer, unless otherwise indicated.
 - .9 Flashings are not to be visible, unless otherwise indicated.

3.13 Loose Steel Lintels

- .1 Set and level lintels, centred over opening width, on a slip-sheet membrane, placed over bed or mortar.
- .2 Allow suitable movement joint at ends of lintels for expansion and contraction movement at exterior lintels.

3.14 Lateral Supports

- .1 In addition to requirements of *Contract Documents*, *Provide* horizontal and vertical wall and partition lateral support anchors in accordance with CAN/CSAA370-14.

3.15 Movement (Control) Joints

- .1 *Provide* continuous movement joints maximum 7480 mm (24'-6") on centre, and/or as indicated.

Masonry Unit Assemblies

- .2 Place movement joints at changes in wall direction, changes in building heights, at door and window locations where necessary and directed, at major changes in thickness of wall, periodic lengths of continuous wall (7480 mm (24'6") on centre maximum) and as directed by *Consultant* and as indicated.
- .3 Review and coordinate movement joint locations with the *Consultant* prior to installation of masonry.
- .4 Construct movement joints as indicated. Unless otherwise indicated, make movement joints 19 mm (3/4") wide. Cut masonry reinforcement at control joints.
- .5 Stop reinforcing 25 mm (1") short of each side of movement joints unless otherwise indicated.

3.16 Horizontal Reinforcing

- .1 Joint reinforcement:
 - .1 Install joint reinforcement in cavity walls, solid walls and partitions.
 - .2 Place reinforcement continuously in horizontal joints at 400 mm (16") on centre, beginning with course 400 mm (16") above bearing, unless otherwise indicated.
 - .3 Do not carry reinforcement through intersections where lateral support anchors are installed, at intersections of walls and partitions with solid piers and at block movement joints.

3.17 Bolts and Anchors

- .1 Embed bolts and anchors solidly in mortar or grout to develop maximum resistance to design forces.

3.18 Structural Reinforcement

- .1 Install to indicated requirements.

3.19 Temporary Bracing

- .1 *Provide* temporary bracing to masonry walls.

3.20 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Source quality control: Perform tests on masonry units to determine compressive strength as required by jurisdictional authorities in accordance with CAN/CSA A165 SERIES-14.
- .2 Field tests and inspections:
 - .1 Supply and install mortar for strength testing in accordance with CAN/CSA A179-14 and Section 01 45 00.

3.21 Adjusting and Cleaning

- .1 Protect masonry and adjacent work from damage from cleaning work.
- .2 Clean masonry in accordance with masonry manufacturer's written requirements. Remove masonry and install new masonry, if masonry is damaged by cleaning work.

Masonry Unit Assemblies

- .3 Test cleaning agent and procedures by cleaning small, inconspicuous sample location prior to commencement of overall cleaning work. Review cleaning test area with *Consultant* and obtain acceptance in writing prior to cleaning remainder of areas requiring cleaning.
- .4 Soak wall with clean water and flush off loose dirt and mortar.
- .5 Apply specified cleaning agent in accordance with the manufacturer's direction, working from top to bottom.
- .6 Rinse areas thoroughly with clean water to remove cleaning solutions, dirt, and mortar residue.
- .7 Remove mortar from exposed masonry face immediately and prior to full set to avoid mortar staining of masonry units. Remove masonry and install new masonry, if mortar staining cannot be removed without damaging masonry work.
- .8 Remove efflorescence and mortar deposits from surfaces to receive coatings and surfaces which are exposed to view. Remove efflorescence and mortar deposits from surfaces to receive coatings or surfaces which are exposed to view, occurring within a time period of 1 year after date of *Substantial Performance of the Work*.
- .9 Use proprietary PH-neutral cleaning solution with water as approved by manufacturer of masonry units in accordance with manufacturer's written directions. Use clean water to remove excess cleaning solution.
- .10 Remove mortar droppings from flashings and other materials immediately to prevent damage and discolouration.

3.22 Protection

- .1 Protect other materials and finishes from contamination by mortar droppings.
- .2 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

END OF SECTION

Lateral Load-Bearing Cold-Formed Metal Framing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Lateral load-bearing cold-formed metal framing, including but not limited to metal studs, furring, at exterior assemblies subject to lateral loads and loads transferred by exterior materials and assemblies.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Submit engineered shop drawings. Field review requirements shall include the following:
 - .1 Checking that mill test reports are properly correlated to materials.
 - .2 Sampling fabrication and erection procedures for general conformity to requirements of the *Contract Documents*.
 - .3 Checking that welding conforms to requirements specified under "Welding" heading in Section 05 41 13.
 - .4 Checking fabricated members against specified member shapes.
 - .5 Visual inspection of welded connections including sample checking of joint preparation and fit-up.
 - .6 Sample checking of screwed and bolted joints.
 - .7 Sample checking that tolerances are not exceeded during fit-up or erection.
 - .8 Additional review and testing of welded connections as required by CSA W59-18.
 - .9 General review of field cutting and alterations required by other sections.
 - .10 Field and shop review of prefabricated panel components and connections.
 - .2 Include necessary shop details and erection diagrams. Indicate member sizes, locations thicknesses exclusive of coating, coatings and materials. Include connection details for attaching framing to itself and for attachment to the structure. Show splice details where permitted. Indicate dimensions, openings, requirements of related work and critical installation procedures. Show temporary bracing required for erection purposes.
 - .3 Indicate design loads and design calculations, including horizontal and vertical reactions at connections to building structure for all load cases.

Lateral Load-Bearing Cold-Formed Metal Framing

1.4 Quality Assurance

.1 Qualifications:

- .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.
- .2 Provide mock-up in accordance with requirements of Section 07 24 10.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Base design on limit states design principles using factored loads and resistances.
- .2 Specified lateral loads shall be in accordance with the building code for building classification - 'Post-Disaster Building'.
- .3 Specified lateral loads shall be in accordance with the building code. For wind load calculations, the reference velocity pressure, q , shall be based on a 1 in 50 probability of being exceeded in any one year.
- .4 Resistances and resistance factors shall be in accordance with the building code and CAN/CSA S136-16.
- .5 Conform to the requirements of fire rated assemblies which have been tested in accordance with CAN/ULC S101-14 and provide indicated fire resistance rating.
- .6 Design and *Provide* work of this section in accordance with Exterior Insulation and Finish Systems Best Practice Guide Building Technology, latest edition.
- .7 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Do not rely on collateral sheathing to help restrain member rotation and translation perpendicular to the minor axis. *Provide* bridging at 1525 mm (60") on centre maximum. Space bridging at equal intervals over the span length of the member.
- .8 Design anchorage and splice details for bridging.
- .9 Design for local loading due to anchorage of cladding and interior wall mounted fixtures.
- .10 Maximum flexural deflections under specified lateral loads shall conform to following:
 - .1 L/360 unless otherwise indicated.
 - .2 Metal framing supporting masonry veneer shall meet the requirements of CSA S304-14.
 - .3 Metal framing assemblies supporting non-metal material clad soffits: L/720.
- .11 Design components or assemblies to accommodate specified erection tolerances of the structure.
- .12 *Provide* head, sill and jamb members and connections to frame openings larger than 100 mm (3-15/16") in any dimension.
- .13 Limit free play and movement in connections perpendicular to the plane of the framing to ± 0.5 mm (0.019") relative to the building structure.
- .14 Anchor top and bottom track to the structure at a maximum spacing of 813 mm (32") centre to centre. Closer spacing shall be required in accordance with design requirements.

Lateral Load-Bearing Cold-Formed Metal Framing

- .15 Allow for movement of structure. Design end connections to accommodate floor/roof deflections such that framing is not loaded axially.
- .16 Connections between lightweight steel framing members shall be by bolts, welding or sheet metal screws.
- .17 Resistances for sheet metal screws shall be based on manufacturer's lowest bound test values multiplied by appropriate resistance factor, given in CAN/CSA S136-16.
- .18 Coordinate framing and *Provide* support for control joints specified in Section 09 29 00.
- .19 Exterior soffit framing systems shall be inclusive of horizontal framing, secondary framing members, lateral braces, suspension members, and any other elements subject to lateral loads and dead loads of soffit cladding systems.

2.2 Materials

- .1 Steel to conform to requirements of CAN/CSA S136-16 and be identified as to specification, type grade and mechanical properties.
 - .1 Minimum base steel thickness exclusive of coating shall be as follows:
 - .1 1.087 mm (0.0428"). Use greater stud thickness if required by the design criteria.
 - .2 1.367 mm (0.0538"). Use greater stud thickness if required by the design criteria.
 - .3 Minimum thickness for clip angles shall be 1.367 mm (0.054"). Use greater clip angle thickness if required by the design criteria.
 - .2 Metal framing members forming part of exterior building envelope shall have a minimum coating of Z275 galvanizing in accordance with ASTM A924/A924M-22a. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of *Consultant*.
 - .3 Sheet metal screws shall have a minimum coating thickness of 0.008 mm (0.0003") of zinc. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of *Consultant*.
 - .4 Welding electrodes shall be of 480 MPa minimum tensile strength series.
 - .5 Zinc rich paint for touching up welds and damaged metallic coatings shall conform to CAN/CGSB 1.181-M99.
 - .6 Galvanic/dissimilar metal corrosion inhibitor (isolation coating): in accordance with Section 01 73 00 and written requirements of manufacturers of metals affected.
 - .7 Concrete anchors shall have a minimum coating thickness of 0.008 mm (0.00032") of zinc. Other coatings providing equal or better corrosion protection may be used.
 - .8 Miscellaneous steel: CSA G40.21-13, Grade 300W, hot dip galvanized after fabrication.
 - .9 Screws, bolts, nuts, washers and fasteners: Stainless steel of austenitic grade, 300 series for galvanized steel connections. Bolted connections shall have a lock washer or other locking device.
 - .10 Screws:
 - .1 Steel screws shall be equal to or exceed minimum diameter indicated on shop drawings.

Lateral Load-Bearing Cold-Formed Metal Framing

- .2 Penetration beyond joined materials shall be not less than 3 exposed threads.
- .3 Thread types and drilling capability shall conform to manufacturer's recommendations.
- .4 Screws covered by sheathing materials shall have low profile heads.

2.3 Fabrication

- .1 *Provide* cut-outs centred in webs of members to accommodate mechanical and electrical services. Effect of cut-outs on strength and stiffness of members shall be considered.
- .2 Steel thickness exclusive of coating shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

PART 3 - EXECUTION

3.1 Welding

- .1 Companies engaged in welding shall be certified by Canadian Welding Bureau to CSA W47.1-19. Companies shall have welding procedures approved and welders qualified for base material types and thicknesses that are to be welded.
- .2 Welds shall conform to CSA W59-18 and/or AWS D1.3/D1.3M:2008, whichever is applicable.
- .3 For materials less than 3 mm (1/8") thick, shop drawings may show nominal weld sizes. For such material, effective throats of welds shall not be less than thickness of thinnest connected part.
- .4 Touch-up welds with zinc rich paint.

3.2 Erection

- .1 Erect lateral load-bearing metal framing and prefabricated EIFS panel system true and plumb within specified tolerances.
- .2 Employ temporary bracing wherever necessary to withstand loads to which the structure may be subject during erection and subsequent construction.
 - .1 Leave temporary bracing in place as long as required for safety and integrity of structure.
 - .2 Erector shall verify that during erection a margin of safety consistent with the requirements of the building code and CAN/CSA S136-16.
- .3 *Provide* galvanic/dissimilar metal corrosion inhibitor (isolation coating) in accordance with Section 01 73 00 and written requirements of manufacturers of metals affected.
- .4 Erection tolerances:
 - .1 For purposes of this section, camber is defined as deviation from straightness of a member or any portion of a member or any portion of a member with respect to its major axis.
 - .2 For metal framing, out of plumbness shall not exceed 1/500th of member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.

Lateral Load-Bearing Cold-Formed Metal Framing

- .3 Metal framing shall seat into top and bottom tracks. Gap between end of stud and web of track shall not exceed 4 mm (0.158").
- .4 For track, camber shall not exceed 1/1000th of member length.
- .5 Align adjacent prefabricated panels to provide surface continuity at interface.
- .6 Spacing of metal framing shall not be more than 3 mm (1/8") from design spacing. Cumulative error in spacing shall not exceed requirements of finishing materials.
- .5 Make field measurements necessary to ensure proper fit of members and prefabricated EIFS panels.
- .6 Cutting of members may be by saw or shear. Torch cutting is not permitted.
- .7 Holes that are field cut into lightweight steel framing members shall conform to requirements specified under "Fabrication" heading in Section 05 41 13 and requirements specified under "Erection" heading in Section 05 41 13.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

END OF SECTION

Metal Fabrications

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Work of this section includes metal fabrications schedule located on the drawings, including but not limited to the following:
 - .1 Cable tray covers, and related components.
 - .2 Farming support for cable tray covers.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Submit list of fabrications to be provided as part of the work of this section.
- .3 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .4 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Include plans, sections and large scale details, and indicate components and methods of assembly, materials and their characteristics, fastenings, metal finishes, welds, and their structural characteristics relative to their purpose, and other fabrication information required.
 - .3 Indicate proposed *Place of the Work* connections and methods.
 - .4 Submit coordination drawings indicating locations of concealed grounds, cutouts, plates, and other required fabrications.
 - .5 Show relation to adjoining construction, details of outside and inside corners and door openings.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit operation and maintenance data for incorporation into maintenance manual specified in Section 01 77 00.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*:
 - .1 Has adequate plant, equipment, and skilled tradespersons to perform work expeditiously.

Metal Fabrications

- .2 Has successfully completed installations similar to that required in the *Work* during a period of at least the immediate past 5 years.
- .2 Requirements of regulatory agencies: the work of this section that functions to resist forces imposed by dead and live loads shall conform to requirements of jurisdictional authorities.

1.6 Delivery, Storage, and Handling

- .1 Label, tag or otherwise mark metal fabrications supplied for installation by other sections to indicate its function, location in building and shop drawing designation.
- .2 Protect work from damage during delivery, storage and handling.
- .3 Deliver work to location at the *Place of the Work* designated by *Contractor* and to meet requirements of construction schedule.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 Performance/Design Requirements

- .1 Design, fabricate, and install work of this section in accordance with the building code and requirements of authorities having jurisdiction.
- .2 Welding:
 - .1 Steel: Weld components to conform to requirements of CSA W59-24, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19(R2024) and CSA W55.3-08 (R2023) as applicable.
 - .2 Stainless steel: Weld components to conform to requirements of CSA W59-24 and ANSI/AWS D1.6/D1.6M-2017 as applicable, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19(R2024).
- .3 Design assemblies and connections to withstand own dead load, live loads, super-imposed dead loads, and fabrication forces, without permanent distortions or deformation, to maximum allowable deflection of L/360, within the following construction tolerances:
 - .1 Maximum variation from plumb in vertical lines: 3.2 mm (1/8") in 3 m (10'-0").
 - .2 Maximum variation from level: 3.2 mm (1/8") in 9 m (30'-0").
 - .3 Maximum variation from straight: 3.2 mm (1/8") in 3 m (10'-0") under a 3 m (10'-0") straight edge.
 - .4 Maximum variation from angle indicated: 10 seconds.
 - .5 Tolerances shall be non-cumulative.

2.2 Materials

- .1 General:
 - .1 Unless detailed or specified otherwise, standard *Products* will be acceptable if construction details and installation meet requirements of the *Contract Documents*.
 - .2 Include materials, *Products*, accessories, and supplementary parts necessary to complete assembly and installation of work of Section 05 50 00.

Metal Fabrications

- .3 Incorporate only metals that are free from defects that are visible, or that impair strength or durability. Install only new metals that are of best quality, free from rust or waves and buckles, clean, straight, with sharply defined profiles.
- .2 Steel:
 - .1 Structural shapes, plate, bars: hot-rolled, in accordance with CSA G40.21-13, Grade 300W.
 - .2 Hollow structural sections: hot-formed, seamless, in accordance with CSA G40.21-13, Grade 350W, Class H.
 - .3 Mild sheet and strip: hot rolled, in accordance with ASTM A1011/A1011M-18a.
 - .4 Cold rolled sheet: stretcher levelled, fully pickled, in accordance with ASTM A1008/A1008M-18, Grade CS Type A exposed, matte finish, dry, unless otherwise indicated.
 - .5 Steel pipe: in accordance with ASTM A53/A53M-18, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015.
- .3 Stainless steel:
 - .1 Type 304 unless otherwise indicated.
 - .2 Stainless steel tubing: in accordance with ASTM A269/A269M-15a, Commercial Grade, seamless welded.
 - .3 Stainless steel sheet and plate: in accordance with ASTM A167-99(2009).
 - .4 Stainless steel bar and angle: in accordance with ASTM A276/A276M-25.
 - .5 Stainless steel seamless pipe: in accordance with ASTM A312/A312M-18a.

2.3 Accessories

- .1 Fasteners:
 - .1 Exposed fasteners to match the material surface on which they occur.
 - .2 For fastening steel: Zinc plated screws and bolts, and in accordance with ASTM A307-21, Type 304 stainless steel where exposed to exterior.
 - .3 For fastening stainless steel: Stainless steel 300 Series or stainless steel 400 Series.
 - .4 High strength bolts: in accordance with ASTM A325-14.
 - .5 Other types of fasteners as appropriate to meet design requirements.
 - .6 Fasteners shall be tamperproof where exposed.
- .2 Welding materials:
 - .1 Steel: in accordance with CSA W59-24.
 - .2 Stainless steel: in accordance with ANSI/AWS D1.6/D1.6M-2017.
- .3 Grout:
 - .1 Epoxy grout; non-shrink, non-expanding.
 - .1 Acceptable *Products*:
 - .1 Hilti 'HY-200'.

Metal Fabrications

- .2 Sika 'Sika AnchorFix 3001'.
- .3 W.R. Meadows 'REZI-WELD 3/2 EPOXY GROUT/PATCH'.
- .4 Substitutions: in accordance with Section 01 25 00.
- .2 Cementitious grout: non-shrink, non-expanding in accordance with ASTM C1107/C1107M-20:
 - .1 *Acceptable Products:*
 - .1 Sika 'Sika Grout 212' or 'Sika M-Bed Standard'.
 - .2 W.R. Meadows 'Sealtight CG-86 Construction Grout'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Dielectric separator: Best grade, quick drying non-staining alkali resistant bituminous paint in accordance with CAN/CGSB 1.108-M89, or membrane type to acceptance of *Consultant*.

2.4 Finishes

- .1 Shop primer; premium quality:
 - .1 *Acceptable Product:*
 - .1 Sherwin-Williams 'Pro Industrial Pro-Cryl Universal Primer', 0.0076 mm (3 mils) DFT.
- .2 Zinc rich paint; steel: Two-component zinc-rich coating, zinc powder in accordance with ASTM D520-00(2019) Type III, SSPC-Paint 20, Type 1 Inorganic or single-component zinc-rich coating to SSPC-Paint, Type 2 Organic, CAN/CGSB 1.181-M99, VOC content <100 g/l to ASTM D1475-13(2020).
 - .1 *Acceptable Products:*
 - .1 Aervoe Industries, Inc. 'Low VOC Cold Galvanize Coating 93% Zinc'.
 - .2 ZRC Worldwide 'ZRC Zero-VOC Galvanizing Compound'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .3 Hot dip galvanizing: in accordance with ASTM A123/A123M-17, minimum zinc coating of 600 g/m². Use air cooling method (no water or chromate dipping treatment permitted).
- .4 Stainless steel: in accordance with AISI No. 4 brushed finish.
- .5 Powder paint:
 - .1 *Acceptable Products:*
 - .1 Tiger Drylac series 58 (epoxy TGIC free), in accordance with AAMA 2604-22.
 - .2 Colour: To later selection by *Consultant*.
- .6 Field painting; for final touch-ups: in accordance with Section 09 91 00.

2.5 Fabrication

- .1 General:
 - .1 Fabricate metal fabrications with machinery and tools specifically designed for the intended manufacturing processes and by skilled tradesmen.

Metal Fabrications

- .2 Fit and assemble metal fabrications in shop. When this is not possible, make a trial shop assembly.
- .3 Incorporate means for fastenings of other work secured to work of this section.
- .2 Construction:
 - .1 Fabricate with materials, component sizes, metal gauges, reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities. Fabricate items from steel unless otherwise noted.
 - .2 Metal fabrications shall remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation.
 - .3 Construct items that are part of floor construction, such as gratings and trench covers, to support the same live loads for which surrounding construction is designed.
- .3 Assembly:
 - .1 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.
 - .2 Provide smooth welds with splatter removed where exposed to view.
 - .1 Finish welds shall comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM-AMP 521-01(R2012).
 - .3 Allow for differential movements within assemblies and at junctions of assemblies with surrounding *Work*.
 - .4 Incorporate holes and connections for work installed under other sections.
 - .5 Cleanly and smoothly finish exposed edges of materials including holes.
 - .6 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.
- .4 Shop prime painting; premium quality:
 - .1 Clean loose mill scale, rust, dirt, weld flux and spatter from work after fabrication.
 - .2 Clean and prepare surfaces to meet specified requirements of SSPC SP-6 and paint manufacturer's installation requirements.
 - .3 Apply primer in accordance with paint manufacturer's installation requirements.
- .5 Powder painting:
 - .1 Apply powder paint in accordance with the manufacturer's requirements and recommendations and as follows.
 - .2 Cleaning:
 - .1 Clean surfaces to be coated as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping dry with clean cloths or compressed air.
 - .2 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

Metal Fabrications

- .3 Allow surfaces to drain completely and allow to thoroughly dry.
- .2 If the above procedures do not clean the substrate surfaces, clean the surfaces with high pressure water washing.
- .3 Apply pre-treatment as soon as possible after cleaning and before surface deterioration occurs.
- .4 Pre-treat iron phosphate for steel, zinc phosphate for galvanized or steel structures, and yellow or green chromating, or approved chrome-free for aluminum substrates.
- .3 Application:
 - .1 Apply coating to requirements of coating manufacturer's written application requirements.
 - .2 Method of application: as recommended by paint system manufacturer.
 - .3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly fluidizing powder coating to be applied.
 - .2 Apply coating materials to clean surfaces to minimum 2.5 - 3.5 mil dry film thickness or as specified by manufacturer.
 - .3 Coating shall adhere to internal corners and recessed areas.
 - .4 Allow surfaces to cure for minimum time period as required by manufacturer.
 - .5 Cure in accordance with manufacturer's cure curves.
- .6 Galvanizing:
 - .1 Galvanize metal fabrications following fabrication.
 - .2 Paint damage galvanized surfaces with zinc rich paint, immediately following damage to galvanized protection. Prepare substrate to remove oil and grease to SSPC-SP1-16, rust scale to SSPC-SP3-18, mill scale to SSPC-SP6/NACE No. 3-07.
 - .3 At interior locations, fill vent and drain holes exposed in the finished *Work* by plugging with zinc solder and filing off smooth.
 - .4 At exterior locations, except where indicated to remain as weep holes, fill vent and drain holes exposed in the finished *Work* by plugging with zinc solder and filing off smooth.

PART 3- EXECUTION

3.1 Examination

- .1 Take measurements at the *Place of the Work* to verify that metal fabrications fit surrounding construction, around obstructions and projections in place, or as indicated, and to suit service locations.

3.2 Installation

- .1 Install metal fabrications plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding work.

Metal Fabrications

- .2 Include in work of this section anchor bolts, high tensile bolts, washers and nuts, expansion bolts, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation as required by loading and jurisdictional authorities.
- .3 Countersink holes at wood screw locations where wood is attached to work of this section.
- .4 Attach metal fabrications to interior concrete and masonry with corrosion resistant expansion bolts to support load with a safety factor of 3.
- .5 Insulate between dissimilar metals or between metal, and masonry or concrete with bituminous paint to prevent electrolytic action.
- .6 Grout components in metal sleeves cast into concrete, with non-shrink quick setting epoxy anchor cement, unless detailed otherwise. Fabricate sleeves of 75 mm (3") minimum in depth.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Field painting: in accordance with Section 09 91 00.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Inspection and testing:
 - .1 Test stainless steel for free iron in accordance with ASTM A380/A380M-25. If test results or inspections show stainless steel work to be contaminated with free iron or other impurity which can lead to discolouration of stainless steel work when exposed to moisture, remove and replace or repair the stainless steel work in accordance with recommendation of Nickel Development Institute and as required to provide stainless steel which meets the requirements of this section.

3.4 Adjusting and Cleaning

- .1 After erection, touch up primed surfaces that are burned, scratched or otherwise damaged with prime paint to match shop paint.
- .2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.

3.5 Metal Fabrications Schedule

- .1 Refer to Metal Fabrications Schedule located on drawings.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

.1 Section includes:

- .1 Work of this section includes architectural metal fabrications and related metals identified on the drawings, including but not limited to the following:

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Submit engineered shop drawings.
- .2 Submit a list of fabrications to be supplied and installed as part of the work of this section.
- .3 Include plans, sections and large scale details, exposed-to-view edge conditions.
- .4 Indicate materials, including material characteristics, profiles of each metal fabrication member, methods of assembly and joinery, fittings, fastenings, finishes, anchorages, welds, solders, brazing, and their structural characteristics relative to their purpose, accessory items, and other fabrication information required.
- .5 Indicate proposed *Place of the Work* connections and methods.
- .6 Submit coordination drawings indicating locations of concealed grounds, cutouts, plates, and other required fabrications.
- .7 Show relation to adjoining construction, details of outside and inside corners and door openings.

.4 Samples:

- .1 Submit 3 sets of samples of architectural metals and shop finished materials, show each type of finish and colour, 200 mm x 200 mm (8" x 8") size.
- .2 Provide samples of welded joints showing quality of workmanship.
- .3 Provide fastener samples for each type required.

.5 Mill certificates:

Architectural Metal Fabrications

- .1 Submit mill certificates signed by manufacturers of stainless steel certifying that products furnished comply with requirements of the *Contract Documents*.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified. In addition:
 - .1 *Subcontractor*, shop foreperson, and *Place of the Work* installation foreperson:
 - .1 Has successfully completed installations similar to that specified during a period of at least the immediate past 10 years.

1.5 Product Handling

- .1 Product handling shall be in accordance with Section 01 60 00 as supplemented by the requirements of this section.
- .2 For aluminum fabrications comply with AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.

1.6 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 10 years.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design, fabricate, and install work of this section in accordance with the building code and requirements of authorities having jurisdiction.
- .2 Welding:
 - .1 Steel: Weld components to conform to requirements of CSA W59-18, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19 and CSA W55.3-08 (R2018) as applicable.
- .3 Design assemblies and connections to withstand own dead load, super-imposed dead loads, live load, and fabrication forces, without permanent distortions or deformation, to maximum allowable deflection of L/360, within the following construction tolerances:
 - .1 Edges and surfaces shall be uniform for like metalwork.
 - .2 Limit inconsistencies in edge and surfaces to those which can be identified when viewed from distance of not greater than 300 mm (12").

Architectural Metal Fabrications

- .3 Surfaces of panels shall be flat and free of distortion when viewed from any distance or angle from surface.
- .4 Finish shall be uniform when viewed from any distance from surface or from like surfaces which are viewed from within the same viewing area.
- .5 Limit variations from plumb and level:
 - .1 3.2 mm in 6096 mm (1/8" in 20'-0") vertically and horizontally.
 - .2 6.4 mm in 12192 mm (1/4" in 40'-0") either direction.
- .6 Limit offsets in theoretical end-to-end and edge-to-edge alignment:
 - .1 1.6 mm (1/16") where surfaces are flush or less than 12.7 mm (1/2") out of flush and separated by not more than 50 mm (2").
 - .2 3.2 mm (1/8") for surfaces separated by more than 50 mm (2").
- .7 Step in face: 1.6 mm (1/16") maximum.
- .8 Jog in alignment: 1.6 mm (1/16") maximum.
- .9 Location: 6.4 mm (1/4") maximum deviation of any member at any location.
- .10 Tolerances are not cumulative.
- .4 Comply with NAAMM AMP 555-92 – Standard Practice for the Architectural Metal Industry (Including Miscellaneous Iron).

2.2 Materials

- .1 General:
 - .1 Unless detailed or specified otherwise, standard *Products* will be acceptable if construction details and installation meet requirements of the *Contract Documents*.
 - .2 Include materials, *Products*, accessories, and supplementary parts necessary to complete assembly and installation of work of Section 05 50 10.
 - .3 Incorporate only metals that are free from defects that are visible, or that impair strength or durability. Install only new metals that are of best quality, free from rust or waves and buckles, clean, straight, with sharply defined profiles.
- .2 Steel:
 - .1 Structural shapes, plate, bars: hot-rolled or cold-rolled to suit design requirements, in accordance with CSA G40.21-13, Grade 300W.
 - .2 Hollow structural sections: hot-formed or cold-formed to suit design requirements, seamless, in accordance with CSA G40.21-13, Grade 350W, Class H or Class C.
 - .3 Mild steel sheet and strip: hot rolled, in accordance with ASTM A1011/A1011M-14, Commercial.

Architectural Metal Fabrications

- .4 Cold rolled sheet: stretcher levelled, fully pickled, in accordance with ASTM A1008/A1008M-13, Grade CS Type A exposed, matte finish, oiled, unless otherwise indicated.
- .5 Steel pipe: in accordance with ASTM A53/A53M-12, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015.

2.3 Accessories

.1 Fasteners:

- .1 Exposed fasteners to match the appearance of the surface on which they occur.
- .2 For fastening steel: Zinc plated screws and bolts, and in accordance with ASTM A307-21, Type 304 stainless steel where exposed to exterior.
- .3 High strength bolts: in accordance with ASTM A325-14.
- .4 Concrete anchors; exterior exposed to weather: embedded epoxy set anchors, unless otherwise indicated.
 - .1 Size: in accordance with manufacturer's written requirements and reviewed shop drawings. Embedment depth shall not be greater than 80% of concrete thickness.
- .5 Other types of fasteners as appropriate to meet design requirements.
- .6 Fasteners shall be tamperproof where exposed.

.2 Welding materials:

- .1 Steel: in accordance with CSA W59-18.

.3 Grout:

- .1 Epoxy grout; non-shrink, non-expanding.
 - .1 *Acceptable Products:*
 - .1 Hilti 'HY-200'.
 - .2 Sika 'Sika AnchorFix 3001'.
 - .3 W.R. Meadows 'REZI-WELD 3/2 EPOXY GROUT/PATCH'.
- .2 Cementitious grout: non-shrink, non-expanding to ASTM C1107/C1107M-20:
 - .1 *Acceptable Products:*
 - .1 Sika 'Sika Grout 212' or 'Sika M-Bed Standard'.
 - .2 W.R. Meadows 'Sealtight CG-86 Construction Grout'.
 - .3 Substitutions: in accordance with Section 01 25 00.

- .4 Galvanic/dissimilar metal corrosion inhibitor (isolation coating): in accordance with Section 01 73 00 and written requirements of manufacturers of metals affected.

Architectural Metal Fabrications

2.4 Finishes

- .1 Prime paint; standard quality:
 - .1 Architectural grade (exposed) fabrications: Provide primers that comply with primers and finish systems specified in Section 09 91 00.
- .2 Zinc rich paint; steel: Two-component zinc-rich coating, zinc powder to ASTM D520-00(2019) Type III ,SSPC-Paint 20, Type 1 Inorganic or single-component zinc-rich coating to SSPC-Paint, Type 2 Organic, CAN/CGSB 1.181-M99, VOC content <100 g/l to ASTM-D1475.
 - .1 Acceptable Products:
 - .1 Aervoe Industries, Inc. 'Low VOC Cold Galvanize Coating 93% Zinc'.
 - .2 ZRC Worldwide 'ZRC Zero-VOC Galvanizing Compound'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .3 Hot dip galvanizing: for irregular sections, in accordance with ASTM A123/A123M-13, minimum zinc coating of 600 g/m². Use air cooling method (no water or chromate dipping treatment permitted).
- .4 Field painting; for final touch-ups: in accordance with Section 09 91 00.

2.5 Fabrication

- .1 General:
 - .1 Fabricate architectural metal fabrications with machinery and tools specifically designed for the intended manufacturing processes and by skilled tradesmen.
 - .2 Fit and assemble architectural metal fabrications in shop. When this is not possible, make a trial shop assembly.
 - .3 Incorporate means for fastenings of other work secured to work of this section.
 - .4 Provide separation of stainless steel or non-ferrous metals fabrication areas from mild steel fabrication areas.
 - .5 Grinders, wire brushes, and tools used on stainless steel or non-ferrous metals shall be free of materials which will leave or produce dissimilar material or metal oxides deposits. Tools previously used on mild steel shall not be used on stainless steel or non-ferrous metal work.
 - .6 Do not bring iron or mild steel surfaces into contact with stainless steel or non-ferrous metals, including lifting tools, steel tables, storage racks, and other storage and handling equipment.
 - .7 Cutting or grinding debris from iron or mild steel materials shall not be permitted to settle on stainless steel or non-ferrous materials and fabrications.
 - .8 Perform water-wetting and drying tests during finishing indicating free iron on finished stainless work in accordance with ASTM A380-06.

Architectural Metal Fabrications

.2 Construction:

- .1 Fabricate with materials, component sizes, metal thicknesses (gauges), reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities. Fabricate items from steel unless otherwise noted.
- .2 Architectural metal fabrications shall remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation to expansion and contraction forces and loads.
- .3 Construct items that are part of floor construction, such as gratings and trench covers, to support the same live loads for which surrounding construction is designed.
- .4 Non-galvanized steel fabrications at exterior locations: *Provide* drainage holes at exterior exposed tubular fabrications to permit drainage of moisture to exterior of metal fabrications.

.3 Assembly:

- .1 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.
- .2 Corners shall be mitred unless otherwise noted.
- .3 Fasten work with concealed methods unless otherwise indicated.
- .4 Weld connections where possible, bolt where not possible, and cut off bolts flush with nuts. Countersink bolt heads, and supply and install method to prevent loosening of nuts. Ream holes drilled for fastenings.
 - .1 Except where exposed to view:
 - .1 Finish welds shall comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.
 - .2 Where exposed to view:
 - .1 Weld behind finished surfaces without distorting or discolouring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Joint Finish Guidelines", for "Finish #1 - no evidence of a welded joint".
- .5 Allow for differential movements within assemblies and at junctions of assemblies with surrounding work.
- .6 Field welding of hot dipped galvanized members permitted only when other fastening methods are not possible. Locations of field welds to be clearly identified on shop drawings.
- .7 Incorporate holes and connections for work installed under other sections.

Architectural Metal Fabrications

- .8 Cleanly and smoothly finish exposed edges of materials including holes.
- .9 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.
- .4 Shop prime painting; standard quality:
 - .1 Clean loose mill scale, rust, dirt, weld flux and spatter from the work after fabrication.
 - .2 Clean and prepare surfaces to meet specified requirements of SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning", and factory prime finish and site finish, to manufacturer's installation requirements. Apply paints using HVLP or conventional spray application.
- .5 Galvanizing:
 - .1 Galvanize metal fabrications following fabrication.
 - .2 Paint damaged galvanized surfaces with zinc rich paint, immediately following damage to galvanized protection. Prepare substrate to remove oil and grease to SSPC-SP1-16, rust scale to SSPC-SP3-18, mill scale to SSPC-SP6/NACE No. 3-07.
 - .3 At interior locations, fill vent and drain holes exposed in the finished *Work*, by plugging with zinc solder and filing off smooth.
 - .4 At exterior locations, except where indicated to remain as weep holes, fill vent and drain holes exposed in the finished *Work* by plugging with zinc solder and filing off smooth.
- .6 Fabrications exposed to view:
 - .1 Fabrications exposed to view shall be of the highest architectural quality, free of scratches, pitting, roughness, marring, discolouration, seams, staining and other imperfections with the quality of workmanship conforming to the workmanship classifications of Class 1 as defined in NAAMM-AMP 555-92, paragraph 8.3 of Section 8, Quality Control or Assurance and as follows:
 - .1 Exposed surfaces are finished smooth with pits, mill marks, nicks and scratches filled or ground off. Defects shall not show when painted or polished. Remove sharp corners and edges.
 - .2 Conceal welds where possible. Where exposed, grind welds to small radius with uniform sized cove. Welds shall appear continuous in appearance. When painted or polished welds shall be undetectable.
 - .3 Use only flat head countersunk bolts in exposed locations unless indicated otherwise.
 - .4 Distortions shall not be visible to the eye.
 - .5 Exposed joints shall be fitted to hairline finish.

Architectural Metal Fabrications

- .2 Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- .3 Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- .4 Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the work.
- .5 Form simple and compound curves in bars, pipe, tubing, and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.
- .6 Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1 mm (0.040") unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- .7 Mill joints to a tight, hairline fit. Cope or mitre corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- .8 Surface preparation; non-ferrous metals: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. Run grain of directional finishes with long dimension of each piece.

PART 3 - EXECUTION

3.1 Examination

- .1 Take measurements at the *Place of the Work* to verify that architectural metal fabrications fit surrounding construction, around obstructions and projections in place, or as indicated, and to suit service locations.
- .2 Inspect surfaces on which work of this section is dependent for any irregularities detrimental to installation and performance of the work of this section. Confirm conditions are satisfactory before proceeding.

3.2 Installation

- .1 Install work plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding Work and as required for proper performance.
- .2 Supply and install anchor bolts, high tensile bolts, washers and nuts, expansion bolts, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation as required by loading and jurisdictional authorities.
- .3 Countersink holes at wood screws where wood is attached to work of this section.

Architectural Metal Fabrications

- .4 Attach metal fabrications to interior concrete and masonry with corrosion resistant expansion bolts to support load with a safety factor of 3.
- .5 Attach metal fabrications to exterior concrete and masonry with non-shrink epoxy grout to support load with a safety factor of 3.
- .1 *Provide* galvanic/dissimilar metal corrosion inhibitor (isolation coating) in accordance with Section 01 73 00 and written requirements of manufacturers of metals affected.
- .2 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .3 Erect members and component parts plumb, level and true to building lines, in correct relation to work of other sections and established lines, curves and levels indicated.
- .4 Securely anchor metal framing to concrete by means of anchor rods with epoxy adhesive, shim and pack to true straight lines and levels.
- .5 Field welding:
 - .1 Comply with applicable specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections given above in this section.
 - .2 Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- .6 Glass shall be in lengths shown, cut to shapes as required to suit slopes, curves, rakes and conditions indicated and to provide vertical joints. Set glass plumb and true to line with no variation in face plane between sections of glass at joints.
- .7 Fasten railing anchors at the *Place of the Work*. Coordinate with related *Subcontractors*.
- .8 Field painting: in accordance with Section 09 91 00.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and as follows:

3.4 Adjusting and Cleaning

- .1 After erection, touch up primed surfaces that are burned, scratched or otherwise damaged with prime paint to match shop paint.
- .2 Repair areas of bare metal and welds on galvanized surfaces with zinc rich paint.
- .3 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.
- .4 Clean and polish surfaces after installation is complete. Use only materials that will not scratch or mar finished surfaces and as approved by material manufacturers.

END OF SECTION

Rough Carpentry

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 The work of this section includes, but is not necessarily limited to, the following:
 - .1 Plywood backing panels.
 - .2 Wood grounds, nailers, blocking and sleepers.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
 - .1 Clearly indicate details of construction, profiles, jointing, fastening and other related details, seismic design, connections, and restraint of wall assemblies.

1.3 Delivery, Storage, and Handling

- .1 When it is required that wood maintain dimensional stability and tolerances to ensure accurate installation of later work, store and install it only in dry areas, and where no further installation of moist materials is contemplated.

PART 2 - PRODUCTS

2.1 Wood Materials

- .1 General requirements:
 - .1 Except as indicated or specified otherwise lumber shall be softwood, S4S, moisture content not greater than 19% at time of installation, in accordance with following standards:
 - .1 CSA O141-05.
 - .2 NLGA-2017 Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds:
 - .1 Use S2S material.
 - .2 Dimension lumber sizes: in compliance with Section 12 of the NLGA-2017.
 - .3 Dimension lumber species and grades:
 - .1 Spruce-Pine-Fir.
 - .2 Light framing in accordance with NLGA-2017 Construction grade, S-Dry.
 - .3 Planks in accordance with NLGA-2017 No. 2 grade, S-Dry.
 - .4 Boards in accordance with NLGA-2017 No. 4 Common grade, S-Dry.
- .3 Curbs, nailers, plywood for roofing: Spruce species, NLGA construction grade, sound and free of imperfections or deficiencies making unsuitable for use. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

Rough Carpentry

2.2 Panel Materials

- .1 Softwood plywood (CSP): in accordance with CSA O151-17.
- .2 Douglas Fir plywood (DFP): in accordance with CSA O121-17.

2.3 Fastenings and Hardware

- .1 General:
 - .1 Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 38 mm (1-1/2") into wood substrate.
 - .2 Anchors to concrete and unit masonry: Capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E488/E488M-22.
 - .3 Use surface fastenings of following types, except where specific type is indicated.
 - .1 To hollow masonry, plaster and panel surfaces use 9 mm (11/32") expansion bolts or other acceptable anchor.
 - .2 To solid masonry and concrete use expansion bolts.
 - .3 To structural steel use bolts through drilled hole, or welded stud-bolts or power driven self-drilling screws, or welded stud-bolts.
 - .4 Fastener materials:
 - .1 Hot-dip galvanized fasteners: in accordance with ASTM A153/A153M-16a Class A or B1 G185 and connectors meeting ASTM A653/A653M-18 Class G-185 sheet or better.
 - .5 Hardware materials:
 - .1 Hot-dipped galvanized in accordance with ASTM A153/A153M-16a, Class A or B1, and connectors in accordance with ASTM A653/A653M-18, Class G185.

2.4 Source Quality Control

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

PART 3 - EXECUTION

3.1 General

- .1 Layout work to accommodate work of others. Cut and fit accurately. Erect in position indicated. Align, level, square, plumb, and secure work permanently in place.
- .2 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolt head and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of work.
- .3 Include in work of this section rough hardware such as nails, bolts, nuts, washers, screws, clips, and connectors required for complete and proper installations; and operating hardware required on work of this section for temporary use.

Rough Carpentry

- .4 Do not attach work by wood plugs or blocking in concrete or masonry.
- .5 Do not regard nailers, blocking, and such other fastening provision indicated as exact or complete. Install required provisions for fastening, located and secured to suit *Place of the Work* conditions, and adequate for intended support.
- .6 Verify that grounds required for fastening of components and equipment are located correctly, and sized for adequate support.

3.2 Furring, Blocking, Nailing strips, Grounds

- .1 Securely attach wood members to substrate by anchoring and fastening as indicated, complying with the following:
 - .1 Attach each item in the build-up with fasteners or anchors at spacing not exceeding the following:
 - .1 Wood to wood:
 - .1 Screws: 450 mm (18").
 - .2 Nails: 300 mm (12").
 - .2 Wood to metal:
 - .1 Screws: 450 mm (18").
 - .2 Bolts/washers: 1220 mm (48").
 - .3 Wood to concrete/concrete block:
 - .1 Tapcon type screws: 450 mm (18").
 - .2 Expansion/toggle bolts/washers: 1220 mm (48").
 - .2 Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces.
 - .3 Size fasteners for embedment into substrate in accordance with manufacturer's installation requirements.
- .2 Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood.

3.3 Curbs, Supports, and Blocking at Roofing Assemblies

- .1 Install wood curbs, upstands, supports and blocking and securely attach to structure, trimmed and levelled to receive flashings and applied roofing materials.
- .2 Slope wood or plywood caps at parapets to provide positive moisture drainage toward roofing membrane unless otherwise indicated.
- .3 *Provide* wood nailers of minimum 38 mm (1-1/2") thick solid wood members for anchorage of fasteners.
- .4 Securely attach wood members to substrate by anchoring and fastening as indicated, complying with the following:
 - .1 Attach each item in the build-up with fasteners or anchors at spacing not exceeding the following:
 - .1 Wood to wood:

Rough Carpentry

- .1 Screws: 450 mm (18").
- .2 Nails: 300 mm (12").
- .2 Wood to metal:
 - .1 Screws: 450 mm (18").
 - .2 Bolts/washers: 1220 mm (48").
- .3 Wood to concrete/concrete block:
 - .1 Tapcon type screws: 450 mm (18").
 - .2 Expansion/toggle bolts/washers: 1220 mm (48").
- .2 Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces.
- .3 Size fasteners for embedment into substrate in accordance with manufacturer's installation requirements.
- .5 Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood.

3.4

3.5 Equipment Backboard

- .1 Provide backboards for mounting equipment as required. Use 19 mm (3/4") Softwood Plywood.
- .2 Refer to Divisions 21, 22, and 23 and Divisions 26, 27, and 28 for requirements for electrical backboards.

END OF SECTION

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Work of this section includes architectural indicated on drawings including, but not limited to, the following:
 - .1 Cabinetry and hardware.
 - .2 Plastic laminate fabrications.
 - .3 Solid surfacing and fabrications.
 - .4 Factory and site finishing of architectural woodwork.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate with other work for satisfactory and expeditious completion of the work of this section. Coordinate with partition accessories, electrical, communications, audio-visual and finish components to ensure that proper provisions are made for the installation of the work of this section and for work by others.
 - .2 Where woodwork is to be fitted to other construction, check actual dimension of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delays in the *Work*.
 - .3 Provide forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the work of this section and set in place. Instruct applicable *Subcontractors* as to their locations.
 - .4 Provide cut-outs for raceways, sleeves, grommets and other manufactured accessories which are required for the work of this section and for work by others.
 - .5 Architectural woodwork specified under this section includes woodwork items which are closely integrated with both prefinished and field painted architectural metalwork, stonework, glass, and built-in electrical components, and consequently requires close coordination with such allied trades. This section is responsible for ensuring correct installation procedures and results.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data for each type of *Product* and process proposed for use in the work of this section and incorporated into items of architectural woodwork.
- .3 Certificates:
 - .1 Fire retardant pressure treated lumber or panel materials and water resistant panel materials shall be accompanied by supplier's certificate of conformance with this specification.

Architectural Woodwork

- .2 Include manufacturer's written requirements for finishing treated material.
- .4 Shop drawings:
 - .1 Submit shop drawings for the work of this section complying with the North American Architectural Woodwork Standards 4.0 requirements.
 - .2 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .3 Submit engineered shop drawings for the following architectural woodwork assemblies:
 - .1 Metal support framing assemblies.
 - .2 Wall hung or suspended millwork.
 - .4 Indicate quality standards and grades.
 - .5 Include full scale drawings of exposed-to-view edge conditions.
 - .6 Include plans, sections and large scale details, and indicate components and methods of assembly, fastenings, and other fabrication information required for the work of this section. Indicate assembly joint lines.
 - .7 Include materials and their characteristics and finishes as applicable including the following:
 - .1 Panel core and material types, thicknesses, compliance with specified standards, special treatments.
 - .2 Adhesive types to be used and locations.
 - .3 Finishing requirements including North American Architectural Woodwork Standards 4.0 finish system number, sheen, and required application steps.
 - .8 Submit coordination drawings indicating locations of concealed grounds, cut-outs, plates, and other required fabrications.
 - .9 Show relation to adjoining construction, details of outside and inside corners and door openings.
- .5 Selection samples:
 - .1 Casework hardware, electronic cut sheet of each component.
- .6 Verification samples:
 - .1 Submit samples for purpose of verification of compliance with specified requirements.
 - .2 Submit 3 sets of 200 mm x 200 mm (8" x 8") samples, or 200 mm (8") long as applicable, of each specified *Product*, material and finish, including but not limited to the following:
 - .1 Samples of each specified *Product*, in each specified colour and finish.
 - .2 Solid surfacing in each specified colour and finish.
 - .3 Plastic laminates, in each specified colour and finish.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.

Architectural Woodwork

.2 Operation and maintenance data:

- .1 Submit maintenance and cleaning instructions for finishes requiring specific care, noting particularly those procedures or materials which will cause damage to finished surfaces to be included in maintenance manuals.

.3 Maintenance materials:

- .1 Deliver extra sets of hardware items for maintenance as follows:
.1 2 % of each type actually installed, but not less than 2 sets.

1.5 Quality Assurance

.1 Qualifications:

.1 Manufacturers:

- .1 Architectural woodwork shall be manufactured by a firm having 5 years' experience, minimum, on work of similar size and quality.
- .2 Shall be a member in good standing of the Architectural Woodwork Institute or the Architectural Woodwork Manufacturers Association of Canada or the Woodwork Institute.
- .3 Solid surfacing fabricator: Fabrication to be performed by a solid surface manufacturer's certified fabricator. Submit certification letter prepared by the solid surfacing manufacturer.

.2 Installers:

- .1 Has successfully completed 2 architectural woodwork projects similar in scope, materials and design to this *Project* within the last 5 years.

.2 Quality standard:

- .1 Work shall be in accordance with the North American Architectural Woodwork Standards 4.0, Premium Grade, or the highest grade available for performance and appearance characteristics of materials in Sections 3 – 5 used that apply to *Product* fabrication and installation requirements governed by Sections 6 – 12.

1.6 Delivery, Storage, and Handling

- .1 Protect architectural woodwork during transit, delivery, storage and handling to prevent damage, spoilage, and deterioration.
- .2 Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate architectural woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified under paragraph 1.7 Field Conditions.
- .3 The architectural woodwork manufacturer and the *Contractor* shall be jointly responsible to make certain that architectural woodwork is not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.

1.7 Field Conditions

- .1 Environmental conditions:

Architectural Woodwork

- .1 During storage and installation: Obtain and comply with North American Architectural Woodwork Standards 4.0 for optimum temperature and relative humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained. Woodwork shall be acclimatized for a minimum of 72 hours prior to commencing woodwork installation.
- .2 During finishing: Comply with Architectural Woodwork Standard's temperature and humidity requirements before, during, and after application of finishes.
- .3 During service life of woodwork: Obtain and comply with woodwork manufacturer's advice for optimum temperature and humidity conditions.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Casework integrity shall meet the minimum acceptance levels in accordance with SEFA 8-1999 as outlined in the North American Architectural Woodwork Standards 4.0 and additional or greater loading capacities as specified throughout the North American Architectural Woodwork Standards 4.0.
- .2 Maximum allowable adjustable shelf lengths shall comply with shelves assembly rules per the North American Architectural Woodwork Standards 4.0 based on shelf thickness indicated or scheduled.

2.2 Wood Materials

- .1 Lumber:
 - .1 Hardwood for concealed blocking and framing: Custom grade, any species that, when painted, will not show any defects.
 - .2 Moisture content: Provide kiln-dried (KD) lumber with moisture content range between 6% to 12% for interior architectural woodwork. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation do not exceed 5% to 10%.

2.3 Panel Materials

- .1 Panel material schedule; except where indicated otherwise:
 - .1 Thickness: 13 mm (1/2") minimum or as indicated or scheduled.
 - .2 Core panels:
 - .1 At plastic laminate: Particle board.
 - .2 Plywood backing; countertops, backsplashes, millwork toe kick, and where indicated: Exterior grade plywood with no added urea-formaldehyde used in composition.
 - .3 Maximum moisture content at time of installation: 10% to 12%.

Architectural Woodwork

.2 Plywood:

.1 Veneer core plywood non telegraphing grain: Sanded good one side or good two sides (when both sides exposed or to receive applied finish materials) plywood:

.1 Hardwood plywood: in accordance with ANSI/HPVA HP-1-2009.

.2 Softwood plywood: to US Plywood Standard APA PS-1-19 Structural Plywood (with Typical APA Trademarks).

.3 Particleboard:

.1 In accordance with ANSI A208.1-2009, 13 mm (1/2") minimum thickness and as follows:

.1 Industrial grade:

.1 M-2 Medium density; between 640 - 800 kg/m³ (40 - 50 lb/ft³).

.2 Formaldehyde emission: No added urea-formaldehyde used in composition.

2.4 Plastic and Composite Materials

.1 High pressure decorative laminate (PL1) (PL2):

.1 General purpose grade: in accordance with ANSI/NEMA LD 3-2005, Horizontal General Purpose Grade (HGS).

.2 Colours, finishes, and patterns:

.1 In accordance with Finish Schedule.

.2 Substitutions in accordance with Section 01 25 00.

.2 Solid surfacing sheet (SSF1)

.1 Homogenous (not coated, laminated or composite construction), filled material containing methyl methacrylate.

.1 Acceptable *Product*: In accordance with Finish Schedule.

.2 Nominal sheet thickness: 13 mm (1/2") minimum, unless otherwise indicated.

.3 Colour/pattern: Refer to Finishes Schedule.

.4 Substitutions: in accordance with Section 01 25 00.

.2 Accessories:

.1 Joint adhesive: Manufacturer's standard adhesive to create inconspicuous, nonporous joints, with a chemical bond.

.2 Sealant: Mildew resistant sealant in accordance with Section 07 92 00.

2.5 Fasteners and Adhesives

.1 Fasteners shall comply with North American Architectural Woodwork Standards 4.0.

.2 Adhesives: Shall be used for intended purpose and manufacturer materials applications and installation, applied in accordance with manufacturer's written requirements and shall comply with the "adhesive usage guidelines" recommendations of North American Architectural Woodwork Standards 4.0.

Architectural Woodwork

2.6 Hardware

- .1 Casework hardware; to be furnished and installed by the architectural woodwork manufacturer.
 - .1 Where casework hardware is not specified or indicated on drawings or scheduled, casework hardware shall comply with ANSI/BHMA Standards, latest edition, minimum grades, loading and other basic rules per the North American Architectural Woodwork Standards 4.0.
 - .2 Drawer slides: Full extension, side mounting, zinc coated, steel ball bearing, minimum 45 kg (100 lb);
 - .1 Acceptable Product: Knape & Vogt '#1429'.
 - .3 Spring Hinges: 170 degree opening, nickel plated steel mounting plate and self-closing hinge with zinc die cast screwed on cup.
 - .1 Acceptable Product: Blum Canada Ltd. '91A6500' or 91A6600.
 - .4 Door bumpers: vinyl, adhesive back, round, provide 2 per door.
 - .1 Acceptable Product: Blum 'TP1950'.
 - .5 Pulls; doors and drawers, except where otherwise indicated: to later selection by *Consultant*.
 - .6 Cabinet Locks: Tumber type, nickel plated. Provide two keys per lock.
 - .1 Acceptable Product: Knape & Vogt '987 NP'.
 - .7 Magnetic catches: Cast aluminum.
 - .1 Acceptable Product: Knape & Vogt '918'.
 - .8 Rod pulls: 7.9 mm diameter, 101.6 mm centres.
 - .1 Acceptable Product: Stanley Canada Inc. 'Model 4484'.
 - .9 Adjustable steel standards and supports: Nickel plated steel, adjustable on 12.7 mm centres. Standards at 152.4 mm from top and bottom, one set of support clips per 304.8 mm length of standard.
 - .1 Acceptable Product: Knape & Vogt '255 ZC x 256'.
 - .10 Grommets:
 - .1 Acceptable Product: Richelieu 'Round Metal Grommet #20694170'.
 - .11 Substitutions in accordance with Section 01 25 00.

2.7 Finishes - Interior Architectural Woodwork

- .1 General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.
- .2 Preparations for finishing:
 - .1 Prior to finishing, exposed portions of woodwork shall have 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.

Architectural Woodwork

- .2 Concealed surfaces of woodwork that might be exposed to moisture, such as those adjacent to exterior concrete or masonry walls, shall be back-primed.
- .3 Comply with referenced quality standard in Part 1 for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

2.8 Fabrication

- .1 Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises pre-cut, where possible, to receive hardware and other items of work.
- .2 Complete fabrication, assembly, finishing, hardware application, and other work before shipment to maximum extent possible. Trial fit in shop and disassemble components only as necessary for shipment and installation. Where necessary, provide ample allowance for scribing, trimming, and fitting. Reassemble with concealed fasteners.
- .3 Provide woodwork, solid tops and other indicated materials with pre-cut openings, where possible, for hardware, appliances, plumbing fixtures, electrical work, telephone cut-outs and similar items. Locate openings accurately and provide proper size and shape. Smooth edges of cut-outs and, where located in countertops, seal edges of cut-outs with a water-resistant coating.
- .4 Provide framing for architectural woodwork, complete with bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.
- .5 Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Take responsibility for the stability of furniture and fitments.
- .6 Provide balancing sheets as required, and specified, complying with the North American Architectural Woodwork Standards 4.0.
- .7 Provide surface mount blocking and strapping necessary to support the work of this section. Such blocking shall not be exposed upon completion of work.
- .8 Prefinish work at the factory, except where specified or indicated otherwise.
- .9 Solid wood edging: No end grain shall be visible; mitre external corners; house internal corners.

2.9 Fabrication - Solid Surfacing

- .1 Fabricate components in shop to greatest extent practical to size and shape indicated, in accordance with reviewed shop drawings and manufacturer's written requirements.
- .2 Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 100 mm (4") wide solid surfacing material reinforcing strip under joints.
- .3 Provide holes and cut-outs as indicated or as required.
- .4 Rout and finish component edges to a smooth, uniform finish. Rout cut-outs then sand edges smooth. Repair or reject defective or inaccurate work.
- .5 Surfaces shall have a uniform finish.

PART 3 - EXECUTION

3.1 Preparation

- .1 Condition woodwork to field conditions in installation areas before installing. Ensure that field conditions have been provided as requested and specified.
- .2 Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.
- .3 Provide grounds, nailers and other required fabrications which are to be built into other work when required.
- .4 Ensure that wall and ceiling variations are not in excess of 6.4 mm (1/4") in 3658 mm (144") and that floors are not in excess of 12.7 mm (1/2") in 3658 mm (144") of being plumb, level, flat, straight, square, of the correct size. Variations shall be corrected prior to installation of work of this section.
- .5 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

3.2 Installation

- .1 Install woodwork to comply with North American Architectural Woodwork Standards 4.0 for same grade specified in Part 1 of this section for type of woodwork involved.
- .2 Install woodwork plumb, level, true, and straight with no distortions.
- .3 Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- .4 Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- .5 Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

3.3 Installation - Tolerances

- .1 Install to a tolerance of 3 mm in 2400 mm (1/8" in 8'-0") for plumb and level (including tops) and with no variations in flushness of adjoining surfaces unless otherwise acceptable in accordance with the North American Architectural Woodwork Standards 4.0.

3.4 Adjusting and Cleaning

- .1 Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork.
- .2 Clean, lubricate, and adjust hardware.
- .3 Clean woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

Architectural Woodwork

3.5 Protection

- .1 Protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.
- .2 Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that woodwork is without damage or deterioration at time of *Substantial Performance of the Work*.

END OF SECTION

Roofing Repairs

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Roofing repairs to the existing roofing system.

1.2 Administrative Requirements

- .1 Coordination
 - .1 Coordinate with Divisions 21, 22, and 23 to ensure that roof drains are suitable for roofing system design.
 - .2 Coordinate with installers of roof mounted items, equipment, and mechanical and electrical work at roof so that installation will not subvert the integrity of the roofing system.
 - .3 Coordinate with installation of air barrier at walls to ensure complete continuity of air barrier system for building.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 The manufacturer shall meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the roofing assembly.
 - .2 Meet with *Consultant*, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - .3 Review methods and procedures related to roofing installation, including manufacturer's written requirements.
 - .4 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - .5 Examine substrates and existing conditions for compliance with requirements, including flatness and fastening.
 - .6 Review structural loading limitations of roof deck during and after roofing.
 - .7 Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - .8 Review governing regulations and requirements for insurance and certificates if applicable.
 - .9 Review temporary protection requirements for roofing system during and after installation.
 - .10 Review roof observation and repair procedures after roofing installation.
 - .11 Forecasted weather conditions.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:

Roofing Repairs

- .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .2 Include covering letter signed by manufacturer of roof assembly materials and on manufacturer's letterhead, confirming compliance of *Products* and materials with CAN/ULC S107-19.
- .3 Shop drawings:
 - .1 Indicate locations and details of main joints, tie-ins to existing work, penetrations, and flashing.
 - .2 Indicate layout of sloped insulation panels with panel identification markings indicated.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 78 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's maintenance instructions for incorporation into the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified. In addition:
 - .1 *Subcontractor*: Shall be a member in good standing of the Canadian Roofing Contractors Association (CRCA) and Ontario Industrial Roofing Contractors Association (OIRCA), for at least 5 years.

1.6 Product Handling

- .1 Product handling shall be in accordance with Section 01 60 00 as supplemented by the requirements of this section.
- .2 Do not store roofing materials on roof.

1.7 Site Conditions

- .1 Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written requirements and warranty requirements.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 10 years.

Roofing Repairs

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 The roofing system shall include roofing system materials required to achieve wind uplift load requirements and roofing membrane manufacturer's warranty.
- .2 FM roof design and performance:
 - .1 Roofing system assemblies shall have been successfully tested by a qualified testing agency to resist project roofing uplift pressures in accordance with the building code.
 - .2 Roofing system shall meet FM Class 1-90 Windstorm Classification as determined in conformance with Factory Mutual test procedures.
- .3 Roof covering classification: Roof assembly shall have a Class C classification as determined in conformance with CAN/ULC S107-19 "Standard Methods of Fire Tests of Roof Coverings".
- .4 Roofing system: Prevent water from entering building and roofing assembly through roofing membrane.

2.2 Materials

- .1 General:
 - .1 Roofing system materials shall be sourced from one manufacturer unless otherwise specified.
- .2 Roofing repair materials: new materials, to match grade and quality of existing roofing systems.
- .3 Insulation: Thickness and type to match existing insulation.
 - .1 Tapered type where indicated.
- .4 Penetration sealer and form system:
 - .1 Compatible with roofing systems.
 - .2 Primer as recommended by sealer manufacturer.
 - .3 Acceptable *Products*:
 - .1 Chem Link Inc. 'ChemCurb System'.
- .5 Flashings: prefinished; to match existing flashings.
- .6 Fasteners and adhesives:
 - .1 Roofing nails: galvanized steel to CSA B111-1974, Table 12, and length sufficient to penetrate wood substrate 25 mm (1") minimum.
 - .2 Metal discs: flat caps of 25 mm (1") minimum diameter, 0.6 mm (0.023") sheet metal, formed to prevent dishing. No discs are required with roofing nails having 25 mm (1") diameter solid cap heads.
 - .3 Adhesives and primers as recommended by roofing system manufacturer.
 - .4 Fastening bars: Z275 galvanized or AZ150 galvalume steel, or extruded aluminum, 14 gauge, slot holes 25 mm (1") on centre.

Roofing Repairs

- .7 Rough carpentry in accordance with Section 06 10 53.
- .8 Joint sealants in accordance with Section 07 92 00.
- .9 Metal flashings in accordance with Section 07 62 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Before proceeding with roofing application, verify that:
 - .1 Roof deck is constructed smoothly; in true planes; and level, or sloped to drains, whichever is design intent.
 - .2 Roof deck is clean and sufficiently dry for application under specified warranty.
 - .3 Adjacent construction and installation of work of other sections to be incorporated with roof is completed.
 - .4 Roofing surfaces are free of cracks that are wider than bridging ability of roofing materials.
 - .5 Preparations have been made for bases on which equipment will be installed.
 - .6 Work that penetrates roof has been installed.

3.2 Preparation

- .1 Remove existing roofing and flashing assemblies.
- .2 Sweep roof deck completely free of dust, dirt and debris. Remove foreign materials.
- .3 Ensure that stored porous materials absorb no moisture. Remove wet materials from *Place of the Work*.
- .4 Protect surrounding work, and adjacent building and other property from damage during roofing operations, and weather damage, taking particular care to prevent droppings and discolouration of surrounding buildings by smoke from kettles, as applicable. Prevent solvents and smoke from entering building intake vents.
- .5 This section shall make payment for repair of damage caused by its work.
- .6 Install temporary blocking and otherwise protect drains during roofing operations, and remove at completion of roofing work.

3.3 Installation

- .1 General:
 - .1 Apply roofing in accordance with the *Contract Documents*, requirements of jurisdictional authorities, and of material manufacturer's written directions which shall establish minimum requirements not otherwise specified.
 - .2 Make adjustments to specified roofing procedures caused by weather and site conditions only when approved.
 - .3 Verify that each part of the roofing system is completely bonded to the other unless otherwise specified.
 - .4 Lay roofing free from wrinkles, air pockets, fishmouths, tears, and prominent lap joints. Embed them in a uniformly spread layer of adhesive, as applicable.

Roofing Repairs

- .5 Complete entire roofing system up to line of termination of each day's work.

3.4 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

Self-Adhering Sheet Waterproofing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Sheet waterproof membrane at vertical locations as indicated.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Submit drawings showing locations of joints, section of entire system, section of each sleeve and penetration condition, flashing conditions and other fabrication information in accordance with Section 01 33 00.
- .4 Samples:
 - .1 Submit samples complete with manufacturer's labels intact, of materials to be used for the work of this section prior to commencement of work, allowing ample time for review and acceptance by *Consultant* and independent inspection and testing company. Do not proceed with work of this section until samples are accepted.
- .5 Manufacturers' instructions:
 - .1 Submit *Product* manufacturer's standard and project specific installation details required to cover the full spectrum of waterproofing conditions applicable to the work of this section.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.
- .2 Mock-Up:
 - .1 Construct panels 10 m² (100 ft²) of typical waterproofing installation for review and approval of *Consultant*. Locate at the *Place of the Work* as part of final installation.
 - .2 Do not proceed until mock-up has been reviewed and accepted by *Consultant*.

1.5 Product Handling

- .1 Product handling shall be in accordance with Section 01 60 00 as supplemented by the requirements of this section.
- .2 Store surface conditioner at temperature above 5°C.

Self-Adhering Sheet Waterproofing

- .3 Do not double-stack pallets during shipping or storage.

1.6 Site Conditions

- .1 Apply only when air and surface temperatures are maintained above 4°C, have been so for 48 hours, and are not likely to fall lower until the work of this section is completed, unless otherwise approved.
- .2 The work of this section may proceed at temperatures below 4°C only with mutual documented agreement of independent inspection and testing company, manufacturer, and applicator that, with materials and methods used, specified installation will be achieved.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 5 years.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Installed waterproofing membrane system shall provide watertight protection to prevent the passage of water under hydrostatic pressure.
- .2 Single source responsibility:
 - .1 Provide *Products* from one waterproofing membrane system manufacturer for the work of this section, including accessory *Products* and materials.
 - .1 Where waterproofing membrane system manufacturer does not manufacture or supply required accessory *Products* and materials, any such accessory *Products* or materials supplied for use in the Work shall have approval from waterproofing membrane system manufacturer for use as part of the final warranted installation.

2.2 Materials

- .1 Waterproofing membrane system; self-adhering polymeric waterproofing membrane:
 - .1 Thickness: 1.5 mm (1/16").
 - .2 Tensile strength: in accordance with ASTM D412-16(2021).
 - .1 Membrane: 2.24 MPa (325 psi) minimum.
 - .3 Elongation: in accordance with ASTM D412-16(2021).
 - .1 Polymeric membrane: 300 percent minimum.
 - .4 Water vapour transmission: in accordance with ASTM E96/E96M-13, Method B: 0.05 grains/ft²/hour maximum.
 - .5 Water absorption: in accordance with ASTM D570-22, 0.1%, 72 hours maximum.
 - .6 Resistance to hydrostatic head: equivalent to 70 m (230 ft) of water minimum.

Self-Adhering Sheet Waterproofing

- .7 Puncture resistance: in accordance with ASTM E154/E154M-08a(2019), 222 N (50 pounds) minimum.
- .8 Acceptable *Products*:
 - .1 Henry 'Blueskin WP 200'.
 - .2 Colloid Environmental Technologies Company (CETCO) 'Envirosheet', as distributed by DRE Industries Inc.
 - .3 GCP Applied Technologies 'Bituthene 3000' and 'Bituthene Low Temperature'.
 - .4 IKO 'AquaBarrier FP'.
 - .5 Soprema 'Colphene 3000'.
 - .6 Tremco 'TREMproof 560A'.
 - .7 W.R. Meadows 'Mel-Rol'.

PART 3- EXECUTION

3.1 General

- .1 Comply with manufacturer's *Product* data, including *Product* application and installation requirements, as well as manufacturer's shipping and storage recommendations.
- .2 Examine conditions of substrates and other conditions under which the work of this section is to be performed and notify the *Consultant*, in writing, of circumstances detrimental to the proper completion of the *Work*. Do not proceed with the work of this section until unsatisfactory conditions are corrected and are acceptable for compliance with manufacturer's written recommendations.

3.2 Preparation - Typical

- .1 Protect adjacent work areas and finish surfaces from damage or contamination from waterproofing *Products* during installation operations.
- .2 Concrete surfaces shall be smooth, clean, dry and free of any foreign matter that would otherwise hinder either adhesion or regularity of waterproofing membrane installation.
- .3 Remove fins, ridges, and other protrusions levelled and smoothly finished to match monolithic concrete surface. Completely fill honeycomb, aggregate pockets, holes and other voids with non-shrink cementitious grout levelled and smoothly finished to match monolithic concrete surface.
- .4 Priming: in accordance with manufacturers written requirements.

3.3 Vertical Membrane Installation

- .1 Apply waterproofing membrane system in accordance with manufacturer's written requirements.
- .2 Inspect membrane thoroughly before placement of protection course and make any corrections or repairs as necessary. Patch tears and any inadequately lapped seams using the waterproofing membrane.

Self-Adhering Sheet Waterproofing

3.4 Protection Course

- .1 Protect waterproofing membrane installation to avoid damage from other trades and backfilling operations.
- .2 Adhere each board using waterproofing protection board adhesive. Apply an adequate number spots of adhesive for each board to ensure resistance to wind uplift and movement due to construction traffic in accordance with manufactures written requirements.
- .3 Press each board into intimate contact with the waterproofing membrane and slide into position tightly against the previous. Gaps shall be no larger than 6 mm (1/4").

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Thermal insulation forming part of the building envelope, including:
 - .1 Batt insulation.
 - .2 Rigid insulation.
- .2 Section excludes:
 - .1 Roof insulation: in accordance with Section 07 01 50.
 - .2 Acoustic insulation within gypsum board assemblies: in accordance with Section 09 29 00.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product data*:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
 - .2 Submit data and installation instructions for materials and prefabricated devices, providing descriptions sufficient for identification at the *Place of the Work*.
 - .3 Submit data from manufacturer's or independent laboratory indicating compatibility and adhesive results of proposed materials.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.

1.5 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2 - PRODUCTS

2.1 Batt Insulation

- .1 Batt insulation:
 - .1 Unfaced, mineral-fibre batts, in accordance with CAN/ULC S702-14, Type 1.
 - .2 Acceptable *Products*:
 - .1 CertainTeed Insulation Canada Inc. 'Fibre Glass Building Insulation'.

Thermal Insulation

- .2 Johns Manville 'Unfaced Batts'.
- .3 Owens Corning 'PINK NextGen Fiberglas'.
- .4 Knauf Insulation 'EcoBatt'.
- .5 Rockwool 'ComfortBatt'.

2.2 Rigid Insulation

- .1 High load rigid insulation board; 275 kPa (40 psi):
 - .1 Compressive strength; ASTM D1621, 276 kPa (40 psi) minimum (measured at 5% deformation or at yield, whichever occurs first).
 - .2 Extruded polystyrene board:
 - .1 Extruded polystyrene, closed-cell, smooth skin, in accordance with CAN/ULC S701.1-17, Type 4:
 - .2 Acceptable *Products*:
 - .1 DuPont 'Styrofoam Highload 40'.
 - .2 Owens Corning 'Foamular NGX 400'.
 - .3 Soprema 'SOPRA-XPS 40'.
- .2 High load rigid insulation board; 415 kPa (60 psi):
 - .1 Compressive Strength, ASTM D1621-16, 415 kPa (60 psi) minimum (measured at 5% deformation or at yield, whichever occurs first).
 - .2 Extruded polystyrene board:
 - .1 Extruded polystyrene, closed-cell, smooth skin, in accordance with CAN/ULC S701.1-17, Type 4:
 - .2 Acceptable *Products*:
 - .1 DuPont 'Styrofoam Highload 60'.
 - .2 Owens Corning 'Foamular NGX 600'.
 - .3 Soprema 'SOPRA-XPS 60'.
 - .3 Expanded polystyrene board:
 - .1 Expanded polystyrene (EPS), closed-cell, in accordance with CAN/ULC S701.1-17, Type 3:
 - .2 Acceptable *Product*:
 - .1 Plasti-Fab 'PlastiSpan 60'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.3 Polyurethane Foam (Gap Filler) Insulation

- .1 Polyurethane Foam for thermal insulation around exterior framing assemblies (Gap Filler):
 - .1 One-component CFC-free polyurethane foam in accordance with CAN/ULC S710.1-11.

Thermal Insulation

2.4 Accessories

- .1 Adhesive for rigid insulation boards: Polymer modified liquid applied membrane, compatible with insulation to be applied, type as manufactured for the attachment of insulation.
 - .1 Acceptable *Product*:
 - .1 Henry Airbloc 21 or 230-21.

PART 3- EXECUTION

3.1 Installation - General

- .1 Install insulation in accordance with manufacturer's written requirements applicable to products and applications indicated.
- .2 Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- .3 Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- .4 Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness. Where multiple layers of insulation boards/batts are required, offset outer layer insulation board/batt joints 150 mm (6") from underlying insulation layer(s).
- .5 Install attachment at rate as required to prevent displacement of insulation boards during construction operations.
- .6 Form an unbroken thermal envelope:
 - .1 Insulation boards at joints shall be in contact for the full thickness of the insulation. Maximum acceptable joint width is 3 mm (1/8"). Fill joints larger than 3 mm (1/8") with insulation or replace to create a tighter joint.
 - .2 Offset insulation board joints a minimum of 150 mm (6").
 - .3 Insulation boards shall be free from chipped or broken edges.
 - .4 Use largest possible dimensions to reduce number of joints.
- .7 Apply insulation to ensure total and complete coverage of surfaces indicated to be insulated, and in direct contact with such surfaces.
- .8 Ensure integrity and continuity of insulation at juncture with different types of materials and seal in an acceptable manner.
- .9 Do not cover insulation until it has been reviewed and accepted by *Consultant*.

3.2 Installation - Batt Insulation

- .1 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .2 Install batt insulation to fill cavity unless otherwise indicated.
- .3 Trim insulation to provide close-fit contact to framing assemblies and fill the required cavity or insulation assemblies to thicknesses specified or indicated.

Thermal Insulation

- .4 Do not over compress or pack insulation to fit into spaces; maintain density to be consistent with the density of the uncompressed batt product.
- .5 Cut insulation to provide close-fit contact around electrical boxes, pipes, and other obstructions and penetrations through and within assemblies.
- .6 Secure insulation in such a manner that it will not sag or settle away from required locations.
- .7 At locations where insulation is not sandwiched by sheet metal or board materials, install continuous woven wire restraint mechanically fastened to steel studs to hold insulation against exterior sheathing materials.
- .8 Place insulation equal to that indicated for applicable assembly in jamb and header assemblies that will be inaccessible after their installation into wall.

3.3 Installation - Rigid Insulation

- .1 Edge butter rigid insulation joints with adhesive and trowel flush with insulation face at wall cavity insulation locations.
- .2 Butter masonry tie penetrations with adhesive at wall cavity insulation locations.

3.4 Installation - Foamed-in-Place (Gap Filler) Insulation

- .1 Install one-component foam insulation to fill gaps where indicated, in accordance with CAN/ULC S710.2-11 application standard.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.6 Protection

- .1 Comply with manufacturer's written requirements respecting protection.
- .2 Protect polystyrene insulation from extended exposure to sunlight.
- .3 Repair damage resulting from performance of work of this section in manner acceptable to *Consultant*.

END OF SECTION

Above-Grade Vapour Barrier

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Above-grade vapour barrier.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Samples:
 - .1 Submit sample of proposed *Products* for review by *Consultant*.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.
- .2 Mock-up:
 - .1 Construct 10 m² (100 ft²) area of typical installation for each type of *Product*.
 - .1 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.
 - .2 Locate at the *Place of the Work* as part of final installation. Space installation to include exterior wall panel incorporating window and insulation.
 - .3 Do not proceed until mock-up has been reviewed by *Consultant*.
 - .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

PART 2 - PRODUCTS

2.1 Sheet Vapour Barrier

- .1 Polyethylene film: in accordance with CAN/CGSB 51.34-M86, Type 1, 0.15 mm (6 mil) thick, with a water vapour permeance of not greater than 45 ng/(P•s•m²), flame spread rating of less than 150 to CAN/ULC-S102-10.

2.2 Accessories

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape.

Above-Grade Vapour Barrier

- .1 *Acceptable Products:*
 - .1 Tuck Tape 'Tuck Blue Sheathing Tape for PE Vapour Barrier'.
- .2 Lap sealant:
 - .1 Gunnable sealant, adheres to polyethylene film, non-acrylic based.
 - .1 In accordance with ASTM C920-14 Type N or S, Grade NS, Use NT or ASTM C919-22.
 - .2 *Acceptable Products:*
 - .1 DOWSIL '758 Silicone Weather Barrier Sealant'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Gunnable sealant, adheres to polyethylene film, non-hardening synthetic rubber.
 - .1 *Acceptable Products:*
 - .1 Pecora 'BA98'.
 - .2 Tremco 'Acoustical/Curtainwall Sealant'.
 - .3 QuietSeal 'Acoustic Sealant QS-350'.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3- EXECUTION

3.1 Installation

- .1 Ensure services are installed and inspected prior to installation of sheet vapour barrier.
- .2 Install sheet vapour barrier on interior side of insulation at exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous application.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect sheets for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 Attachment

- .1 Seal vertical joints in sheet vapour barrier over framing by lapping no fewer than two studs.
- .2 Fasten sheet vapour barrier to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners at 400 mm (16") on centre.

3.3 Exterior Surface Openings

- .1 Cut sheet vapour barrier to form openings and ensure material is lapped and sealed to frame.

3.4 Perimeter Seals

- .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.

Above-Grade Vapour Barrier

- .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 Lap Joint Seals

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm (6") and press into sealant bead.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.6 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

END OF SECTION

Below-Grade Vapour Barrier

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Below-grade vapour barrier; located beneath concrete slabs.

1.2 Administrative Requirements

1.3 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* to be for used in the work of this section.
- .3 Manufacturer's instructions:
 - .1 Submit manufacturer's *Product* installation instruction for *Products* to be used in the work of this section.
- .4 Vapour barrier test results and certification:
 - .1 Provide certification prepared by accredited testing company for test procedures listed in Table 1 of ASTM E1745-17(2023) and paragraphs 7.1.2, 7.1.3, 7.1.4, and 7.1.5 of ASTM E1745-17(2023). Provide the date of the most recent test and the test results for each test.
 - .1 Accompany certification tests specified above with letter signed by *Product* manufacturer attesting that material to be provided is of the same formulation and manufacture as the *Product* tested.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.
- .2 Mock-up:
 - .1 Construct 10 m² (100 ft²) area of typical installation for each type of *Product*.
 - .1 Construct mock-up of sheet vapour barrier installation including one lap joint, one edge termination, and one penetration. Mock-up may be part of finished work.
 - .2 Locate at the *Place of the Work* as part of final installation.
 - .3 Do not proceed until mock-up has been reviewed by *Consultant*.
 - .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

Below-Grade Vapour Barrier

PART 2 - PRODUCTS

2.1 Materials

- .1 Vapour barrier membrane:
 - .1 Performance criteria:
 - .1 Strength: Class A to ASTM E1745-17(2023).
 - .2 Thickness of plastic:
 - .2 Acceptable *Products*:
 - .1 Stego Industries 'Stego Wrap Vapor Barrier', thickness specified above.
 - .2 W.R. Meadows 'PERMINATOR', thickness specified above.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .2 Vapour barrier membrane joint tape:
 - .1 Pressure sensitive high density polyethylene tape, 100 mm (4") wide, product selection per vapour barrier membrane manufacturer's written installation requirements.
- .3 Penetration flashing:
 - .1 Vapour barrier membrane material and vapour barrier joint tape in accordance with manufacturer's written requirements.

PART 3 - EXECUTION

3.1 Installation

- .1 Install vapour barrier membrane in accordance with below-grade vapour barrier manufacturer's written requirements and ASTM E1643-18a.
- .2 Extend vapour barrier to the perimeter of the slab and seal to perimeter and penetration conditions. Seal around penetrations such as utilities and columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab and at the slab perimeter.
- .3 Install vapour barrier membrane using largest practicable sheet size to minimize joints over compacted fill.
- .4 Inspect vapour barrier membrane sheets for continuity. Repair punctures and tears in vapour barrier membrane with sealing tape before work is concealed.
- .5 Vapour barrier membrane installation shall be continuous and vapour tight.
- .6 Overlap vapour barrier membrane joints 150 mm (6") minimum and tape seal with vapour barrier joint tape.
- .7 Unroll vapour barrier membrane with longest dimension parallel with direction of concrete placement.
- .8 Lap vapour barrier membrane up foundation walls a minimum of 100 mm (4") and tape seal with vapour barrier joint tape.
- .9 Centre vapour barrier joint tape over vapour barrier membrane laps and joints. Keep area of tape adhesion free of dust, dirt, and moisture.

Below-Grade Vapour Barrier

- .10 Cut slit around pipes, ductwork, rebar, and wire penetrations to place the initial layer of vapour barrier membrane.
 - .1 Cut a piece of vapour barrier membrane minimum width of 300 mm (12"). The length should be 1 1/2 times the pipe circumference. With a roofer's knife or scissors, cut "fingers" half the width of the film.
 - .2 Wrap vapour barrier membrane around and tape the collar onto the pipe and completely tape fingers to the bottom layer of vapour barrier membrane with vapour barrier joint tape.
- .11 In the event that vapour barrier membrane is damaged during or after installation, repair the membrane. Cut a piece of vapour barrier membrane large enough to cover damage by minimum overlap of 150 mm (6"). Clean adhesion areas of dust, dirt, and moisture. Tape down edges using vapour barrier joint tape.

3.2 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

END OF SECTION

Air Barrier Systems

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Sheet-applied self-adhesive vapour impermeable air barrier membrane.
 - .2 Sheet-applied, self-adhesive impermeable water flashing membrane

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Compatibility statement:
 - .1 Submit manufacturer's compatibility statement validating compatibility of air barrier system materials with substrates and adjacent materials.
- .4 Samples:
 - .1 Submit 305 mm (12") square samples of each type of air barrier membrane.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.
- .2 Mock-up:
 - .1 Construct minimum 10 m² (100 ft²) area of each typical wall assembly installation for each type of *Product*.
 - .2 Locate at the *Place of the Work* as part of final installation. Space installation to include exterior wall panel incorporating window, glazing system and insulation.
 - .3 Do not proceed until mock-up has been reviewed by *Consultant*.

1.5 Product Handling

- .1 Product handling shall be in accordance with Section 01 60 00 as supplemented by the requirements of this section.
- .2 Store surface conditioner at temperature above 5°C.

1.6 Site Conditions

- .1 Low temperature application:
 - .1 Perform adhesion test for membrane when ambient temperature is below -5°C.

Air Barrier Systems

- .2 Proceed with work when temperature is (or is predicted) to fall below -5°C ambient temperature only with the mutual documented agreement of independent inspection and testing company, manufacturer, and applicator.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2
- .3 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 10 years.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Air barrier system shall perform as continuous air barrier and as liquid-water drainage plane flashed to discharge to exterior of building envelope incidental condensation or water penetration.
- .2 At wall and roof assembly transitions, air barrier system shall perform as continuous air barrier and as liquid-water drainage plane flashed to discharge to exterior of building envelope incidental condensation or water penetration by creation of unobstructed drainage plane that extends across the cladding transition or by flashing to discharge to exterior of building envelope incidental condensation or water penetration.
- .3 Air barrier system shall accommodate substrate movement, construction material changes, and transitions at perimeter conditions without deterioration which permits air and water leakage exceeding the following specified limits and requirements, or interruption of the drainage plane:
 - .1 Air permeance of air barrier material: Maximum 0.02 L/s.m² at 75 Pa (0.004 cfm/ft² at 1.57 psf) in accordance with ASTM E2178-13.
 - .2 Maximum air leakage rate for air barrier assemblies: 0.05 L/s.m² (0.010 cfm/ft²) when tested in accordance with ASTM E2357-18 at a pressure difference of 75 Pa (1.57 psf).
 - .3 Water vapour transmission for air and vapour barriers: Maximum 60 ng/Pa.s.m² (1.0 perms).
 - .4 Water vapour transmission for vapour permeable air barriers: Minimum 570 ng/Pa.s.m² (10 perms).
 - .5 Air barrier system structural performance while maintaining air barrier performance for air leakage: Air barrier system shall transfer wind loads to structure and shall resist design wind load in accordance with the building code.
 - .6 Low temperature performance: Minimum -30°C (-22°F).
 - .7 Compatibility: Air barrier system materials shall be compatible with substrate and adjacent materials with material manufacturers and show no performance deterioration during service conditions.
 - .8 Self-sealability: in accordance with ASTM D1970/D1970M-21.

Air Barrier Systems

- .9 Adhesion: in accordance with ASTM D4541-22, 110 kPa (16 psi) minimum performance for site tested adhesion.
- .4 Air barrier system shall be joined in an airtight and flexible manner to air barrier material of adjacent building envelope air barrier systems, allowing for relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between the following unless otherwise applicable:
 - .1 Foundation and walls.
 - .2 Walls and openings (windows, doors, louvres, and other wall penetrations).
 - .3 Wall and roof systems.
 - .4 Wall and roof over unconditioned space.
 - .5 Walls, floor and roof across construction, control, and movement joints.
 - .6 Walls, floors and roof to utility, pipe and duct penetrations.

2.2 Materials - General

- .1 Single source responsibility: Materials shall be sourced from one manufacturer including sheet membranes, air barrier sealants, primers, mastics and adhesives.

2.3 Sheet-Applied, Vapour Impermeable Self-Adhesive Air and Vapour Barrier Membrane System

- .1 Description: Composite preformed membrane system consisting of SBS modified asphalt or butyl backing and polyethylene or polypropylene scrim facer:
 - .1 Single source responsibility: Components required for complete air barrier system and through wall flashing membrane behind the opaque wall assemblies to be obtained from single manufacturer.
 - .2 Thickness: 1.0 mm (40 mils) for modified asphalt-based membrane and 0.55 mm (28 mils) for butyl-based membranes.
 - .3 Application temperature: in accordance with manufacturers written requirements.
 - .4 Primer: in accordance with manufacturers written requirements.
 - .5 Termination and penetration sealing mastic: in accordance with manufacturers written requirements.
 - .6 Acceptable product systems:
 - .1 Henry Company 'Blueskin SA' and 'Blueskin SA LT'.

2.4 Sheet-Applied, Self-Adhesive Impermeable Water Flashing Membrane

- .1 Description: Water resistive, vapour permeable, air barrier membrane consisting of a tri-laminate of two outer layers of modified polyolefin or polypropylene, bonded with permeable adhesive layer and split-back release film, complete with manufacturer's recommended primer. Membrane, with physical properties as follows:
 - .1 Weight: minimum 160 gm/m² (0.539 ounces/ft²).
 - .2 Penetration and termination sealant: in accordance with manufacturers written requirements.
 - .3 Acceptable product systems:

Air Barrier Systems

- .1 Henry 'Blueskin VP 160'.

PART 3 - EXECUTION

3.1 Installation - General

- .1 Surfaces to receive air barrier systems shall be smooth, dry and free from conditions that will adversely affect execution, permanence, or quality of the work of this section.
- .2 Air barrier system shall be continuous in the building envelope. Lap and seal air barrier systems in accordance with product manufacturer's written installation requirements to construction, control, and expansion joints, across junctions between different building assemblies, and around penetrations through the building assembly.
- .3 Wrap into jamb, head and sill of building envelope window openings, door openings, and other openings with air barrier system membrane by returning membrane to inside face of opening unless otherwise indicated.

3.2 Installation - Sheet Applied, Self-Adhesive Membrane

- .1 Apply self-adhering membrane continuous to prepared and primed substrate in an overlapping shingle fashion to shed moisture towards exterior and in accordance with manufacturer's written requirements.
- .2 At the end of each day's work seal the top edge of the membrane where it meets the substrate using liquid air seal mastic. Trowel apply a feathered edge to seal termination and shed water.
- .3 Apply self-adhering membrane continuous across junctions between different building assemblies, and around penetrations through the building assembly. Provide overlap in accordance with manufacturer's written requirements.
- .4 Inspect membrane for punctures, misaligned seams and fishmouths, apply additional layer of membrane over affected area.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

END OF SECTION

Metal Flashing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Supply and installation of prefinished steel flashings.
 - .2 Supply and installation of prefinished aluminum flashings.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Shop drawings:
 - .1 Submit shop drawings including the following:
 - .1 Plans, elevations, sections, and attachment details.
 - .2 Detail fabrication and installation layouts, expansion-joint locations, and key details. Distinguish between shop and field assembled work.
 - .3 Include identification of material, thickness, weight, and finish for each item and location in the work.
 - .4 Include details for forming, including profiles, shapes, seams, and dimensions.
 - .5 Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - .6 Include details of termination points and assemblies.
 - .7 Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contracting from fixed points.
 - .8 Include details of roof penetrations flashing.
 - .9 Include details of edge conditions, and counter flashings as applicable.
 - .10 Include details of special conditions.
 - .11 Include details of connections to adjoining work.
- .3 Samples:
 - .1 Submit full-size samples of each specified flashing material formed to detailed profile including corner, curb, cap, and parapet flashing, and coping including lock-joints and hold-down clips.
 - .2 Submit 2 - 50 mm x 50 mm (2" x 2") samples of each type of sheet metal material, colour and finish.

1.4 Quality Assurance

- .1 Qualifications:

Metal Flashing

- .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 5 years' experience in application of *Products*, systems, and assemblies specified. In addition:
 - .1 *Subcontractor*: Shall be a member in good standing of the Canadian Roofing Contractors Association (CRCA) and Ontario Industrial Roofing Contractors Association (OIRCA), who has been a member for at least 5 years.
- .2 Quality standards:
 - .1 Quality of fabrication and installation of sheet metal work shall comply with recommendations published by Sheet Metal and Air Conditioning Contractors National Association.

1.5 Product Handling

- .1 Product handling shall be in accordance with Section 01 60 00 as supplemented by the requirements of this section.
- .2 Comply with AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.

1.6 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 10 years.

PART 2 - PRODUCTS

2.1 Prefinished Steel Flashing

- .1 Sheet steel: Commercial quality to ASTM A653/A653M-13 with Z275 designation zinc coating.
 - .1 Minimum thickness: 0.45 mm (0.0179") (26 gauge) except as follows:
 - .1 At parapets: 0.912 mm (0.0359") (20 gauge).

2.2 Prefinished Aluminum Flashing

- .1 Aluminum flat sheet: Flat aluminum sheet in accordance with ASTM B209/B209M-21a, to the following minimum thickness and alloy:
 - .1 Painting quality: 3003H14 or 3105H14 to ANSI H35.1/H35.1M-2017.

2.3 Prefinished Metal Finishes

- .1 Provide the following finish to exposed prefinished steel:
 - .1 Painted finish: Silicone modified polyester, with ceramic pigments and other select inorganic pigments, 2-coat system.
 - .1 Coating shall exhibit zero cracking, chipping, or peeling (lose adhesion) that is visible in ordinary outdoor visual observations (within 10 metres to the unaided naked eye) for 40 years from date of installation. This does not include minute fracturing that may occur during the normal fabrication process.

Metal Flashing

- .2 Coating chalk more than a number 8 rating in vertical installations and shall not chalk in excess of a number 6 rating in non-vertical installations, in accordance with ASTM D-4214-98 method A at any time for 30 years from date of installation, 30.5 yrs from application of coating.
- .3 Coating shall not change colour more than 5.0 Hunter ΔE units in vertical installations and not more than 7.0 Hunter ΔE units in non-vertical installations, in accordance with ASTM D2244-23.
- .4 Acceptable *Products*:
 - .1 ArcelorMittal Dofasco 'Perspectra Plus Series'.
 - .2 Baycoat 'Perspectra Plus Series'.
 - .3 Sherwin-Williams 'WeatherXL'.
 - .4 Vicwest 'WeatherXL'.
 - .5 Substitutions: in accordance with Section 01 25 00.
- .2 Provide the following finish to exposed prefinished aluminum:
 - .1 Exposed aluminum surfaces: 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments to AAMA 2605-22.
 - .1 Acceptable *Products*:
 - .1 PPG 'Duranar XL'.
 - .2 Sherwin-Williams 'Fluoropon Classic'.
 - .2 Colour:
 - .1 Colour to later selection by *Consultant* from manufacturer's full range. Colour shall be:
 - .1 Solid.

2.4 Accessories

- .1 Galvanic/dissimilar metal corrosion inhibitor (isolation coating): in accordance with Section 01 73 00 and written requirements of manufacturers of metals affected.
- .2 Sealants:
 - .1 Exposed sealants: Silicone in accordance with Section 07 92 00, colour as selected by *Consultant* from manufacturer's full range.
 - .2 Concealed flashing sealants; hooked-type expansion joints with limited movement: Butyl sealant to ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied.
- .3 Cleats: of matching metal to flashing material, continuous, and of greater thickness than flashing material. Offset joints in cleats 305 mm (12") with joints in perimeter edge metal. Allow a 12.7 mm (1/2") gap between pieces.
- .4 Fasteners:
 - .1 Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

Metal Flashing

- .2 General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head:
 - .1 Exposed screws: 38 mm (1-1/2") long minimum at 450 mm (18") on centre maximum. Heads matching colour of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM washer under heads of exposed fasteners.
 - .2 Blind fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - .3 Cleat fasteners: Corrosion-resistant barbed angular ring or screw shank nail; length to achieve approximately 32 mm (1-1/4") penetration into nailer.
- .3 Fasteners for prefinished aluminum sheet: Aluminum or Series 300 stainless steel.
- .4 Fasteners for prefinished galvanized steel sheet: Series 300 stainless steel or hot dip galvanized steel to ASTM A153/A153M-09 and ASTM A653/A653M-13 Class G185.
- .5 Fasteners for galvanized steel sheet: Type 304 stainless steel or hot dip galvanized steel to ASTM A153/A153M-09 and ASTM A653/A653M-13 Class G185.
- .6 Fasteners and plates to meet the requirements of FM 4470-12 for wind uplift and corrosion resistance.
- .5 Flexible flashing membrane; high temperature grade for use at locations where membrane is not protected by insulation:
 - .1 Description:
 - .1 Self-adhesive grade rubberized membrane backed by high density polyethylene.
 - .2 High temperature grade to resist softening at 105°C minimum.
 - .3 Thickness: 1.0 mm (40 mils) minimum.
 - .4 Primer for substrate.
 - .2 Acceptable *Products*:
 - .1 Henry 'Blueskin PE 200 HT'.
 - .2 Elevate 'Clad-Gard SA'.
 - .3 Soprema 'Lastobond Shield HT'.
- .6 Flexible flashing membrane; standard temperature grade for use at locations where membrane is protected by material with insulating properties:
 - .1 Description:
 - .1 Self-adhesive grade rubberized membrane backed by high density polyethylene.
 - .2 Thickness: 1 mm (40 mils) minimum.
 - .3 Primer for substrate.
 - .2 Acceptable *Products*:
 - .1 Henry 'Blueskin Roof RF200'.
 - .2 GCP Applied Technologies 'Ice & Water Shield'.

Metal Flashing

.3 Soprema 'Lastobond Shield'.

- .7 Expansion joint flashings: 1000 microns (40 mils) reinforced PVC with foam backing and metal nailers, purpose made for roof/wall expansion joints as detailed.

2.5 Fabrication

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable NRCA Roofing Manual: Membrane Roof Systems 2011, details and as indicated.
- .2 Fabricate metal flashings and other sheet metal work in accordance with applicable SMACNA "Architectural Sheet Metal Manual (Seventh Edition) details and as indicated.
- .3 Form pieces in 3048 mm (10 ft) maximum lengths. Make allowance for expansion at joints.
- .4 Sealed joints: Form non-expansion but movable joints in metal to accommodate sealant.
- .5 Expansion provisions: Form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with butyl sealant concealed within joints.
 - .1 Joints that provide expansion and contraction capabilities should be located near the corners within approximately 610 mm (24") from each direction of the corner measured from the interior side.
- .6 Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, and of greater thickness of metal being secured.
- .7 Hem exposed edges on underside 12.7 mm (1/2"). Mitre and seal corners with butyl sealant.
- .8 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .9 Provide 25.4 mm (1") gap between drip edges and wall finish material to redirect water runoff away from walls.
- .10 Provide 25.4 mm (1") minimum overlap between bottom of wood blocking or flashing anchorage support and edge of drip or termination of flashing.
- .11 Provide concealed heavy gauge holding clips, on the metal flashing cladding used to cover the roof parapet wall, on both sides of the wall, located at 610 mm (24") c.c. Seal holding penetrations to the roofing membrane.

PART 3 - EXECUTION

3.1 Flexible Flashing Underlayment Installation

- .1 Apply primer to concrete masonry and precast concrete substrates.
- .2 Install in a consecutive weatherboard method starting at bottom or base of wall and working up.
- .3 Provide minimum of 50 mm (2") side laps and 75 mm (3") end laps.
- .4 Cut to manageable lengths, position membrane for alignment, remove protective poly-film and firmly apply pressure to assure adhesion.
- .5 Eliminate wrinkles or gaps, roll entire membrane surface (including seams) with a counter top or "J-roller" to ensure full contact and adhesion.

Metal Flashing

- .6 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the air barrier membrane and around the perimeter edge of membrane terminations.
- .7 Flashing membrane shall be applied in weatherboard fashion starting at bottom of base of wall and working up, in and around the full perimeter of openings, to provide water tight protection and according to the following procedures:
 - .1 Apply the first strip horizontally immediately below the sill, cut it sufficiently long to extend past each side of the window, so that it projects even with the vertical jamb flashing to be applied later. Turn sill flashing up 50 mm (2") at ends of sill.
 - .2 Sill flashing shall overlap wall membrane. Overlap jamb at head flashing membrane in the same manner.

3.2 Roof Flashing Installation

- .1 Install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual - Seventh Edition - 2012.
- .2 *Provide* galvanic/dissimilar metal corrosion inhibitor (isolation coating) in accordance with Section 01 73 00 and written requirements of manufacturers of metals affected.
- .3 *Provide* watertight flashing installing capable of resisting specified uplift pressures in accordance with roofing specifications, thermally induced movement and exposure to weather.
- .4 *Provide* minimum 10% slope for drainage towards roof at parapet locations, with minimum 2% sloped to drain at remaining flashing locations.
- .5 Provide continuous cleats for attachment of flashings at exterior face of wall and fasten at 150 mm (6") spacing and not less than 2 fasteners per cleat.
- .6 Provide radius (3-piece) copings for curved wall condition unless otherwise indicated.
- .7 Prefabricate corner copings in 610 mm (24") x 610 mm (24") shop fabricated and connected one pieces sections.
- .8 Concealed fastenings and cleats, from view except where exposed flashings are accepted by *Consultant* prior to installation.
 - .1 Roof side fastening of copings shall be accomplished using either cleats or exposed colour matched screws with EDPM backed metal washers fastened through oversized holes in coping to allow for thermally induced movement and spaced at maximum spacing of 610 mm (24") centre to centre and not less than 2 fasteners per section of coping.
- .9 Flash joints using S-lock forming tight fit over hook strips/cleats; unless otherwise indicated.
- .10 Install surface mounted flared joint true and level, and caulk top of reglet with sealant at reglets.
- .11 Insert metal flashings to other materials and flashings to form weather-tight junction.
- .12 *Provide* prefinished metal flashing over equipment curbs which are covered with roofing membrane.

Metal Flashing

- .13 Expansion provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 3048 mm (10 ft) and provide uniform joint spacing with no joints allowed within 610 mm (24") of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with butyl sealant concealed within joints.

3.3 Wall Flashing Installation

- .1 Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- .2 Through-wall flashing: Installation of through-wall flashing is specified in Division 4. Flashing between shelf angle and through wall flashing for bridging over insulation to connect to air barrier system in accordance with 07 27 00.
- .3 Reglets: Installation of reglets is specified in Division 3 under "Cast-in-Place Concrete".
- .4 *Provide* galvanic/dissimilar metal corrosion inhibitor (isolation coating) in accordance with Section 01 73 00 and written requirements of manufacturers of metals affected.

3.4 Installation of Roof Accessories

- .1 Incorporate devices to which roofing and flashing may be secured.
- .2 Install work to ensure that roofing and flashings will be properly applied to maintain building envelope weather-tight.

3.5 Installation Tolerances

- .1 Shim and align sheet metal flashing and trim within installed tolerance of 6 mm in 6 m (1/4 inch in 20 feet) on slope and location lines as indicated and within 3.2 mm (1/8") offset of adjoining faces and of alignment of matching profiles.

3.6 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Independent inspection and testing company shall perform inspection of completed work.
 - .2 The work of this section will be inspected and tested in conjunction with inspection and testing of roofing work.

3.7 Adjusting and Cleaning

- .1 Remove deposits, stains or protections and wash metals left unpainted and exposed to view as recommended by manufacturer of metal or paint finish.

3.8 Protection

- .1 Advise *Contractor* of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering.

END OF SECTION

Sprayed Fire-Resistive Materials (SFRM)

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Sprayed fire-resistive materials.

1.2 Administrative Requirements

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 ULC or cUL design number, brand names and descriptive catalogue data of *Products* to be used in the work of this section.
 - .2 Include complete test report in cases where references are not published by testing laboratories, and where authority having jurisdiction has approved significant changes from tested assembly on basis of an engineering study; study calculations shall accompany report.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Execute the work of this section using workers skilled in the respective duties for which they are employed, and with minimum 3 years' experience in application of *Products*, systems, and assemblies specified.

1.5 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 5 years.

PART 2 - PRODUCTS

2.1 Materials

- .1 Materials shall be listed in accordance with CAN/ULC S101-14 achieve required fire protection rating.
- .2 *Products* shall be asbestos free.
- .3 Water, bonding agents, binders, accessories, cleaning solvents, aggregates and sealers shall be in accordance with base material manufacturer's recommendation.
- .4 Metal lath or non-metallic fibre mesh: as recommended by applied fireproofing manufacturer.

Sprayed Fire-Resistive Materials (SFRM)

2.2 Cementitious Fireproofing (Wet-Mix)

- .1 Description: Wet-mix spray-applied fire resistive materials (SFRM) consisting of factory mixed dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water to form slurry for conveyance and application.
- .2 Acceptable *Products*; standard density:
 - .1 Carboline 'Southwest Type 5GP'.
 - .2 GCP Applied Technologies 'Monokote MK-6'.
 - .3 Isolatek International 'Cafco 300/Isolatek Type 300'.

PART 3- EXECUTION

3.1 Preparation

- .1 Review locations of exposed/non-exposed fireproofed surfaces with *Consultant* prior to application.
- .2 Prepare substrate in accordance with the written requirements of the manufacturer of the sprayed fireproofing material to achieve required fire protection.
- .3 Mechanically fasten metal lath or non-metallic fibre mesh to painted surfaces to receive applied fireproofing in accordance with manufacturer's recommendations.

3.2 Application

- .1 Apply sprayed-applied fireproofing in accordance with the written requirements of the manufacturer of the sprayed fireproofing material, and as specified herein and in accordance with listed assembly.
- .2 Apply by the contour method in one or more coats of sufficient thickness to achieve the fire ratings as required.
- .3 Install the sprayed-applied fireproofing so that any movement of building structure acting alone or together does not tear, rupture, delaminate, puncture or perforate spray-applied fireproofing.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.
 - .2 Independent inspection and testing will be carried out on finished installation to verify, at random, densities and minimum thicknesses of sprayed fire resistant materials.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.4 Protection

- .1 Protect during installation any adjacent finished surfaces from contamination and damage due to the work under this section.

Sprayed Fire-Resistive Materials (SFRM)

- .2 Protect completed work, vulnerable corners, edges, and surfaces liable to be damaged due to construction activities. Provide wood cover strips and sheet material as required to prevent damage.

END OF SECTION

Joint Firestopping and Smoke Seals

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Materials installed in joints to restrict the spread of fire and smoke.
 - .1 Joints in or between fire-resistance-rated constructions.
- .2 Section excludes:
 - .1 Firestopping and smoke seals, for mechanical, electrical and communications penetrations of fire resistant assemblies, and firestopping and smoke seals within their respective assemblies. Refer to Divisions 21, 22, and 23 and Divisions 26, 27, and 28.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate joint firestopping and smoke seal work with Section 01 33 00, paragraph 1.8 Project Firestopping Manual and Coordination.
 - .2 Coordinate with other sections to assure that pipes, conduit, cable, and other items that penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
 - .3 Schedule the *Work* to assure that penetrations and other construction that conceals penetrations are not erected prior to the installation of firestop and smoke seals.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Representatives for mechanical and electrical work shall attend pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets: Submit data and installation instructions for *Products* providing descriptions sufficient for identification at the *Place of the Work*.
 - .1 Materials list of *Products* proposed for use in the work of this section; complying with listed systems designs.
 - .2 Listing agency's detailed drawing showing joint assemblies and firestopping materials, identified with listing agency's name and number or designation, fire rating achieved, and date of listing.
 - .3 Certificates:
 - .1 Submit the following certification documents with closeout submittals:
 - .1 Manufacturer's certification: Submit manufacturer's certification that installed firestopping and smoke seal *Products* are suitable for the use indicated and comply with specified requirements.

Joint Firestopping and Smoke Seals

- .2 Installation certification: Installer shall submit certification that all joint firestopping system installations are completed and that installations comply with listed systems designs.
- .4 Submit fire resistance rating test listings for firestopping and smoke seal systems.
- .3 Shop drawings:
 - .1 Submit drawings indicating fire resistance rated assembly number, required temperature, hose stream, and flame rating, material thicknesses, installation methods and materials of firestopping and smoke seals, primers, supports, damming materials as applicable, reinforcements, anchorages, fastenings and methods of installation for each condition to be encountered.
 - .2 Designate on shop drawings static and dynamic joint systems, relative positions, expansion and control joints in rated slabs and walls, and firestopping details.
 - .3 Engineered shop drawings; for engineering judgements:
 - .1 Where *Project* conditions require modification to an accredited third party testing agency's listed system design to address a particular firestopping condition that is not covered by a listed system, submit engineered shop drawings detailing the modifications to the listed system design as an engineering judgment or equivalent fire-resistance-rated assembly, for each *Project* location and condition.
 - .2 Submit the manufacturer's engineering judgment identification number and shop drawing details prepared by a professional engineer. The engineering judgment submittal shall include both *Project* name, *Project* location, and *Subcontractor's* name who will install firestop system as described in engineering judgement shop drawings.
 - .3 Provide complete details of specific application of listed system and its modifications upon which the engineered judgement is based upon.
 - .4 For perimeter fire barrier systems:
 - .1 Submit engineered shop drawings for engineering judgements covering perimeter fire barrier systems. Identify each cladding assembly type in contact with each perimeter fire barrier system.
 - .4 Manufacturers' instructions:
 - .1 Manufacturer of *Products* proposed for use in work of this section shall prepare firestopping manual scheduling products to be used for each assembly and installation required in the *Work*.
 - .1 Coordinate with project firestopping manual specified under Section 01 33 00.
 - .2 Manual shall include manufacturer's *Product* data sheets as specified under paragraph 1.3.2.
 - .3 Firestopping manual shall be submitted within 4 weeks of *Contract* award.

1.4 Quality Assurance

- .1 Qualifications:

Joint Firestopping and Smoke Seals

- .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval, training and certification of *Product* manufacturers.
 - .1 Submit proof of manufacturer's installer certification for each installer of firestopping and smoke sealant systems.
 - .1 Manufacturer's willingness to sell its firestopping *Products* to the *Contractor* or to an installer engaged by the *Contractor* does not in itself confer qualification on the buyer.
- .2 Applicator shall designate a single individual as *Project* foreperson who shall be present at the *Place of the Work* at all times throughout the work of this section when the work of this section is being performed.

1.5 Delivery Storage, and Handling

- .1 Deliver materials to *Place of the Work* in manufacturer's unopened containers, containing classification label, with labels intact and legible at time of use.
- .2 Store materials in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- .3 Do not use damaged or adulterated materials and materials exceeding their expiry date.

1.6 Field Conditions

- .1 Comply with manufacturer's requirements relative to temperature and humidity conditions, before, during and after installation.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 2 years.

PART 2 - PRODUCTS

2.1 Manufacturers

- .1 General: Manufacturers of firestopping and smoke seal system *Products* and installation specialists for the work of this section are limited to applicable assemblies as required for the *Work* and having listing mark on packaging.
- .2 Subject to compliance with requirements, provide products by one of the following:
 - .1 3M Canada Inc.
 - .2 Hilti Canada Corp.
 - .3 NUCO Inc.
 - .4 STI Firestop.
 - .5 Tremco Commercial Sealants & Waterproofing.

Joint Firestopping and Smoke Seals

2.2 Performance/Design Requirements

- .1 Firestop and smoke sealant systems shall consist of material, or combination of materials installed to retain integrity of fire-rated construction by effectively impeding spread of flame, smoke, and/or hot gasses through perimeter joint or gaps, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers.
- .2 Smoke sealants applied over firestopping materials or combination smoke seal/firestop seal material shall form air tight barriers to prevent passage of gas and smoke.
- .3 Fire-resistance rating of firestopping system shall be equivalent to rating of adjacent floor, wall or other fire separation assembly.
- .4 Firestopping system at fire rated assemblies with assembly STC rating requirements shall provide STC rating equal to STC rating of fire rated assembly.
- .5 Confirm locations of exposed/non-exposed firestopping/smoke seal surfaces with *Consultant* prior to application.
- .6 Provide movement capability at movement joints in accordance with design requirements for movement joint.
- .7 Head-of-wall joints; with dynamic designation:
 - .1 Joint assemblies shall permit vertical movement allowing wall to move independent of structure due to forces including, but not limited to, live loads, dead loads, thermal expansion/contraction, and wind sway. Such movement shall not damage the wall assembly or its fire protection components.
 - .1 Provide head-of-wall joints with dynamic designation.
- .8 Regulatory requirements:
 - .1 Joint firestop systems shall be listed in accordance with CAN/ULC-S115-11 and shall achieve required fire resistance rating in accordance with building code.
 - .2 Proposed firestopping and smoke seal materials and methods shall conform to applicable governing codes having local jurisdiction.

2.3 Materials

- .1 Single source responsibility for firestopping and smoke seal materials:
 - .1 Obtain firestopping and smoke seal materials from single manufacturer for each different *Product* required.
 - .2 Manufacturer shall instruct applicator in procedures for each material.
- .2 Firestopping and smoke seal systems shall conform to the following:
 - .1 VOC content not to exceed 250 gm/litre minus water.
 - .2 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gasses in compliance with requirements of CAN/ULC-S115-11 and not to exceed opening sizes for which they are intended.
 - .3 Provide firestopping materials and systems with fire-resistance rating not less than the fire-resistance rating of applicable adjacent assembly.
 - .4 Listed in accordance with CAN/ULC-S115-11.

Joint Firestopping and Smoke Seals

- .5 Use only joint firestop systems that have been tested by an accredited third party testing agency for specific fire-rated construction conditions conforming to construction assembly type, joint type and fire-rating requirements for each separate instance.
 - .1 Where there is no specific third party tested and classified firestop system for a particular firestop configuration, submit engineered shop drawings.
- .6 For joints in fire-separations, provide listed systems designs for the joint firestop and smoke seal systems as required by building code to maintain the integrity of the fire separations.
- .7 *Products* shall be compatible with abutting dissimilar membranes, architectural coatings, finishes at floors, walls and ceilings. Check with requirements of *Contract Documents* and manufacturer of selected materials being installed.
- .3 Smoke sealants for overhead and vertical joints shall be non-sagging; sealants for floors shall be self-levelling.
- .4 Smoke seal sealant colour at exposed locations: Grey.

PART 3 - EXECUTION

3.1 Preparation

- .1 Examine sizes, anticipated movement and conditions to establish correct thickness and installation of back-up materials.
- .2 Prepare surfaces in accordance with manufacturer's written specifications and to requirements of listed system designs.

3.2 Installation

- .1 Install joint firestopping and smoke seal systems in accordance with manufacturer's written requirements and in compliance with listed system designs. Products and installation requirements must comply with listed system designs.
- .2 For materials that will remain exposed after completing the *Work*, finish to achieve smooth, uniform surfaces. Tool or trowel exposed surfaces.
- .3 Notify *Consultant* when random completed installations are ready for review, as directed by *Consultant*, prior to concealing or enclosing firestopping and as applicable, smoke seals.
- .4 Protect materials from damage on surfaces subjected to traffic.

3.3 Identification and Documentation

- .1 Provide documentation for each joint firestop system application addressed. This documentation is to identify each joint location on the entire Project.
- .2 Documentation for installed joint firestop systems is to include:
 - .1 Sequential location number.
 - .2 Project name.
 - .3 Date of installation.
 - .4 Detailed description of joint firestop system location.

Joint Firestopping and Smoke Seals

- .5 Listed firestop system design number or engineered judgment number.
- .6 Type of joint.
- .7 Width of joint.
- .8 Overall length of joint.
- .9 Number of sides addressed.
- .10 Hourly rating of firestop joint system to be achieved.
- .11 Installers name.

3.4 Field Quality Control

- .1 Field tests and inspections:
 - .1 Examine completed firestop joint installations to ensure proper installation before concealing or enclosing areas. Keep areas of work accessible until inspections are completed.
 - .2 Inspection consultant to review installation of the work of this section and to perform random tests to verify its completion in accordance with the requirements of the *Contract Documents*.
 - .3 Give at least 48 hours notice before operations commence, and arrange for a pre-job conference with *Contractor*, installer, independent inspection and testing company, manufacturer, and *Consultant* present.
 - .4 Independent inspection and testing company shall examine installed firestopping in accordance with ASTM E2174-20a and ASTM E2393-20a. Independent inspection and testing company shall examine firestopping and shall determine, in general, that firestopping has been installed in accordance with requirements of the *Contract Documents* and in compliance with each listed firestop system design.
 - .5 Representatives of the manufacturer(s) shall have access to the *Work*. *Contractor* shall provide assistance and facilities for such access in order that the manufacturer(s) representative(s) may properly perform its function.

END OF SECTION

Joint Sealants

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Joint sealants – interior locations.
 - .2 Joint sealants – exterior building envelope locations.
- .2 Section excludes:
 - .1 Roofing system sealants.
 - .2 Mechanical and electrical sealants.
 - .3 Acoustic sealants.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 The following items shall be addressed at the pre-installation meeting:
 - .1 Analysis of the work and weather conditions.
 - .2 Shape factor of the joint.
 - .3 Recommendations for priming joints.
 - .4 Inspection of surfaces and joints.
 - .5 Compatibility of materials.
 - .6 Backing materials.

1.3 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.
 - .2 Submit manufacturer's and *Product* name for each sealant which will be used in the *Work* prior to commencing the *Work*.
- .3 Samples:
 - .1 Submit "wet sample" sealant colour samples for each sealant *Product* and colour.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
 - .1 Include manufacturer's warranties.
- .2 Maintenance instructions:
 - .1 Submit maintenance instructions for all items for incorporation into the operation and maintenance manuals.

Joint Sealants

1.5 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor:*
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified.
 - .2 Installer to comply with quality assurance articles referenced in ASTM C1193-16(2023) for installation of joint sealants.

1.6 Field Conditions

- .1 Conform to sealant manufacturer's specifications and recommendations.
- .2 Do not proceed with installation of joint sealants under the following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer, or are below 5° C (40° F).
 - .2 When joint substrates are wet.
 - .3 Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
 - .4 Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 Performance/Design Requirements

- .1 Interior sealants shall have a VOC limit of 50 g/L maximum, unless otherwise specified, and comply with South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealant Applications.
- .2 Joint sealants:
 - .1 Shall perform as air tight and water-tight joints.
 - .2 Defects shall include, but are not limited to:
 - .1 Staining from abutting materials or filler.
 - .2 Migrating, bleeding into, or staining abutting materials.
 - .3 Unsightly surface deformation.
 - .4 Excessive colour change, chalking, or dust pick-up.
 - .5 Failing adhesively or cohesively where maximum elongation is less than 25% of designed width of exposed joints.
 - .6 Hardening to more than 25% over specified hardness.

2.2 Sealants

- .1 General:

Joint Sealants

- .1 Colours: Sealant colours shall match colours of adjacent materials, as selected and approved by *Consultant*.
 - .1 Colours: shall be selected from manufacturer's full range of colours.
- .2 In accordance with ASTM C920-18 and other requirements indicated for each liquid-applied chemically curing sealant, including those referencing ASTM C920-18 classifications for type, grade, class, and uses.
- .3 For sealants to be applied to porous substrates:
 - .1 Provide products that have undergone testing in accordance with ASTM C1248-22 and have not stained porous joint substrates indicated for *Work*.
- .4 Sealant supplied shall not exude any material(s) which travel into adjacent materials, or travel onto surfaces of adjacent materials; causing damage, or attracting soiling, which becomes apparent during the service life of the building.
- .2 Exterior sealants; joints in vertical and overhead surfaces:
 - .1 Silicone sealant; high performance; 100% inorganic type:
 - .1 Single-component, non-sag, low to medium modulus non-bleed, high-performance silicone joint sealant, in accordance with the following: ASTM C920-11, Type S, Grade NS, Class 50 or greater.
 - .2 Provide low or medium modulus sealants as recommended by exterior wall cladding manufacturer.
 - .3 Acceptable *Products*:
 - .1 Low modulus:
 - .1 DOWSIL '790'.
 - .2 Momentive 'SCS2700 Silpruf LM.
 - .3 Sika 'Sikasil WS-290'.
 - .4 Tremco, Inc. 'Spectrem 1'.
 - .2 Medium modulus:
 - .1 DOWSIL '795'.
 - .2 Momentive 'SCS 2000 Silpruf'.
 - .3 Sika 'Sikasil WS-295'.
 - .4 Tremco, Inc 'Spectrem 2'.
- .3 Interior general sealants:
 - .1 VOC limit: Maximum 50 g/L, unless otherwise indicated.
 - .2 Interior sealant; at joints with painted gypsum board: one-component paintable acrylic in accordance with ASTM C834-17Type OP; or polyurethane in accordance with ASTM C920-18 Type S, Grade NS, Class 35.
 - .1 Acceptable *Products*:
 - .1 Acrylic sealants:
 - .1 Master Builders Solutions Canada 'MasterSeal NP 520'

Joint Sealants

- .2 Tremco, Inc. 'Tremflex 834'.
 - .2 Polyurethane sealants:
 - .1 Sika 'Sikaflex 1A'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .3 Interior sealant; gap filler: at movement paintable joints in vertical surfaces: One-component polyurethane sealant in accordance with the following: ASTM C920-18, Type M or S, Grade NS, Class 25.
 - .1 *Acceptable Products:*
 - .1 Master Builders Solutions Canada 'MasterSeal NP100'.
 - .2 Sika 'Sikaflex 15LM'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Interior sealant; at movement joints in vertical surfaces: one-component polyurethane sealant in accordance with the following: ASTM C920-18, Type M or S, Grade NS, Class 25.
 - .1 *Acceptable Products:*
 - .1 Master Builders Solutions Canada 'MasterSeal NP1'.
 - .2 Sika 'Sikaflex 15LM'.
 - .3 Tremco, Inc. 'Dymonic 100'.
 - .4 Substitutions: in accordance with Section 01 25 00.
- .5 Interior sealant; at vertical and trafficable movement joints: one-component low modulus silicone sealant in accordance with the following: ASTM C920-18, Type S, Grade NS, Class 100/50.
 - .1 *Acceptable Products:*
 - .1 DOWSIL '790'.
 - .2 Momentive 'Silpruf LM SCS2700'.
 - .3 Sika 'Sikasil WS-290'.
 - .4 Tremco, Inc. 'Spectrem 1'.
- .6 Interior sealant, mildew resistant one part silicone sealant in accordance with the following: ASTM C920-18, Type S, Grade NS, Class 25.
 - .1 *Acceptable Products:*
 - .1 DOWSIL '786'.
 - .2 Momentive 'Sanitary SCS1700 Sealant'.
 - .3 Sika 'Sikasil GP'.
 - .4 Tremco, Inc. 'Tremsil 200'.
- .4 Specialty sealants:
 - .1 Interior sealant; mildew resistant one part silicone sealant; healthcare facilities: in accordance with FDA Regulation No. 21 CFR 177.2600, ASTM C920-18, Type S, Grade NS, Class 25, CAN/CGSB 19.22-M89.

Joint Sealants

.1 Acceptable *Products*:

.1 DOWSIL '786'.

.2 Substitutions: in accordance with Section 01 25 00.

2.3 Accessories

- .1 General: Provide joint sealants, primers, backings, and fillers that are compatible with one another and with joint substrates and other sealants or joint fillers specified and approved for applications indicated under joint sealant scheduled and under conditions of service and application as demonstrated by joint sealant manufacturer based on proven test results and field experience. When incompatible, inform *Consultant* and change to compatible type acceptable to *Consultant*.
- .2 Cylindrical sealant backings: Provide joint backings that meet ASTM C1330-18, Type O (open-cell polyurethane), or Type B (non-absorbent bi-cellular backing materials with surface skin), sized 25 percent or greater than joint opening with proper density to control sealant depth and profile. Follow joint sealant manufacturer's recommendations with backing selections for optimum joint sealant performance, in accordance with the following schedule:
 - .1 Use open cell foam with non-absorbing closed cell skin (Sof-Rod) for vertical joints; round shape for open joints and triangular shape for angular joints.
 - .2 Use closed cell foam for horizontal joints.
- .3 Bond-breaker tape: Polyethylene tape or other approved plastic tape as recommended by joint sealant manufacturer to prevent 3-sided joint adhesion to rigid, inflexible joint fillers or joint surfaces at back of joint where such adhesion would restrict proper sealant movement or result in sealant failure.
- .4 Masking tape: Non-staining, non-absorbent and compatible with joint sealants and adjacent surfaces.
- .5 Sealant primers: Use primers only as recommended by sealant manufacturer where required to enhance adhesion of sealant to specific joint substrates indicated and as determined for use from pre-construction mock-up testing. Select primers in consultation with sealant manufacturer and manufacturer of substrate material which do not have a detrimental effect on sealant adhesion or in-service performance.
- .6 Cleaners for nonporous surfaces:
 - .1 Provide non-staining, chemical cleaners of type which are acceptable to manufacturer of sealant and sealant backing material, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
 - .2 Provide cleaner conditioner required for glass and glazed surfaces as recommended by sealant manufacturer.

PART 3 - EXECUTION

3.1 Manufacturer's Recommendations

- .1 Unless specified otherwise herein, comply with the recommendations and directions of the manufacturer whose materials are being used in the work of this section.

Joint Sealants

3.2 Preparation

- .1 Protect adjacent work areas and finished surfaces from damage during joint sealant installation.
- .2 Clean and prepare joint surfaces and substrates of substance that could impair the bond of joint sealants immediately before installing joint sealants.
- .3 Provide a dry, dust-free and cleaned substrate for optimum results.
- .4 Clean porous joint surfaces by using heavy-duty brushing, light abrasive, mechanical abrading or combination of these methods to produce a clean, sound surface for optimum bond with joint sealants per manufacturer's recommendations.
- .5 Clean non-porous surfaces using the two-cloth wipe method as referenced in ASTM C1193-16(2023) and outlined by joint sealant manufacturer's written requirements.
- .6 Prepare rusting or scaling surfaces using abrasive cleaning methods as recommended by joint sealant manufacturer prior to joint sealant installation. Remove and neutralize efflorescence, mould, mildew and algae prior to joint sealant installation.
- .7 Prepare finish-coated surfaces per joint sealant manufacturer's specific recommendations.
- .8 Test materials for indications of staining or poor adhesion before any sealing is commenced. Submit reports in writing to *Consultant* of results.

3.3 Masking

- .1 Where necessary to prevent contamination or marring surfaces of adjacent materials, mask areas adjacent to joints with masking tape prior to priming or sealing application. Remove tape immediately after joint has been completed and an initial set achieved.

3.4 Installation

- .1 Install in accordance with joint sealant manufacturer's installation written requirements for products, primers and applications indicated unless more stringent project-specific instructions or requirements apply.
- .2 Apply joint sealants for continuous waterproof sealant joint protection. Lap vertical joints over horizontal joints as recommended by sealant manufacturer. Comply with installation recommendations in ASTM C1193-16(2023) for use of joint sealants as applicable to each specific sealant installation.
- .3 Install sealant primers only when recommended by sealant manufacturer and demonstrated at pre-construction tests after joint surface preparation has been completed and when surfaces are verified as clean and dry. Allow any primer installation to completely dry or cure prior to installation of backing or joint sealants. Primer is mandatory for gun applied sealants.
- .4 Install joint sealants using proven techniques that comply with the following and in proper sequence with installation of primers and backings.
 - .1 Using proper joint sealant dispensing equipment, place sealants by pushing sealant beads into opening to fully wet-out joint sealant substrates. Fill sealant joint opening to full and proper configuration.

Joint Sealants

- .2 Provide uniform cross-sectional shapes and depths in relation to joint width for optimum sealant movement capability per joint sealant manufacturer's written requirements.
- .5 Joint sealant tooling is required for non-sag joint sealant installations. Immediately after placing fresh sealants and before skinning or curing begins, tool sealants using metal spatulas designed for this purpose in accordance with manufacturer's recommendations. Provide a smooth, uniform sealant finish, eliminating air pockets and ensuring good contact for optimum sealant adhesion within each side of the joint opening.
 - .1 Provide concave joint configuration as indicated per figure 5-A in ASTM C1193-16(2023) unless otherwise indicated.
 - .2 Use tooling agents that are approved in writing by sealant manufacturer and that do not discolour sealants or adjacent surfaces.
 - .3 Remove excess sealant from surfaces adjacent to joint openings using metal spatula, promptly cleaning any sealant residue from adjacent finished surfaces. Remove masking after joint sealant is installed.
- .6 Allow single-component sealants to fully cure before adhesion testing is performed as recommended by joint sealant manufacturer.
- .7 Match approved sealant mock-up for colour, finish and overall aesthetics. Remove, refinish or re-install work not in compliance with the *Contract Documents*.
- .8 When surfaces of adjacent materials are to be painted, perform sealant work before these surfaces are painted.
- .9 Check form release agent used on concrete for compatibility with primer and sealant. If they are incompatible inform *Consultant* and change primer and sealant to compatible type, or clean concrete to sealant manufacturer's acceptance.
- .10 Install joint backing material, filler strips, gaskets, bond breakers and similar type material of comparable performance characteristics. Install bond breaker tape or packing over asphalt impregnated fibre board as recommended by sealant manufacturer.
- .11 Where joints are 12.7 mm (1/2") or deeper, insert backing material in continuous uniform compression with setback from finished face of adjoining materials equal to required depth of sealant (width/depth ratio) as specified herein.
- .12 On horizontal traffic surfaces, support joint filler against vertical movement which might result from traffic loads, including foot traffic.
- .13 Install bond breaker tape in bottom of joints in lieu of sealant backing where proper depth cannot be obtained when backing is installed.
- .14 Maintain correct sealant depth. Sealant depth shall be 1/2 the width of the joint, maximum depth shall be 12.7 mm (1/2"), minimum depth shall be 6 mm (1/4"). Comply with manufacturer's written recommendations.
- .15 Fillet bead sealant joints to be sized to provide proper contact area with substrates, in accordance with manufacturer's written recommendations.
- .16 Apply sealants using pressure-operated guns fitted with suitable nozzles in accordance with manufacturer's directions. Apply sealants in such manner as to ensure good adhesion to sides of joints and to completely fill voids in joints.

Joint Sealants

- .17 Apply sealants so that surfaces of joints are smooth, full bead, free from ridges, wrinkles, sags, air pockets and embedded impurities. Tool sealant surfaces to produce a smooth surface.
- .18 Install sealant with exterior face of sealant set back 10 mm (3/8") from face of adjacent materials at building movement joints, unless otherwise indicated.
- .19 Do not apply sealants to areas where installation of paints, coatings or flooring is in progress. Apply sealants after such work is complete and fully cured.

3.5 Exterior Sealant Schedule

- .1 Include in work of this section joint sealants in exterior assemblies to seal open joints in surfaces exposed to view, and to make building weather-tight, as indicated, and as otherwise specified, except where specified under the work of other sections.
- .2 Exterior sealant work is part of the work of this section. Install sealant to:
 - .1 Perimeters of exterior openings where frames/glazing meet exterior facade of building.
 - .2 Movement and control joints in exterior surfaces of insitu concrete and masonry.
 - .3 Exterior joints between masonry and insitu concrete.
 - .4 Exterior joints in horizontal wearing surfaces.
 - .5 Perimeters of louvers.
 - .6 Perimeters of mechanical and electrical penetrations including but not limited to outlets and electrical boxes.

3.6 Interior Sealant Schedule

- .1 Include in work of this section sealants to seal open joints in surfaces exposed to view, and to make building weather-tight and air-tight, as applicable, as indicated, and as otherwise specified, except where specified under the work of other sections.
- .2 Install sealant to:
 - .1 Movement and control joints on exposed insitu concrete walls.
 - .2 Interior control and expansion joints in floor and wall surfaces.
 - .3 Raked out joints at junctions of masonry with concrete walls and columns, and at intersection of masonry walls and partitions where joint reinforcement is installed.
 - .4 Perimeters of exterior and interior door and window frames.
 - .5 Joints at tops of non-load bearing masonry walls at the underside of insitu concrete.
 - .6 Exposed interior control joints in gypsum board.
 - .7 Millwork junctions with walls.
 - .8 Floor finishes at perimeters where indicated or scheduled.
- .3 Mildew resistant sealant at wet areas:
 - .1 Perimeter joints of wet fixtures such as:
 - .1 Water closets.

Joint Sealants

- .2 Counter/wall junctions at countertops.

3.7 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.8 Adjusting and Cleaning

- .1 Remove droppings and clean off excess sealant or sealant residue adjacent to sealant joint installations as the work progresses by methods approved by joint sealant manufacturer before material achieves initial set.
- .2 Do not damage adjacent surfaces with harmful removal techniques and protect finished surfaces beyond those that have been masked.
- .3 Remove and replace damaged joint sealants.
- .4 Remove temporary coverings and masking protection from adjacent work areas upon completion.

3.9 Protection

- .1 Protect installed sealants during and after final curing from damage resulting during construction.

END OF SECTION

Steel Doors and Frames

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Hollow metal doors and panels (steel doors).
 - .2 Metal frames (steel frames, transom frames).
 - .3 Metal frames (steel frames for screens, sidelights, window assemblies).

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Cooperate fully with finish hardware distributor's representative during preparation of shop drawings and execution of shop fabrication.
 - .2 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Submit copy of NAAMM-HMMA 840-17 standard.
- .3 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .4 Shop drawings:
 - .1 Include details of each door and frame type, finish hardware types and locations, frame profiles, door and frame elevations, mitre details, fire protection rating, glazing preparation details and anchor details and locations.
 - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and in door schedule.
 - .3 Electrified hardware requirements and preparations shall be clearly indicated on shop drawings.
- .5 Samples:
 - .1 Submit cut-away sample door, with provision for lockset and hinge, and corner section of frame.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers:
 - .1 Provide doors and frames manufactured by a firm specializing in the design and production of hollow metal steel doors and frames.

Steel Doors and Frames

- .2 Manufacturer shall be a member in good standing of the Canadian Steel Door Manufacturers Association (CSDMA).

1.5 Delivery, Storage, and Handling

- .1 Inspect materials thoroughly upon receipt and report immediately discrepancies, deficiencies and damages, in writing, to *Supplier*.
- .2 Note damages incurred during shipment on carriers' bill of lading and report immediately, in writing, to *Supplier*.
- .3 Store materials properly on planks, out of water and covered to protect from damage from adverse weather conditions. Remove wet packaging immediately.
- .4 Remove wrappings or coverings from doors upon receipt at the *Place of the Work*, and store in a vertical position, spaced with blocking to permit air circulation between them.

1.6 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranties:
 - .1 System:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 The warranty is a total system warranty, and includes hardware, sealants, hanging and fitting, and finishing.
 - .3 Duration: 2 years.
 - .2 Glass and glazing: in accordance with Section 08 80 00.

PART 2 - PRODUCTS

2.1 Manufacturers

- .1 All Steel Doors 2000 Ltd.
- .2 Apex Industries Inc.
- .3 Artek Door (1985) Ltd.
- .4 Daybar Industries Ltd.
- .5 Fleming-Baron Door Products.
- .6 M.J. Daley Manufacturing Co. Ltd.
- .7 Trillium Steel Doors Limited.
- .8 Vision Hollow Metal Limited.

2.2 Performance/Design Requirements

- .1 Fire rating requirements:
 - .1 Fire rated labelled doors and frames: tested in accordance with CAN/ULC-S104-15 and listed by a nationally recognized agency having a factory inspection service and shall be constructed as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

Steel Doors and Frames

- .2 Install fire labelled steel door and frame products in accordance with NFPA 80-2013, except where indicated otherwise.
- .2 Doors and frames shall function as intended, including but not limited to:
 - .1 Be in true alignment.
 - .2 Operate and swing freely, smoothly, and easily.
 - .3 Remain stationary at any point.
 - .4 Close evenly and tightly against stops without binding.
 - .5 Latch positively when doors are closed with moderate force.

2.3 Materials

- .1 Steel:
 - .1 Fabricated from tensioned levelled steel in accordance with ASTM A924/A924M-22a, galvanized in accordance with ASTM A653/A653M-18, Commercial Steel CS, Type B.
 - .2 Steel shall be free of scale, pitting, coil breaks, surface blemishes, buckles, waves, and other defects.
 - .3 Minimum sheet thickness; uncoated steel sheet: in accordance with Appendix 1 of ANSI/NAAMM HMMA 861-14 "Guide Specifications for Commercial Hollow Metal Doors and Frames".
 - .4 Finish: Minimum Galvanneal coating designation ZF120 (A40).
- .2 Door core materials:
 - .1 Honeycomb: Structural small cell 25 mm (1") maximum kraft paper 'honeycomb'. Weight: 36.3 kg (80 lb) per ream (minimum). Density: 16.5 kg/m³ (1.03 pcf) minimum, sanded to required thickness.
- .3 Door frame materials:
 - .1 Fibreglass batt, minimum density 24 kg/m³ (1.5 lbs/ft³) in accordance with ASTM C665-17 or CAN/ULC S702.1-14.
- .4 Adhesives:
 - .1 Heat resistant, single component, polyurethane reactive (water) hot melt, thermoset adhesive.
 - .2 Lock seam doors: fire resistant, resin reinforced polychloroprene, high viscosity sealant-adhesive.
- .5 Primer: rust inhibitive for touch-up.
- .6 Finishing hardware: in accordance with Section 08 71 00.
- .7 Miscellaneous:
 - .1 Door silencers: single stud rubber or neoprene type.
 - .2 Channel glazing stops and glazing trim: formed channel of minimum 0.81 mm (0.032") (20 gauge) steel, 15.9 mm (5/8") high.
- .8 Lead lining: by Others.

Steel Doors and Frames

2.4 Fabrication - General

- .1 Fabricate steel doors, frames, transoms, sidelights and borrowed lights as applicable, to the design and dimensions indicated. Take field measurements where coordination with adjoining work is necessary.
- .2 Fabricate steel doors and frames to be rigid, neat in appearance and free from defects, warp, wave or buckle with all corners square unless otherwise indicated.
- .3 Operating clearances:
 - .1 Provide clearance at floor with allowance made for indicated finish flooring materials.
 - .2 Clearances for Fire-Rated Doors: As required by NFPA 80-2013.
 - .3 Clearances for Non-Fire-Rated Doors: Not more than 3 mm (1/8") at jambs and heads, except not more than 6 mm (1/4") between pairs of doors. Not more than 19 mm (3/4") at bottom.
- .4 Drill and tap or reinforce for mortised or surface mounted hardware in accordance with accepted hardware schedule, ANSI A115, NFPA 80-2013, or manufacturers recommendations.
- .5 Countersink exposed fasteners unless otherwise shown. Use flat or oval head screws.
- .6 Reinforce components to resist stresses imposed by hardware in use.
- .7 Allow for anticipated expansion and contraction of frames and supports.
- .8 Fit elements at intersections and joints accurately together, in true planes, and plumb and level.
- .9 Weld frame assemblies together.
- .10 Perform welding in accordance with CSA W59-24.
- .11 Mortise, reinforce, drill and tap to receive hardware and security devices using templates provided by respective *Supplier*.
- .12 Touch up finish damaged during fabrication.
- .13 Prepare doors or frames to receive seals where seals are indicated.
- .14 Attach labels to suit required fire-protection ratings.

2.5 Fabrication - Steel Doors and Panels

- .1 Fabricate steel doors and panels to a thickness of 45 mm (1-3/4"), unless indicated otherwise.
- .2 Interior and non-insulated doors and panels:
 - .1 Face sheets fabricated from 1.06 mm (0.042") (18 gauge) steel.
 - .2 Honeycomb core.
 - .3 Longitudinal edges mechanically interlocked.
 - .1 Adhesive assisted with edge seams visible.
- .3 Fabricate of composite metal face construction with each face formed from flush sheet steel without visible seams, free of scale, pitting, coil brakes, buckles and waves.

Steel Doors and Frames

- .4 Formed edges shall be true and straight with minimum radius for the thickness of steel used.
- .5 Lock and hinge edges shall be bevelled 3 mm in 50 mm (1/8" in 2") unless hardware or door swing dictates otherwise.
- .6 Top and bottom of doors shall be provided with inverted, recessed, 1.34 mm (0.053") (16 gauge) steel end channels, welded to each face sheet at 50 mm (2") on centre maximum.
- .7 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.
- .8 Blank, reinforce, drill and tap doors for mortised, templated hardware. Locate hardware to manufacturer's standard unless indicated otherwise.
- .9 Holes 12.7 mm (1/2") and larger shall be factory prepared.
- .10 Glazing:
 - .1 For glazing materials up to and including 8 mm (5/16") thick, doors shall be provided with 0.81 mm (0.032") (20 gauge) steel glazing trim and snap-in glazing stops.
 - .2 Glazing trim and stops shall be accurately fitted (within 0.39 mm (0.015") tolerance), butted at corners, with removable glazing stops located on the 'push' side of the door.
- .11 Fabricate closing stiles of paired doors as indicated or scheduled.

2.6 Fabrication - Steel Frames

- .1 General: Applicable to frames, transom panel frames, sidelights, and window assemblies.
- .2 Interior and non-thermally broken frames; welded:
 - .1 Fabricated from:
 - .1 1.34 mm (0.053") (16 gauge) steel.
 - .2 Supplied set-up and welded (SUW).
- .3 Factory assembled frame product shall be square, free of defects, warps or buckles.
- .4 Set-up and welded corner joints (SUW):
 - .1 Profile welded—punch mitred, continuously welded on inside of the profile faces, rabbets, returns and soffit intersections, with exposed faces filled and ground to a smooth, uniform seamless surface, as defined in the CSDMA - "Recommended Specifications for Commercial Steel Door and Frame Products".
- .5 Set-up and welded joints at mullions, sills and center rails:
 - .1 Coped accurately, butted and tightly fitted.
 - .2 At intersecting flush profile faces, securely weld, fill and grind to flush, smooth, uniform, seamless surface.
 - .3 At intersecting recessed profile faces, securely weld to concealed reinforcements, with exposed hairline face seams.
 - .4 At other intersecting profile elements make exposed face seams to hairline tolerance.

Steel Doors and Frames

- .6 Where required due to site access, when required for co-ordination or installation, or shipping limitations, frame product shall be fabricated in sections for splicing in the field.
 - .1 Field spliced jambs, heads and sills shall be provided with 1.34 mm (0.053") (16 gauge) steel splice plates securely welded into one section, extending 100 mm (4") minimum each side of splice joint.
 - .2 Field splices at closed sections (mullions or center rails) shall be 1.34 mm (0.053") (16 gauge) steel splice angles securely welded to the abutting member. Face of splice angle shall extend 100 mm (4") minimum into closed sections when assembled.
 - .3 Field splice joints shall be welded, filled and ground to present a smooth uniform surface by the installation company responsible for installation after assembly.
- .7 On factory assembled frame product, provide 2 temporary steel shipping bars welded to the base of the jambs or mullions to maintain alignment during shipping and handling. Remove shipping bars prior to anchoring of frames to floor.
- .8 Each door opening shall be prepared for single stud door silencers. Silencers shall be shipped loose for installation by installer, after finish painting.
 - .1 Single interior doors: 3 at strike jamb.
 - .2 Pair of interior doors: 2 at header.
 - .3 Sound, light, or smoke sealed doors: None required.
- .9 Prior to shipment, mark each frame with an identification number as shown on the approved submittal drawings.
- .10 Provide mullions and transom bars of closed construction type. For fixed condition, attach members to frame with butt-welded joints. For removable condition, attach members with removable mullion anchors.
- .11 Conceal fastenings unless otherwise indicated.
- .12 Anchor frames to floor by 1.34 mm (0.053") (16 gauge) thick angle clips, welded to frame and provide with 2 holes for floor anchorage.
- .13 Grind welded corners to a flat plane, fill with metallic paste filler and sand to uniform smooth finish.
- .14 Protect strike and hinge reinforcements using guard boxes welded to frames at masonry construction.
- .15 Reinforce head of frames wider than 1220 mm (48").
- .16 Brace frame units to prevent distortion in shipment and protect finish.

2.7 Hardware Reinforcements and Preparations

- .1 Door and frame product shall be blanked, reinforced, drilled and tapped at the factory for fully templated mortise hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .2 Door and frame products shall be factory blanked and reinforced only for mortised hardware that is not fully templated.

Steel Doors and Frames

- .3 Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware are required frame product shall be reinforced only, with drilling and tapping done by field installation.
- .4 Templated holes 12.7 mm (1/2") diameter and larger shall be factory prepared, except mounting and through bolt holes, which shall be by installation on site. Templated holes less than 12.7 mm (1/2") diameter shall be factory prepared only when required for the function of the device (for knobs, levers, cylinders, thumb or turn pieces) or when these holes over-lap function holes.
- .5 Hinge reinforcements shall be 3.12 mm (0.123") (10 gauge) steel minimum, high frequency type shall be provided.
- .6 Hinge reinforcements for lead-lined doors shall be 3.12 mm (0.123") (10 gauge) minimum with each cut-out provided with 114.3 mm (4.5") heavy weight 4.6 mm (0.180") high frequency type reinforcing.
- .7 Frames shall be prepared for 114 mm (4.5") standard weight hinges minimum unless otherwise indicated.
- .8 Doors and frames in excess of 2450 mm (96") rabbet height shall be prepared for 114 mm (4.5") heavy weight 4.6 mm (0.180") hinges minimum.
- .9 Lock, strike and flush bolt reinforcements shall be 1.34 mm (0.053") (16 gauge) steel minimum, with extruded tapped holes that provide equivalent number of threads as 2.36 mm (0.093") (12 gauge).
- .10 Reinforcements for surface mounted hardware, concealed closers and holders and flush bolts shall be 1.06 mm (0.042") (18 gauge) steel minimum.
- .11 Reinforcements are not required for surface applied hardware supplied with thru-bolts and spacers or sex-bolts.
- .12 Provide hardware mortises on perimeter frame members to be grouted in masonry or concrete partitions with 0.66 mm (0.026") (22 gauge) steel grout guards.
- .13 Electrified hardware:
 - .1 Where electrically or electronically operated hardware is specified on the schedules or details or the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on the templates, shall be provided and inter-connected with CSA approved 12.7 mm (1/2") diameter conduit and connectors.
 - .2 Refer to electrical documents for general electrical rough-in details. At door locations indicated in electrical documents as requiring rough-in only of electrical (ie. where no electrically or electronically operated hardware is specified in the hardware schedule), provide enclosures, boxes, and conduit to permit future installation of devices without removal of grout, demounting of frames, or installation of exposed conduits.
 - .3 Frames:
 - .1 Frames with electrified devices shall include electrical connection boxes sized to accommodate devices specified in Section 08 71 00. At time of frame manufacture, electrical connection boxes shall be supplied by Divisions 26, 27, and 28 for installation into frame by work of this section.

Steel Doors and Frames

- .2 Frame electrical connection boxes shall be positioned flush to edge of frame face return. Clearance shall be maintained to allow wall material to be consistently applied for length of frame member. Frame connection boxes shall be welded in place and positioned to allow necessary clearance for electrical trade to install conduit and connection components, with conduit layout in a manner that takes conduit up to ceiling in an uninterrupted configuration and to accommodate wire installation.
- .4 Doors:
 - .1 Doors with electrified devices shall be manufactured to include wire raceway in door panel to accommodate electrified devices, such as electric hinge, power transfer units, electrified locks, electrified door closures and electrified exit devices. Construction of raceways shall provide a continuous conduit or channel between entry and exit points to accommodate wire installation after door manufacture.
 - .2 Doors with electrified locks may require extended space to accommodate plug-type connection components or wire collection space. Coordinate with work of Section 08 71 00 and obtain hardware templates for electrified hardware clearly indicated on reviewed shop drawings and prior to door manufacture.

2.8 Frame Anchorage

- .1 Frame products shall be provided with anchorage appropriate to floor, wall and frame construction.
- .2 Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb.
- .3 Frame products for installation in new masonry walls shall be provided with steel adjustable wall anchors of the T-strap, stirrup or wire, 1.34 mm (0.053") (16 gauge) minimum or 3.96 mm (0.156") diameter wire. Straps shall be not less than 50 mm (2") x 254 mm (10") in size, corrugated and/or perforated.
- .4 Frame products installed in steel stud and drywall partitions shall be provided with 0.81 mm (0.032") (20 gauge) steel snap-in or "Z" stud type anchors.
- .5 Jambs of frames in previously placed concrete, masonry or structural steel shall be punched and dimpled to accept machine bolt anchors, 6.4 mm (1/4") diameter, located not more than 150 mm (6") from the top and bottom of each jamb. Anchor preparations and guides shall also be located immediately above or below the intermediate hinge reinforcing and directly opposite on the strike jamb. Each preparation shall be provided with 1.34 mm (0.053") (16 gauge) anchor bolt guides.
- .6 Anchor bolts and expansion shell anchors for the above preparations shall be provided by the installation company.
- .7 Where frame product is installed prior to construction of the adjacent wall, each jamb shall be provided with 1.34 mm (0.053") (16 gauge) steel floor anchors. Each anchor shall be provided with 2 holes for mounting to the floor and shall be securely welded to the inside of the jamb profile.

Steel Doors and Frames

- .8 On sidelights or windows exceeding 3 m (9'-10") in width, installed in stud partitions, channel extensions shall be provided from the top of the frame assembly to the underside of the structure above. Extensions shall be fabricated from 2.36 mm (0.093") (12 gauge) steel formed channels, mounting angles and adjusting brackets, with mounting angles welded to the inside of frame head. Formed channels, adjusting brackets and fasteners shall be shipped loose. Channels shall be mechanically connected to mounting angles and adjusting brackets with supplied fasteners, on site, by contractor responsible for installation.

2.9 Sizes and Tolerances

- .1 Widths of door openings shall be measured from inside of frame jamb rabbet with a tolerance of ± 1.6 mm (± 0.063 ").
- .2 Heights of door openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame with a tolerance of ± 1.2 mm (± 0.047 ").
- .3 Unless finishing hardware dictates otherwise, doors shall be sized so as to fit the above openings and allow a 3 mm ($1/8$ ") clearance at jambs and head. A clearance of 19 mm ($3/4$ ") between the bottom of the door and the finished floor (exclusive of floor coverings) shall be provided. Tolerances on door sizes shall be ± 1.2 mm (± 0.047 ").
- .4 Manufacturing tolerances on formed frame profiles shall be ± 0.8 mm (± 0.031 ") for faces, door stop heights and jamb depths. Tolerances for throat openings and door rabbets shall be ± 1.6 mm (± 0.063 ") and ± 0.4 mm (± 0.016 ") respectively. Hardware cut-out dimensions shall be as per template dimensions, ± 0.4 mm (± 0.015 ").

2.10 Hardware Locations

- .1 Hardware preparations in frame product shall be as noted below and locations on doors shall be adjusted for clearances specified in paragraph 2.9 of this section.
- .2 Top of upper hinge preparation for 114.3 mm (4.5") hinges shall be located 180 mm (7.5") down from head, transom mullion or panel as appropriate. The top of the bottom hinge preparation for 114.3 mm (4.5") hinges shall be located 310 mm (12.625") from finished floor as defined in paragraph 2.9 of this section. Intermediate hinge preparations shall be spaced equally between top and bottom cutouts.
- .3 Strike preparations for unit, integral, cylindrical and mortise locks and roller latches shall be centered 1033 mm (40-5/16") from finished floor. Strikes for deadlocks shall be centered at 1220 mm (48") from finished floor. Strikes for panic or fire exit hardware shall be located as per device manufacturer's templates.
- .4 Push and/or pulls on doors shall be centered 1070 mm (42") from finished floor.
- .5 Preparations not noted above shall be as per hardware manufacturer's templates.
- .6 Hardware preparation tolerances shall comply with the ANSI A115 standards.

PART 3 - EXECUTION

3.1 Examination

- .1 Provide necessary grounds, bracing and strapping for fitting and adequate for securing of the work.

Steel Doors and Frames

- .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 Installation - Steel Doors and Frames

- .1 Set frame product plumb, square, aligned, without twist at correct elevation in accordance with NAAMM-HMMA 840-1708 11 13.
- .2 Fire labelled product shall be installed in accordance with NFPA 80-2013.
- .3 Frame product installation tolerances:
 - .1 Plumbness tolerance, measured through a line from the intersecting corner of vertical members and the head to the floor, shall be ± 1.6 mm ($\pm 1/16$ ").
 - .2 Squareness tolerance, measured through a line 90° from one jamb at the upper corner of the product, to the opposite jamb, shall be ± 1.6 mm ($\pm 1/16$ ").
 - .3 Alignment tolerance, measured on jambs, through a horizontal line parallel to the plane of the wall, shall be ± 1.6 mm ($\pm 1/16$ ").
 - .4 Twist tolerance, measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall, shall be ± 1.6 mm ($\pm 1/16$ ").
- .4 Brace frame product rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install temporary wood spreaders at mid-point of frame rabbet height to maintain frame widths. Remove wood spreaders after product has been built-in.
- .5 Provide vertical support at center of head for openings exceeding 1250 mm (48") in width.
- .6 Secure anchorages and connections to adjacent construction.
- .7 Adjust operable parts for correct clearances and function.
- .8 Steel surfaces shall be kept free of grout, tar or other bonding materials or sealers.
- .9 Remove grout or other bonding material from products immediately following installation.
- .10 Provide appropriate anchorage for floor and wall construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite the strike jamb. On each jamb, install 2 anchors for openings up to and including 1525 mm (60") high and install 1 anchor for each additional height of 760 mm (30") of height or fraction thereof, except as indicated below. Frames placed in previously placed concrete, masonry or structural steel shall be provided with anchors located not more than 150 mm (6") from top and bottom of each jamb, and intermediate anchors at 660 mm (26") on centre maximum.
- .11 Secure frames set in previously constructed concrete or masonry openings by countersunk expansion bolts at same centres as for adjustable Tee wall anchors. Reinforce frame at fastening location to prevent indentation of frame by fastening device.
- .12 Fill and grind smooth "punch and dimpled" frame installations.
- .13 Prior to site touch-up, exposed surfaces of galvanized steel to be finished shall be cleaned to remove foreign matter. Refer to paint manufacturers recommendations for additional information and requirements of Section 09 91 00.
- .14 Touch-up exposed field welds shall be finished to present a smooth uniform surface and with a rust inhibitive primer.

Steel Doors and Frames

- .15 Touch-up exposed surfaces that have been scratched or otherwise marred during shipment, installation, and handling shall be with a rust inhibitive primer.
- .16 Finish paint in accordance with Section 09 91 00.
- .17 Install door silencers.
- .18 Properly fasten units and secure in place with concealed fixings wherever possible. Include grounds and furring where required.
- .19 Make allowance for deflection to ensure structural loads are not transmitted to frames.
- .20 Adjust operable parts for correct clearances and function.

3.3 Installation - Finishing Hardware

- .1 Install finishing hardware in accordance with ANSI A115.1G-1994, manufacturers' templates and instructions, and Section 08 71 00.

3.4 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 Adjust doors equipped with closers 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

Flush Wood Doors

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Solid core doors with high pressure plastic laminate faces.
 - .2 Factory finishing wood doors.
- .2 Section excludes:
 - .1 Lead lined doors by Section 13 49 00

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate installation of doors with installation of frames specified in other Sections and hardware specified in Section 08 71 00.
 - .2 Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

1.3 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 Submit shop drawings for the work of this section complying with the North American Architectural Woodwork Standards 4.0 requirements.
 - .2 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.
 - .3 Indicate dimensions and locations of factory machining criteria for hardware, extent of hardware blocking.
 - .4 Indicate dimensions and locations of cut-outs including trim for openings.
 - .5 Indicate doors to be factory finished and finish requirements.
 - .6 Indicate electrified hardware requirements and preparations.
- .4 Verification samples:
 - .1 Submit samples of proposed plastic laminate door faces for each colour, texture and pattern selected.
 - .2 Submit cut-away sample of each type of door, to show stile and rail construction, core, cross banding, door face finish and edges.

Flush Wood Doors

1.4 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 4.0, Custom Grade.

1.5 Delivery, Storage, and Handling

- .1 Doors 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.

1.6 Field Conditions

- .1 Environmental conditions:
 - .1 During storage and installation: Obtain and comply with wood door manufacturer's instructions for optimum temperature and relative humidity conditions for wood doors during its storage and installation. Do not install wood doors until these conditions have been attained.
 - .2 During finishing: Comply with wood door manufacturer's temperature and humidity requirements before, during, and after application of finishes.
 - .3 During service life of woodwork: Obtain and comply with wood door manufacturer's advice for optimum temperature and humidity conditions.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranties:
 - .1 System:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 The warranty is a total system warranty, and includes hardware, sealants, hanging and fitting, and finishing.
 - .3 Duration: 2 years.
 - .2 Glass and glazing: in accordance with Section 08 80 00.

Flush Wood Doors

PART 2 - PRODUCTS

2.1 Manufacturers

- .1 Baillargeon by Masonite Architectural.
- .2 Lambton Doors.
- .3 Masonite Architectural.
- .4 VT Industries.
- .5 Substitutions: in accordance with Section 01 25 00.

2.2 Performance/Design Requirements

- .1 Flush wood doors shall meet the minimum acceptance levels in accordance with the North American Architectural Woodwork Standards 4.0.
- .2 Doors and frames shall function as intended, including but not limited to:
 - .1 Be in true alignment.
 - .2 Operate and swing freely, smoothly, and easily.
 - .3 Remain stationary at any point.
 - .4 Close evenly and tightly against stops without binding.
 - .5 Latch positively when doors are closed with moderate force.
 - .6 No delamination.
 - .7 No telegraphing of core construction in face panels exceeding 0.254 mm (0.01") in a 75 mm (3") span, and warp exceeding 3 mm (1/8") in a 1066 mm (42") x 2133 mm (84") section.

2.3 General

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

2.4 Door Construction

- .1 Door construction, industry abbreviations and types to North American Architectural Woodwork Standards 4.0.
- .2 Performance duty level:
 - .1 Doors shall meet the requirements of ANSI/WDMA I.S. 1A-13 for Heavy Duty Performance Level unless otherwise indicated or scheduled.
- .3 Solid particle board core, veneer faced, lead lined, plastic laminate faced, non fire rated wood door construction:
 - .1 In accordance with Section 13 49 00.
- .4 Solid particle board core, high pressure decorative laminate faced, non fire rated wood door construction:
 - .1 Type PC-HPDL-5, particle core to ANSI A208.1-2009 LD-2.
- .5 Bonding:

Flush Wood Doors

- .1 Bond stiles and rails to core; abrasive sand core assembly to achieve uniform thickness prior to lamination of door faces.
- .6 Panel edge types:
 - .1 High pressure decorative laminate faced doors:
 - .1 For vertical edges (stiles) and exposed horizontal edges (rails). (Exposed horizontal edges are those edges that can be viewed from floors above.):
 - .1 High pressure decorative laminate finish, face and cross bands are covered.
- .7 Blocking:
 - .1 Provide hardware blocking for doors as follows:
 - .1 Non-rated doors: Structural composite lumber for hardware blocking.
 - .2 HB-1, minimum 125 mm (5") wide, full door width, top-rail blocking for closure devices or flush bolts or for sliding door hardware.
 - .3 HB-2, minimum 125 mm (5") wide, full door width, bottom-rail blocking for doors with protection plates, concealed door seals, automatic bottoms, pivots or floor bolts.
 - .4 HB-4, minimum 125 mm (5") wide x 250 mm (10") high blocking for doors with mortise locks and pockets.
 - .5 HB-5, minimum 125 mm (5") wide x 250 mm (10") high blocking for hinges.
 - .6 HB-6, minimum 125 mm (5") wide, full door width, mid-rail blocking for fire exit devices.
 - .7 HB-7, minimum 125 mm (5") wide, full door height, for doors with continuous type hinges.
- .8 Thickness:
 - .1 45 mm (1-3/4") minimum unless otherwise indicated or scheduled.

2.5 Plastic Laminate Faced Doors

- .1 Type: Grade 10 General Purpose, to ANSI/NEMA LD3-2005.
- .2 Colours and patterns: In accordance with the Finish Schedule.
- .3 Surface finish: In accordance with the Finish Schedule.
- .4 Substitutions in accordance with Section 01 25 00.

2.6 Accessories

- .1 Vision frame light kits:
 - .1 Accurately fitted, mitred at corners and fastened to frame opening with counter-sunk oval head sheet metal screws. Locate exposed fasteners to glazing face as directed by *Consultant*.
 - .2 Finish:
 - .1 Type 304 stainless steel, #4 satin finish.

Flush Wood Doors

- .2 Baked enamel finish, colour to later selection by *Consultant* from manufacturer's standard full range.
- .3 Acceptable *Product*:
 - .1 Anemostat 'LoPro' Metal Vision Frame.
 - .2 Air Louver 'VSL Slimline' Metal Vision Frame.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .2 Finishing hardware: in accordance with Section 08 71 00.

2.7 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 Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes.
- .5 Electrified hardware: Where electrically or electronically operated hardware is specified on the schedules or details or the final approved schedule and templates provided by the hardware supplier, doors with electrified devices shall be manufactured to include wire raceway in door panel to accommodate electrified devices, such as electric hinge, power transfer units, electrified locks, electrified door closures and electrified exit devices. Construction of raceways shall provide a continuous conduit or channel between entry and exit points to accommodate wire installation after door manufacture.
- .6 Factory cut and trim openings.

2.8 Factory Finishing

- .1 Finish work in factory in accordance with North American Architectural Woodwork Standards 4.0 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.

Flush Wood Doors

PART 3- EXECUTION

3.1 Examination

- .1 Provide necessary grounds, bracing and strapping for fitting and adequate for securing of the work.

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 - Doors

- .1 Align and fit doors in frames 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:
 - .1 Provide clearances as follows except where more stringent clearance is required or indicated.
 - .2 Provide 3.18 mm (1/8") maximum clearance between door and frame at heads, jambs, and between pairs of doors.
 - .3 Provide minimum 6 mm (1/4") clearance from bottom of door and top of floor finish and maximum clearance of 9.5 mm (3/8").
 - .4 At door assemblies having fire-protection rating not less than 20-minutes provide clearance not more than 6 mm (1/4") at the bottom and not more than 3 mm (1/8") at the sides and top.
 - .2 Seal top and bottom edges of wood doors. Re-seal field cuts in accordance with manufacturer's written requirements.
 - .3 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.

Flush Wood Doors

- .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

SECTION 08 34 49

RADIATION SHIELDED BI-PARTING DOORS AND FRAMES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Radiation protection products including the following:

1. Radiation Shielded Bi-Parting Sliding SmartDoor®.

1.02 RELATED SECTIONS

- A. Section 05 12 00 - Structural Steel
- B. Section 05 12 10 - Structural Steel Erection
- C. Section 05 50 00 - Miscellaneous Metals
- D. Section 06 xx 00 - Finish Carpentry (P-Lam / Veneer applications)
- E. Section 09 xx 00 - Interior Painting (Primer / Finish Coats to door shell or frame if applicable)
- F. Section 13 49 00 - Modular Radiation Shielding
- G. Section 26 xx 00 - Electrical (Conduit, Power, etc., for door controls)

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A568/S68M - Standard Specification for Steel, Sheet, Carbon, Structural, and High Strength, Low Alloy, Hot Rolled and Cold Rolled.
3. ASTM 829 - Standard Specification for Refined Lead.

B. National Council on Radiation Protection and Measurements (NCRP):

1. NCRP Report No. 038 - Protection Against Neutron Radiation.
2. NCRP Report No. 144 - Radiation Protection for Particle Accelerator Facilities.
3. NCRP Report No. 147 - Structural Shielding for Medical X-Ray Imaging Facilities.
4. NCRP Report No. 148 - Radiation Protection in Veterinary Medicine.
5. NCRP Report No. 151 - Structural Shielding Design and Evaluation for Megavoltage X and Gamma Ray Radiotherapy Facilities.

C. U.S. Department of Labor Occupational Safety and Health Administration (OSHA):

1. OSHA standard 29 CFR 1910.1025 - (Alloy) Lead.
2. OSHA standard 29 CFR 1926 - Safety and Health Regulations for Construction.
3. OSHA standard 29 CFR 1926.62 - Lead.
4. CAL-OSHA Title 8 Sec 1532.1, Sec 5198, and Sec 5216.

D. Canadian Nuclear Safety Commission (CNSC) Regulatory Guide G-129, Rev.1:

1. All projects in Canada are shielded using the standards from the CNSC Regulatory Guide.

1.04 DEFINITIONS

- A. **Pre-Engineered:** The advanced design of shielding elements and room components to maximize performance and compatibility with the overall project parameters.
- B. **Modular/Modules:** Radiation shielding components shall be individual elements or modules that are combined together to form a composite structure to create the required radiation attenuating environment. The modular system shall retain the ability to be deconstructed and reused. The individual block units shall not exceed 45 lb. maximum safe handling limit and shall provide a 100% interlocking joint between mating modules.
- C. **Interlocking:** All photon, neutron and electron shielding VeriShield modules shall feature a design that presents a full 100% interlocking edge. Lapping or alternating of seams which result in straight line paths and allow radiation streaming will not be permitted due to the possibility of decreased shield effectiveness in these areas. Modules shall interlock together to form a solid and stable structure comprised primarily of dry stacked modules.
- D. **Proper Attenuation:** Shielding of all photon, neutron and electron radiation to the levels specified by the governing regulatory agencies as identified in the final physics report.
- E. **Radiation Shielded Environment:** The overall structure providing the radiation shielding along with associated components such as doors and duct shielding, thus forming the full treatment room.

1.05 PERFORMANCE REQUIREMENTS

- A. **Performance Criteria:** This is a performance specification, and the manufacturer shall be responsible for the complete design, fabrication, and installation of door assembly. Doors shall be designed according to manufacturer's recommendations. The design for the shielding door shall be as manufactured by Veritas Medical Solutions of Harleysville, PA. Manufacturer shall determine size, door lap, hinge loading, and all structural requirements from shielding figures and clear opening dimensions. Unless otherwise specified, shielding thickness shall be determined by Veritas based on owner provided equipment and facility workloads and operating parameters. Doors installed on high energy medical linear facilities shall limit weekly exposure to 100u-Sv/week for controlled spaces and if installed in a public area, exposure shall be limited to 20u-Sv/week. In both instances, the maximum permissible dose to a person is governed by yearly exposure limits of 5 mSv/year and 1 mSv/year. These limits are based on NCRP-151 recommendations and are generally applicable to all doors installed within the United States. If local regulations require exposure limits be reduced to comply with instantaneous dose rate values or "in any hour" limits, these limits for the various states or localities shall be provided by the client in advance of the request for proposal. Otherwise, doors shall be designed and manufactured to be compliant with NCRP-151 recommendations with respect to maximum yearly permissible dose. For doors installed outside of the United States, instantaneous and time average dose rates shall be considered for each respective country and local installation. It is the client's responsibility or their appointed radiological health physicist and architect to provide the manufacturer with the parameters under which they wish the design to comply. Doors will be aesthetically covered and will be completely finished utilizing high quality door finishes of durable polymers and high-pressure laminates, stainless steel, or anodized aluminum.
- B. **Mechanism:** Door shall consist of two bi-parting shielded door leaves with a 100% interlocking leading edge. Door system shall be complete with a single-track support beam, guidance and drive mechanisms, columns and tie backs, appropriate laps, safety sensors, and aesthetic finishes. Door shall be designed to provide a 4 ft. clear opening (1.22 meter) by 7 ft. 0 inch (2.13 meter) vertical opening.

- C. **Motor and Drive System:** Shall be specially designed for door size and weight of door. Drive mechanism shall be complete with electric motor, linear drive with high strength toothed drive belt. Screw-style drive mechanisms shall not be allowed.
1. Manual operation shall be effected without change or alteration to any component. Motor shall be high starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from any position and produce a door travel speed of approximately 1 ft/sec without exceeding rated capacity.
 2. Door drive components shall not be located above the doorway to keep area clear for HVAC or other penetrations.
 3. Drive system shall not contain wear strips, rollers, or other degradable high maintenance components.
- D. **Opening / Closing Speeds:** Bi-parting leaves shall open in unison to a full open position in six (6) seconds to eight (8) seconds and shall close in less than ten (10) seconds. Door speed shall be infinitely adjustable.
- E. **Safety:** SmartDoors shall be equipped with presence sensing devices, manual operating system and a safe-space designation lighting system, which identifies safety areas surrounding the door during operation. Doors shall be equipped with top mounted infra-red or ultrasonic presence sensing devices on both the inside and outside of the room, casting a safety zone to detect people or objects that may be within the unsafe zone for door operation. Optional safety package is offered to include protective door panels that move in advance of the shielded radiation door segments to seal the entry and egress path prior to movement of the shielded radiation doors.
- F. **Materials and Construction:**
1. Door shell shall be constructed of A36 carbon steel plate face panels, and minimum 1/2 inch thick edged banding along three (3) sides (top, bottom, and trailing edge) and be prime coated with two (2) coats of rust inhibitive primer.
 2. The leading edge of the door shall be constructed of a sinewave roll shaped edge which shall provide a 100% effective shield against radiation streaming through the joint, or other suitable interlocking design, providing a 100% interlocking seal.
 3. The inner core of the door shall contain VeriShield® ultra high-density materials for the attenuation of all photon or neutron attenuation reducing exposure to the permissible design limits, and shall be at a thickness to meet the requirements of the physics report.
 4. All exposed surfaces of the door shall be fully finished with designer laminate materials selected from manufacturer's standard plastic, wood, or metal laminated finishes. Final door finishes shall extend into the throat of the door entrance.
- G. **Electrical Requirements:** Door system shall operate on 220 volt, 3 phase, 30 amp power supply with low voltage wiring to all door controls and presence sensors and safety systems.
- H. **Controls and Operation:**
1. Drive shall have zero backlash during operation.
 2. A programmable touch screen interface will be utilized as a Human Machine Interface (HMI). HMI shall include remote connectivity and be connected to internet for remote trouble shooting. Additional connections shall be available for optional peripheral connectivity such as scanners and card readers.

3. System shall also include two push button stations. Location of switches to be determined by client architect and are to be mounted such that all codes and practices for accessibility are maintained. Control equipment shall conform to NEMA ICS-1. Switch control station shall be three (3) button, momentary pressure type, with buttons marked OPEN/CLOSE/STOP. When door is in motion and stop button is activated; door shall stop and remain in stopped position. Activating either OPEN or CLOSE buttons (with door in any position) shall move door to desired position and automatically stop when travel limit switch is activated. All wiring and wiring materials shall be supplied by others. Veritas Medical Solutions shall make all final connections for door operation.
4. Door shall provide quiet operation. During movement door drive shall not exceed 48 db.
- I. **Manual Operation:** Door system shall be "free-wheeling" in the event of power failure, such that at least one of the door panels (leaves) can be opened and closed manually. Personnel must be able to manually open/close door under their own power. No battery-backup or hand-crank mechanism shall be required. Hand-crank mechanism shall be provided as part of a fail-safe safety system.
- J. **Radiation Shielding Protection:** Vendor shall provide complete radiation shielding barriers and enclosures as described on Veritas drawings. All shielding shall be homogeneous and contain high atomic number materials and neutron moderating additives as required. Radiation attenuating requirements shall be as presented in the final physics report. Number of courses of VeriShield®, as well as type and grade, required to attenuate radiation levels to that prescribed by same, shall be determined by manufacturer. Interlocking VeriShield modules manufactured and guaranteed by Veritas Medical Solutions, LLC shall provide shielding for both photon and neutron radiation as required.
- K. **Interlocking Modules:** Door system shall be of a modular design for all items of radiation shielding. All photon, neutron and electron shielding materials must be designed, fabricated, and installed with an interlocking design to present a full 100% interlocking edge. Lapping or alternating of seams which result in any straight-line paths for radiation streaming will not be permitted.
- L. **Warranty:** Doors must be provided with a 1-year comprehensive warranty.

1.06 SUBMITTALS

- A. Refer to Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. **Product Data:** Manufacturer's data sheets on each product to be used, including:
 1. Performance data and physical properties.
 2. Preparation instructions and recommendations.
 3. Storage and handling requirements and recommendations.
 4. Installation methods.
- C. **Shop Drawings:**
 1. Indicate dimensions, description of materials and finishes and general construction.
 2. Indicate layout of radiation protected areas.
 3. Indicate the thickness of the shielding materials.

D. Closeout and Maintenance Documents:

1. Closeout Conference: Schedule project closeout conference with sufficient time to prepare for requesting Substantial Completion. This conference shall be attended by the Owner, General Contractor, Shielding Subcontractor, Owner's Testing and Inspection Agency, Architect and all other parties as may be appropriate.
2. Manufacturer shall provide operator manuals, maintenance schedules and contact information, as necessary.

E. Certification: Manufacturer's written certification stating that doors, frames, and all related items to be furnished hereunder, meet or exceed the shielding performance requirements required by physicist of record report(s).

F. Manufacturer's Instructions: Manufacturer's installation instructions and diagrams for components installed under other trades.

G. Welding: Welders' certificates will be supplied as required.

1.07 QUALITY ASSURANCE

A. Qualifications: Door supplier shall have minimum of 5 years successful experience manufacturing radiation protection products similar to those specified for this project.

B. Single Source Responsibility: Obtain radiation protection materials and accessories produced as standard products from a single manufacturer regularly engaged in production of high energy shielding materials, equipment, and accessories.

C. Radiation Protection Survey: Employ registered Health Physicist, certified by American Board of Radiology, for testing specified radiation protective work and to conduct radiation protection survey of facility.

D. Radiation Protection Work: Shall comply with National Council of Radiation Protection (NCRP) Report No. 049 - Structural Shielding Design and Evaluation for Medical Use of Gamma Rays of Energies up to 18 MV.

1. Comply with requirements of local regulatory agencies where local standards and criteria exceed requirements for NCRP Report No. 049.
2. Shall be installed per the recommended practices of National Council on Radiation Protection as outlined in handbooks #151, #51 (#144) and #49.

E. Guarantee: Completed installation must be 100% guaranteed to meet agreed upon shielding requirements applicable at the time of contract, and that any shielding deficiencies will be rectified by the shielding manufacturer at no charge.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instruction for receiving, handling, storing, and protecting materials.

B. Components shall be delivered in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Owner shall provide adequate area for storage and staging of all materials delivered to the site. Reasonable access to the site must be provided.

2. Any required protection of existing floors, carpets, tile, plumbing/electric stub up fixtures, walls, etc. shall be the responsibility of the Owner/Construction Manager shall provide hard surfaced area suitable for delivery and storage of palletized 2 ton packaged materials.
- C. Store materials in original packaging, protected from exposure to harmful environmental conditions, including static electricity, and at temperature and humidity conditions recommended by manufacturer.
- D. Exercise care to prevent edge damage to materials.

1.09 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 DESIGN REQUIREMENTS

- A. Door shall be designed for sliding style conditions and shall be complete with:
 1. Heavy duty SmartDoor® drive mechanism.
 2. Acceleration and deceleration ramp speed control.
 3. Minimum of six (6) and ten (10) second cycle speeds (open and close).
 4. Minimal height support system.
 5. Safety Sensor Package for interior and exterior sides.
 6. Light Curtain: Electric eye to detect the presence of people or other objects as they pass through the door opening. In the event of detection the door will be signaled to stop.
 7. Presence Sensor: Ceiling mounted device detects people as they pass through the detection field sending a signal to the operator to stop.
 8. X-ray interlock (Note: Wiring requirements shall be coordinated with equipment vendor).
 9. Easy manual door movement in power out conditions.
 10. Noise resistant electrical cabling.
 11. Silent operation with infinitely variable door speed. Max. 48 db.
 12. Full structural support system and mounting hardware.
 13. 100% shielding guarantee to meet or exceed specified shielding parameters.
 14. Decorative brushed US32D stainless door hardware.
 15. Two (2) customized push button stations with brushed aluminum faceplates.
 16. "SmartDoor" Technology Advanced Monitoring System with HMI touch screen panel control center to monitor all door functions.
 17. Innovative operator interface - Controls and monitors all aspects of door operation, Door Position, Operation History, Door Speed, Safety Status, Stop Points, Lock Out Status, Power Status, Service Issues.
 18. High quality door finishes selected from an array of durable polymers and high-pressure laminates, stainless steel, or anodized aluminum.
 19. Interior and exterior door edge protection panels.
 20. Safe-Space designation lighting system.
 21. One (1) year comprehensive warranty.

1.11 WARRANTY

- A. Door shielding components shall be designed and offered with a 100% Guarantee against radiation streaming, mechanical failure etc.
- B. Door system will be designed to guarantee against radiation streaming through joints and seams from radiation emanating from any point within the room.
- C. A one (1) year warranty shall be provided to ensure maximum "up time".

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. To ensure that all door and shielding design criteria are met, the specifications and construction drawings shall be based on the use of Veritas SmartDoors® as manufactured by:

Veritas Medical Solutions, LLC
160 Cassell Road
Harleysville, PA 19438 USA
Phone: +1 484.991.8928
www.veritas-medicalsolutions.com

- B. Requests for substitutions shall be in accordance with provisions of Section 01 60 00 of the contract documents.

Substitution Provisions:

1. Documentation: Substitutions will not be considered if they are indicated or implied on shop drawing, product data, or sample submittals. All requests for substitution shall be by separate written request from Contractor. See paragraph below for documentation required in the submission of request for substitution.
2. Cost and Time Considerations: Substitutions will not be considered unless a net reduction in Contract Sum or Contract Time results to Owner's benefit, including redesign costs, life cycle costs, plan check and permit fees, changes in related Work and overall performance of building systems.
3. Design Revision: Substitutions will not be considered if acceptance will require substantial revision of the Contract Documents or will substantially change the intent of the design, in the opinion of the Architect. The intent of the design shall include functional performance and aesthetic qualities.
4. Data: It shall be the responsibility of the Contractor to provide adequate data demonstrating the merits of the proposed substitution, including cost data and information regarding changes in related Work.
5. Determination by Architect: Architect and Owner's Representative will determine the acceptability of proposed substitutions, and Owner's Representative will notify Contractor in writing of acceptance or rejection. The determination by the Architect regarding functional performance and aesthetic quality shall be final.
6. Non-Acceptance: If a proposed substitution is not accepted, Contractor shall immediately provide the specified product.
7. Substitution Limitation: Only one request for substitution will be considered for each product.

C. Request for Substitution Procedures: Comply with provisions of Contract General Conditions

1. Contractor shall prepare a request for substitution and submit the request to Architect through Owner's Representative for review and recommendation for acceptance. Acceptance and approval of substitutions shall be by Owner's Representative.
 - a. Submit a minimum of five hard copies or submit electronically to the Owner's Representative.
 - b. Present the request for substitution using form provided below.
 - c. Comply with other administrative requirements shall be as directed by Owner's Representative.
2. Substitution requests shall include complete product data, including drawings and descriptions of products, fabrication details, and installation procedures. Include samples where applicable or requested.
3. Substitution requests shall include appropriate product data for the specified product(s) of the specified manufacturer, suitable for use in comparison of characteristics of products.
 - a. Include a written, point-by-point comparison of characteristics of the proposed substitute product with those of the specified product.
 - b. Include a detailed description, in written or graphic form as appropriate, indicating all changes or modifications needed to other elements of the Work and to construction to be performed by the Owner and by others under separate contracts with Owner that will be necessary if the proposed substitution is accepted.
4. Substitution requests shall include a statement indicating the substitution's effect on the Construction Schedule. Indicate the effect of the proposed substitution on overall Contract Time and, as applicable, on completion of portions of the Work for use by Owner or for work under separate contracts by Owner.
5. Except as otherwise specified, substitution requests shall include detailed cost data, including a proposal for the net change, if any, in the Contract Sum.
6. Substitution requests shall include signed certification that the Contractor has reviewed the proposed substitution and has determined that the substitution, in combination with the cost or time savings, represents an equivalent or superior condition in every respect to product requirements and value indicated or specified in the Contract Documents, and that the substitution is suited for and can perform the purpose or application of the specified product indicated or specified in the Contract Documents.
7. Substitution requests shall include a signed waiver by the Contractor for change in the Contract Time or Contract Sum because of the following:
 - a. Substitution failed to perform adequately.
 - b. Substitution required changes in on other elements of the Work.
 - c. Substitution caused problems in interfacing with other elements of the Work.
 - d. Substitution was determined to be unacceptable by authorities having jurisdiction.

2.02 MATERIALS

A. Steel Bars and Plates: ASTM A36.

B. Roll Formed Steel Members: ASTM A36.

- C. Bolts and Fasteners: ASTM A325 and A490 as required.
- D. Rust inhibitive primer paint for all steel components prone to oxidation.
- E. Certification: Manufacturer's written certification stating that doors, frames, and all related items to be furnished hereunder, meet or exceed the shielding performance requirements required by physicist of record report(s).
- F. Manufacturer's Instructions: Manufacturer's installation instructions and diagrams for components installed under other trades.
- G. Welders' certificates will be supplied as required.
- H. Veritas Ultra High-Density Shielding:

VeriShield®: Cementitious interlocking modular shielding with a sine wave shape that eliminates straight line seams and provides neutron, proton, and particle attenuation at the joints. Fabricate the dry stacked modular shielding of one of the following densities:
 - 1. Size: V-250: 10" inches (254mm) by 5" inches (127mm) by 5" inches (127mm).
 - 2. Size: V-300: 10" inches (254mm) by 5" inches (127mm) by 5" inches (127mm).

3.02 INSTALLATION

- A. Door support frame to be installed according to Veritas drawings. Frame shall be set straight, plumb and level, within plus/minus 1/16" in 10'0". Side jambs and tie backs shall be firmly anchored.
- B. Erect shielded door and all necessary support members as specified in Veritas shop drawings. Provide supplemental shielding around door edges, head, and threshold to limit radiation streaming through clearance gap, as necessary.
- C. Adjust door leaves for proper balance and alignment to ensure proper load.
- D. Install motor drive unit and all necessary connections, bracing, etc. as specified in Veritas shop drawings. Proper coordination with Veritas is required for all wiring and wiring materials necessary for the door drive installation. Veritas shall provide (but not install) all push button stations, safety packages, switches, etc. as required. Location of switches to be determined by client architect and shall be mounted such that all codes and practices for accessibility are maintained. Veritas will provide all necessary engineering and architectural drawings as required for door location and installation.
- E. Manufacturer shall provide and install all safety equipment as specified in Veritas shop drawings.
- F. Attach all surface finishes as specified in Veritas Medical Solutions shop drawings.
- G. Manufacturer shall include three (3) separate mobilizations as part of the door purchase price, and shall include installation, power up and finishes installations and training.

3.03 OPERATOR

Veritas HMI and electric door operator system shall be installed and maintained by Veritas approved and trained personnel only.

END OF SECTION 08 34 49

PART 1 - GENERAL

1.1 Summary

.1 Section includes:

- .1 Supply and off-load to place in a clean, dry, and secure room at the *Place of the Work*, which has been designated for storage of all finish hardware specified including necessary fastening devices.
- .2 Supply all finish hardware required and not supplied under other Sections.
- .3 Check and verify hardware information on door and frame shop drawings, prior to fabrication.
- .4 Packaging, labelling, provision of installation instructions, templates, fixings and similar items, and delivery to the *Work* site.
- .5 Give assistance at the *Place of the Work* to organize hardware storeroom and supply qualified staff to correctly categorize, mark, and arrange each item in groups to enable efficient dispensing in specified hardware groups for each door to installation trades.
- .6 Provide qualified staff at the *Place of the Work* promptly to assist installation trades subsequent to being requested and to ensure that hardware is being correctly installed.
- .7 Upon completion of installation of hardware, hardware *Supplier* shall arrange and conduct, in company of *Consultant* and *Contractor*, inspections to verify that all hardware is installed and functioning satisfactorily, and where necessary shall recommend adjustments of such items as closer arms, valves, door holders and latch and locksets. Report comments in writing to *Consultant* and *Contractor*.
- .8 Supply temporary locking cylinders and keys for construction purposes. Locks used for *Contractor* security shall be keyed as required to conform to building operations' security requirements.

1.2 Administrative Requirements

.1 Coordination:

- .1 Coordinate work of this section to ensure information and material is promptly provided, to ensure orderly and expeditious progress of the *Work*, and to comply with schedule for completion.
- .2 Within 3 weeks of *Contract Award*, submit confirmed orders to manufacturers/*Suppliers* to *Consultant*.
- .3 Assist *Contractor* to organize hardware storeroom and supply qualified staff to correctly categorize, mark, and arrange each item in groups to enable efficient dispensing in specified hardware groups for each door to installation trades.
- .4 Coordinate the work of this section to ensure supplied hardware can function as required and can be installed within the particular details of the door and frame assemblies. Hardware that cannot be installed or will not function as intended will be replaced at no cost to the *Owner*.

Finish Hardware

1.3 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 Schedules and samples:
 - .1 Prepare and submit for review, a finish hardware schedule with technical product data sheets for use in the *Work*. List type, selected manufacturer's name and number, location, mounting heights and finish of hardware, and complete cross reference to door schedule.
 - .2 The indication or omission of a hardware component on the hardware schedule does not remove the responsibility of this section to ensure that all hardware can be installed and will function as intended.
 - .3 Submit samples of complete line of hardware and finishes. Identify samples indicating hardware item numbers used in the Finish Hardware Schedule, manufacturer's numbers, names, types, finishes, sizes and indication of door location(s). Approved samples will be retained for comparisons and returned upon completion of the *Work*.
 - .4 Prepare and submit for review, a keying schedule recognizing *Owner* requirements which shall be determined after award of *Contract*.
- .4 Templates:
 - .1 Submit for distribution, 3 copies of templates, template information, installation instructions and details necessary to enable preparation for, and installation of finish hardware in accordance with Door Hardware Institute recommended procedures. Submit templates arranged and marked coincident with specified hardware designations.
 - .2 Submit promptly when requested, the foregoing information in 3-ring plastic hard-covered binders suitably identified.
 - .3 In lieu of 1.3.4.1 arrange for the issue by each hardware manufacturer, the manufacturer's standard book of template drawings, at the option of door and frame manufacturers.
- .5 Jigs:
 - .1 Submit template jigs for each component to be recessed to enable installation trades to prepare doors to preclude misalignment and improper fit.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Instruct the *Owner's* designated representative in proper care and preventative maintenance of hardware to assure longevity of operation.
 - .2 Submit maintenance data for cleaning and maintenance of finish hardware.

Finish Hardware

- .3 Submit to building maintenance staff prior to date of *Substantial Performance of the Work*, two sets of wrenches for door closers, locksets and fire exit hardware.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 *Supplier:*
 - .1 Shall have 5 years' experience, minimum, in *Products*, systems and assemblies specified and with approval of *Product* manufacturers.
 - .2 Finish Hardware Supplier's project manager shall be directed involved in the day to day management of the project and shall be an accredited Architectural Hardware Consultant (AHC) with a minimum of 5 years experience managing commercial door hardware for similar projects.

1.6 Delivery, Storage, and Handling

- .1 Package each item of hardware individually, complete with trim and necessary fastenings, and accessories, including wrenches, keys, and other appurtenances required to ensure correct installation. Mark each item as to contents and appropriate use in specified groups.
- .2 All items of hardware subject to handling when installed shall be submitted with an easily removable covering to protect against scratches, abrasions, coating with dissimilar finish materials on adjacent surfaces, and tarnishing.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Manufacturer's standard extended warranties.
 - .2 Labour, materials, and workmanship for work of this section.
 - .1 Duration: 2 years.
 - .3 Closers: 25 years.
 - .4 Hinges: Lifetime.
 - .5 Mortise locks: 10 years.
 - .6 Electrified mortise locks: 2 years.
 - .7 Exit devices: 5 years.
 - .8 Electrified exit devices: 5 years.
 - .9 Electric strikes: 10 years.
 - .10 Auto operators: 2 years.
 - .11 Power transfers: 3 years.
 - .12 Power supplies: 3 years.

Finish Hardware

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Comply with codes and requirements of governing authorities, and as specified.
- .2 Provide hardware items with characteristics to meet specified fire ratings, and conform to exit requirements of governing authorities.

2.2 Materials

- .1 Finish hardware: in accordance with Finish Hardware Schedule.

PART 3- EXECUTION

3.1 Examination

- .1 Before furnishing any hardware, carefully check *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.

3.2 Installation

- .1 Install in accordance with manufacturer's written installation requirements. Refer also to installation requirements indicated, and specified in other sections of specifications.
- .2 Accurately locate and adjust hardware to meet manufacturer's written requirements. Use special tools and jigs as recommended.
- .3 Locate door stops to contact doors 75 mm (3") from latch edge.
- .4 Refer to Section 08 14 00 with respect to factory preparation for hardware for wood doors. Install wood doors and applicable hardware, including hinges.
- .5 Take delivery of finishing hardware and install, except hardware specified as part of work of another section. Check each item as received.
- .6 Set, fit and adjust hardware according to manufacturer's directions, at heights later directed by *Consultant*. Hardware shall operate freely. Protect installed hardware from damage and paint spotting.
- .7 Sound and weather seals:
 - .1 Install seals to continuously seal entire perimeter of doors. Secure in place with non-ferrous screws, in accurate alignment.
 - .2 Maintain integrity of seal at head of doors fitted with closers. Adapt seals as required to achieve specified performance.
- .8 Pre-drill kickplates and doors prior to installation of kickplates. Apply with water-resistant adhesive and countersunk stainless steel screws.

Finish Hardware

- .9 Set thresholds on two continuous beads of polyurethane caulking fastened with a minimum of 4 countersunk screws.
- .10 At wood doors, use screw attachment for exit devices and closers except as follows:
 - .1 Use through-bolt attachment for exit devices and closers at mineral core doors.

3.3 Electrified Hardware

- .1 Install electronic components, security components such as magnetic locks, sentronic hold open devices door status switches, card readers, processors, transformers, and other electric devices.
- .2 Power wiring will be supplied and installed by Electrical Divisions 26, 27, and 28 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.
- .3 Arrange for testing and commissioning of system by the distributor of the system. Submit a copy of reports to the *Consultant*.

3.4 Keying

- .1 Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- .2 Factory key locks and cylinders under existing Grand Master Keying system. Mark keyset symbol on cylinder face and key bow. Furnish silver nickel keys with standard key bow and stamp on bow "Do Not Duplicate". Provide 4 master keys for each level and two change keys per cylinder.
 - .1 Confirm key quantities with *Consultant*.

3.5 Field Quality Control

- .1 Field tests and inspections:
 - .1 Inspect the installation of finish hardware on an agreed frequency.
 - .2 Advise in writing of work being performed that will prejudice the installation or correct operation of items of hardware.
 - .3 Ensure items have been installed complete with required trim and accessories, and fastenings are adequately secured and approved. Ensure closer arms, valves, holder devices, locksets and latchsets are correctly adjusted.
 - .4 Inspections shall be performed by Finish Hardware Supplier's project manager involved in the day to day management of the project and shall be an accredited Architectural Hardware Consultant (AHC) with a minimum of 5 years experience managing commercial door hardware for similar projects.

3.6 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.

Finish Hardware

- .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

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DOOR HARDWARE

08 71 00



PROJECT: **THP – Credit Valley Hospital**
Oncology Radiation Treatment Expansion
2200 Eglinton Ave W.
Mississauga, ON

ARCHITECT: 
CUMULUS ARCHITECTS INC.
160 Pears Avenue
Suite 300
Toronto, ON

Prepared By: Mohammad Alnabelsi
Date: June 7, 2024
Revised: October 2, 2025
Revised: October 28, 2025





Architectural Hardware Finishes





	Steel	Stainless Steel	Brass/Bronze	Aluminum	Paint/Powder Coat	US/CAN
Clear Anodized				628	689	US28
Satin Nickel	646		619	670		US15
Polished Nickel	645		618	669		US14
Satin Stainless Steel		630				US32D
Polished Stainless Steel		629				US32
Satin Chrome	652		626	702		US26D
Polished Chrome	651		625	672		US26
Satin Brass	633		606	667	678	US4
Polished Brass	632		605	666	677	US5
Satin Bronze	639		612	668	680	US10
Oil Rubbed Bronze	640		613	703	695	US10B
Flat Black / Anodized Black	631		622	671	693	US19

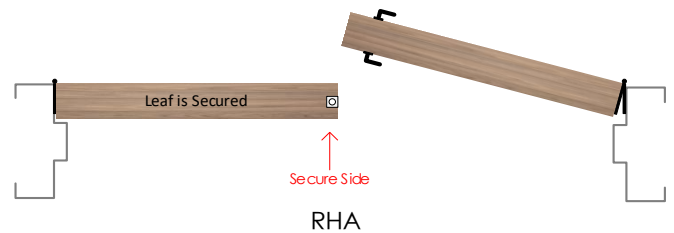
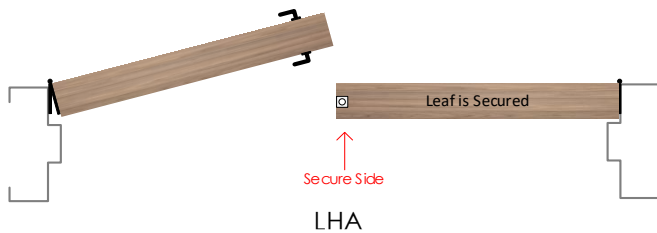
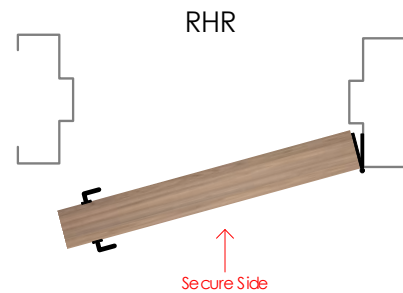
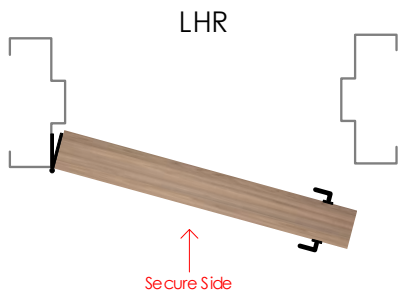
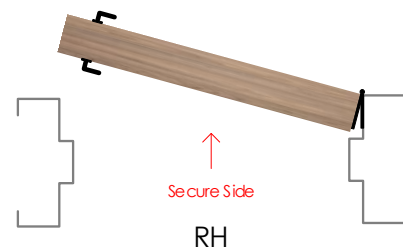
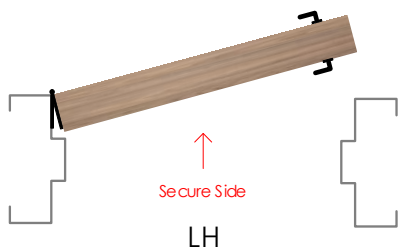
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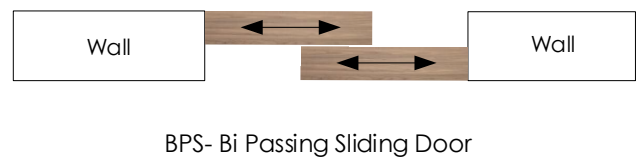
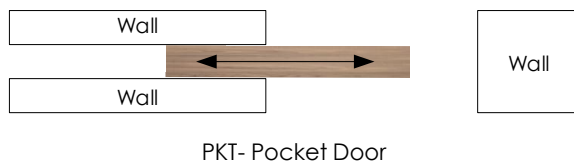
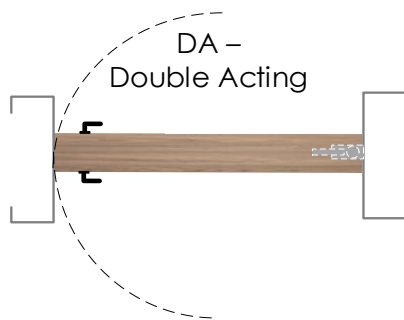
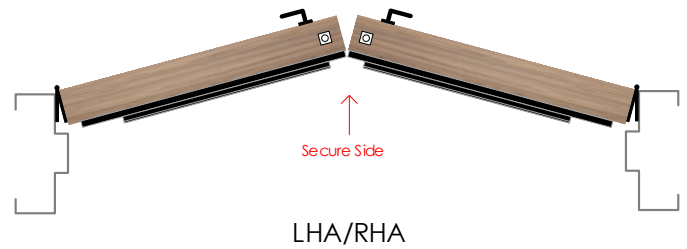
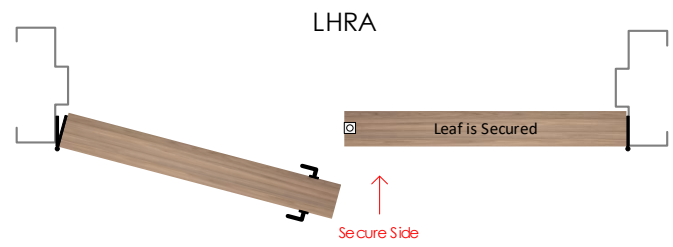
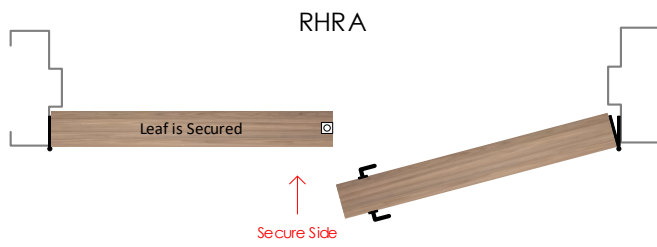


Abbreviations

RH = Right Hand	RHA = Right Hand Active	SS = Single Slider
LH = Left Hand	LHA = Left Hand Active	BP = Bi-Parting Slider
RHR = Right Hand Reverse	RHA/LHA = Right & Left Hands Active	BF = Bi-Folding Slider
LHR = Left Hand Reverse	RHRA/LHRA = Right & Left Hand Reverse Active	TS = Telescopic Slider
RHRA = Right Hand Reverse Active	DA = Double Acting	PKT = Pocket Slider
LHRA = Left Hand Reverse Active	DE = Double Egress	

NOTE: The handing of a swing door is determined by placing yourself on the secured or keyed side of the door.





Products & Alternatives

NOTE: Only those products / brands listed here are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If using an alternate product to form a price it is the bidder's responsibility to ensure that product is identical in every way to the specified item. If no alternates are listed, no alternate products are acceptable.

Product Type	Product#	Manufacturer	Alternate Manufacturer 1	Alternate Manufacturer 2
Heavy Weight Butt Hinges	TA386	McKinney	Ives	Best
Continuous Hinges	CFM83HD1	Pemko	Select	Best
Dbl. Acting Continuous Hinges	DSH1000	Markar	ABH	N/A
Emergency Rel. Stops	ERS	Pemko	N/A	N/A
Power Transfers	CEPT-10	Securitron	Von Duprin	Dormakaba
Automatic Flush Bolts	2842	Rockwood	Ives	Hager
Combination Flush Bolts	2845	Rockwood	Ives	Hager
Manual Flush Bolts	550	Rockwood	Ives	Hager
Dust Proof Strikes	570	Rockwood	Ives	Hager
Mortise Locksets	8200 Series	Sargent	Schlage	Best
Exit Devices	8800 Series	Sargent	Von Duprin	Dormakaba
LFIC Mortise Cylinders	9852IC	ASSA	N/A	N/A
LFIC Rim Cylinders	9852IC	ASSA	N/A	N/A
Magnetic Locks	M680E-BD	Securitron	Schlage	Dormakaba
Electric Strikes	1600CS	HES	Von Duprin	Dormakaba
Concealed Overhead Stops	1000 Series	ABH	Glynn Johnson	Rixson
Closers	351 Series	Sargent	LCN	Dormakaba
Wall Stops	S120	Standard Metal	Gallery	CBH
Coordinators	2672 x FB	Rockwood	Ives	Hager
Mounting Brackets	2601AB/2601C	Rockwood	Ives	Hager
Kick Plates	K10A	Standard Metal	Gallery	CBH
Mop Plates	K10A	Standard Metal	Gallery	CBH
Armour Plates	K10A/K10F	Standard Metal	Gallery	CBH
Door Edge Guards	K42/K42F	Standard Metal	Gallery	CBH
Frame Guards	K50/K50F	Standard Metal	Gallery	CBH
Frame Guards	K51/K51F	Standard Metal	Gallery	CBH
Gasketing/Weatherstrip	2891APK	Pemko	KN Crowder	National Guard
Auto Door Bottoms	420APKL	Pemko	KN Crowder	National Guard
Auto Door Bottoms	434APKL	Pemko	KN Crowder	National Guard
Door Sweep	18100CNB	Pemko	KN Crowder	National Guard
Astragal Sets	351CP	Pemko	KN Crowder	National Guard
Auto Operators	SW200i	Besam	Tormax	Dormakaba
Wave Actuator	CM-331/42W-SGLR	Camden	BEA	Dormakaba
Wave to Lock Kit	CX-WC16-PS	Camden	BEA	Dormakaba
Logic Relay	CX-33	Camden	BEA	Dormakaba
Safety Sensor	OLZRFLATSCAN	BEA	Optex	Dormakaba
Door Position Switch	DPS-M-BK	Securitron	Schlage	Dormakaba
Door Position Switch	MSS100-4Y	Flair	Interlogix	GRI
Request to Exit	XMS	Securitron	Schlage	Dormakaba
Power Supply	AQD4-8	Securitron	Schlage	Dormakaba

Symbols



- Door has a fire rating and all associated hardware must have a fire label to suit. Must comply with local requirements.



- Door is automatic and is equipped with an auto operator. Door must meet local barrier free codes



- Door has an electrical requirement and requires power to be brought to the appropriate location above the door or to the latch, for either security or barrier free applications. Refer to security & electrical drawings for further information.



- Door requires security card access. Refer to security / electrical drawings for further information.

Abbreviations

Door:

HMD = Hollow Metal Door
IHMD = Insulated Hollow Metal Door
ALD = Aluminum Door
IC-ALD = Insulated Clad Aluminum Door
SCWD = Solid Core Wood Door
HCWD = Hollow Core Wood Door
FGD = Frameless Glass Door
FRP = Fiberglass Reinforced Plastic Door
OHD = Overhead Door

Frame:

HMF = Hollow Metal Frame
ALF = Aluminum Frame
Cased Open HMF = Cased Open Hollow Metal Frame
WDF = Wood Frame
Cased Open WDF = Cased Open Wood Frame
Cased Open Drywall = Cased Open Drywall

Fire Ratings:

0 HR – Zero Hour Fire Rating / Smoke Barrier
20 MIN – 20 Minute Fire Rating
¾ HR – 45 Minute Fire rating
1 ½ HR – 90 Minute Fire Rating
2 HR – 120 Minute Fire Rating
3 HR – 180 Minute Fire Rating

Disclaimer

Weblinks:

Weblinks do change from time to time as manufacturers move around their websites, please inform us if you have a none functioning weblink.



HARDWARE SCHEDULE

Heading# 1

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	0 HR

1	Total Openings							
1	Door#	1F101	Location:	Corridor 1F104	To	CCA Room 1F101	Handing:	LH

Web Link

Site Verified

By Hardware Supplier

3	Heavy Weight Butt Hinge	HT-TA386 127 x 114	630 / US32D / Satin Stainless Steel	McKinney		<input type="checkbox"/>
1	Mortise Office Lockset	LC-8205 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Closer	DA-351-UO x -351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK X (2x2135 + 1x965)	White	Pemko		<input type="checkbox"/>
1	Auto Door Bottom	434APKL x 965	719 Milled Aluminum	Pemko		<input type="checkbox"/>

-----End of Heading-----





Heading# 2

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	0 HR

1	Total Openings							
1	Door#	1F102	Location:	Corridor 1F104	To	Kitchen 1F102	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

3	Heavy Weight Butt Hinge	HT-TA386 127 x 114	630 / US32D / Satin Stainless Steel	McKinney		<input type="checkbox"/>
1	Mortise Passage Set	8215 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Closer	DA-351-UO x -351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK X (2x2135 + 1x965)	White	Pemko		<input type="checkbox"/>
1	Auto Door Bottom	434APKL x 965	719 Milled Aluminum	Pemko		<input type="checkbox"/>

.....End of Heading.....





Heading# 3

Opening Information					
Opening Type:	Single	Opening Size:	1220 x 2135 x 45	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

4	Total Openings							
1	Door#	1F103	Location:	Corridor 1F104	To	Staff Lounge 1F103	Handing:	LH
1	Door#	1F152A	Location:	RAD. Therapy MED. Physics 1F146	From	Workroom A 1F152	Handing:	LHR
1	Door#	1F162	Location:	Electronics Shop 1F163	To	Equipment & Maintenance Room 1F162	Handing:	RH
1	Door#	1F393	Location:	Patient Waiting Area 2 1F341	To	Storage Room 1F393	Handing:	LH

Web Link

Site Verified

Notes:

- Existing doors to be retained.

.....End of Heading.....





Heading#

4

Opening Information

Opening Type:	Pair	Opening Size:	2-915 x 2135 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F104B	Location:	Corridor 1F110	From	Corridor 1F104	Handing:	RHRA

Web Link

Site Verified

By Hardware Supplier


2	Elec. Continuous Hinge	CFM83HD1-PT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
2	Power Transfer	CEPT-10	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
2	Latch Retraction Exit Device / Passage Trim	55-56-NB-LD-MD8615J x 715-4	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
2	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
2	Armour Plate	K10F – 864 x 849 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Armour Plate	K10F – 864 x 862 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Door Edge Guard	K42F x 2135 x 3M Tape (Size to Suit Door Height)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Frame Guard	K51F x 1220 x 3M Tape (Width to Suit Jamb Profile)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2135 + 1x1830)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Astragal Set	351CP x 2135	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Power Supply	AQD4-8 - Located in Central Location	Grey	Securitron		<input type="checkbox"/>

By Security Supplier

2	Magnetic Locks	M680E-BD	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
2	Door Position Switch	MSS100-4Y	Black	Flair		<input type="checkbox"/>
1	Card Reader	By Security Supplier				<input type="checkbox"/>
1	Motion Request to Entry	By Security Supplier				<input type="checkbox"/>
1	Fire Alarm Pull Station	By Electrical Supplier				<input type="checkbox"/>
1	Access Controller	By Security Supplier				<input type="checkbox"/>





By Automatics Supplier					
1	Auto Operator / Single Door	SW200i-SA-5x5 SGL x 1905mm Header	628 / US28 / Clear Anodized	Besam	 <input type="checkbox"/>
1	Closer	351-O x Top Jamb x Installed in ADO Header	689 / US28 / Painted Aluminum	Sargent	 <input type="checkbox"/>
2	Wave Actuator	CM-331/42W-SGLR	630 / US32D / Satin Stainless Steel	Camden	 <input type="checkbox"/>
1	Logic Relay	CX-33		Camden	 <input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm with auto operator supplier the location and quantity of wires required prior to pulling wires.
- Magnetic lock to be connected to fire alarm system.

Theory of Operation:

- Door is normally closed and locked.
- To enter present valid credential to momentarily unlock door then wave hand at exterior actuator or rotate lever and pull to open door(s).
- To exit, walk towards the door for motion sensor to momentarily unlock door then wave hand at interior actuator or push exit device push bar to open door.
- In the event of fire alarm or loss of power door remains unlocked.
- In the event of an emergency pull fire alarm pull station to unlock and open doors.
- Free egress always unless magnetic lock is energized.

.....End of Heading.....





Heading# 5

Opening Information					
Opening Type:	Single	Opening Size:	915 x 2135 x 45	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

4	Total Openings							
1	Door#	1F117	Location:	Corridor 1F164A	To	Washroom 1F117	Handing:	RH
1	Door#	1F165	Location:	Brachytherapy Treatment 1F168	To	Planning Room 1F165	Handing:	RH
1	Door#	1F169	Location:	Brachytherapy Treatment 1F168	To	Soiled Utility 1F169	Handing:	RH
1	Door#	1F170	Location:	Brachytherapy Treatment 1F168	To	Clean Utility 1F170	Handing:	RH

Web Link

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Notes:

- Existing doors to be retained.

.....End of Heading.....





Heading#

6

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	1F151A	Location:	Corridor 1F164	To	Resources Team 1F151A	Handing:	LH
1	Door#	1F151B	Location:	Corridor 1F164	To	Rad. Supervisor 1F151B	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

6	Heavy Weight Butt Hinge	HT-TA386 127 x 114	630 / US32D / Satin Stainless Steel	McKinney		<input type="checkbox"/>
2	Mortise Office Lockset	LC-8205 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
2	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
2	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
2	Closer	DA-351-UO x -351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
2	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Gasketing	2891APK X (2x2135 + 1x965)	White	Pemko		<input type="checkbox"/>
2	Auto Door Bottom	434APKL x 965	719 Milled Aluminum	Pemko		<input type="checkbox"/>

.....End of Heading.....





Heading#

7

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	0 HR

1	Total Openings							
1	Door#	1F161	Location:	Corridor 1F123	To	Workroom B 1F161	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Electric Strike	1600CS	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Closer	DA-351-O x 351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK X (2x2135 + 1x965)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Auto Door Bottom	434APKL x 965	719 Milled Aluminum	Pemko		<input type="checkbox"/>

By Security Supplier

1	Door Position Switch	DPS-M-BK	Black	Securitron		<input type="checkbox"/>
1	Card Reader	By Security Supplier				<input type="checkbox"/>
1	Request to Exit	XMS	White	Securitron		<input type="checkbox"/>
1	Access Controller	By Security Supplier				<input type="checkbox"/>
1	Power Supply	By Security Supplier - Located in Central Location				<input type="checkbox"/>

Theory of Operation:

- Door is normally closed and locked.
- Emergency key in lockset will momentarily unlock door.
- To enter present valid credential to unlock then push lever to open door.
- To exit rotate lever and pull to open door.





-
- Request to exit sensor alerts access control system of authorized exit.
 - In the event of fire alarm or loss of power door remains locked.
 - Free egress always.

.....End of Heading.....





Heading#










8

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F162A	Location:	Equipment & Maintenance Room 1F162	To	Storage 1F162A	Handing:	LH

Web Link

Site Verified

By Hardware Supplier						
1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Wall Stop	S120	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Armour Plate	K10F – 864 x 899 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 912 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Door Edge Guard	K42 x 2135 x 3M Tape (Size to Suit Door Height)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Frame Guard	K50 x 1220 x 3M Tape (Width to Suit Jamb Profile)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2135 + 1x965)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>

Notes:

- Wall Stop requires blocking if installed on drywall partition to prevent future damage.

.....End of Heading.....





Heading#

9

Opening Information

Opening Type:	Pair	Opening Size:	2-915 x 2135 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	3/4 HR

1	Total Openings							
1	Door#	1F162B	Location:	Corridor 1F104	To	Equipment & Maintenance Room 1F162	Handing:	RHA

Web Link

Site Verified

By Hardware Supplier

2	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Auto Flush Bolt (Top) w/ Fire Pin	2848	630 / US32D / Satin Stainless Steel	Rockwood		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Coordinator	2672 x FB2	628 / US28 / Clear Anodized	Rockwood		<input type="checkbox"/>
2	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
2	Closer	DA-351-UO x -351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
2	Armour Plate	K10A – 864 x 849 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Mop Plate	K10A – 152 x 862 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Door Edge Guard	K42 x 2135 x 3M Tape (Size to Suit Door Height)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Frame Guard	K51 x 1220 x 3M Tape (Width to Suit Jamb Profile)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK X (2x2135 + 1x1830)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
2	Door Sweep	18100CNB x 915	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Z-Astragal	By Hollow Metal Door Supplier	600 / USP / Primed			<input type="checkbox"/>

-----End of Heading-----





Heading#

10

Opening Information

Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

1	Total Openings						
1	Door#	1F164A	Location:	Corridor 1F164A	To	Brachytherapy Treatment 1F168	Handing: RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Electric Strike	1600CS	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Closer	DA-351-O x 351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK X (2x2135 + 1x965)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Auto Door Bottom	434APKL x 965	719 Milled Aluminum	Pemko		<input type="checkbox"/>

By Security Supplier

1	Door Position Switch	DPS-M-BK	Black	Securitron		<input type="checkbox"/>
1	Card Reader	By Security Supplier				<input type="checkbox"/>
1	Request to Exit	XMS	White	Securitron		<input type="checkbox"/>
1	Access Controller	By Security Supplier				<input type="checkbox"/>
1	Power Supply	By Security Supplier - Located in Central Location				<input type="checkbox"/>

Theory of Operation:

- Door is normally closed and locked.
- Emergency key in lockset will momentarily unlock door.
- To enter present valid credential to unlock then push lever to open door.
- To exit rotate lever and pull to open door.





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- Request to exit sensor alerts access control system of authorized exit.
 - In the event of fire alarm or loss of power door remains locked.
 - Free egress always.

.....End of Heading.....





Heading# 11

Opening Information					
Opening Type:	Pair	Opening Size:	2-905 x 2135 x 45	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

1	Total Openings							
1	Door#	1F113	Location:	Corridor 1F177	From	Switch Board 1F113	Handing:	RHRA

Notes:

- Existing door to be retained.

Web Link

Site Verified

.....End of Heading.....





Heading#

12

Opening Information

Opening Type:	Pair	Opening Size:	2-905 x 2110 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F152	Location:	Corridor 1F110	From	Corridor 1F177	Handing:	RHRA

Web Link

Site Verified

By Hardware Supplier

2	Elec. Continuous Hinge	CFM83HD1-PT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
2	Power Transfer	CEPT-10	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
2	Latch Retraction Exit Device / Passage Trim	55-56-NB-LD-MD8615J x 715-4	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
2	Concealed Overhead Stop	1022A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
2	Kick Plate	K10A – 305 x 855 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Mop Plate	K10A – 152 x 880 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2110 + 1x1810)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Astragal Set	351CP x 2110	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Power Supply	AQD4-8 - Located in Central Location	Grey	Securitron		<input type="checkbox"/>

By Security Supplier




2	Magnetic Locks	M680E-BD	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
2	Door Position Switch	MSS100-4Y	Black	Flair		<input type="checkbox"/>
1	Card Reader	By Security Supplier				<input type="checkbox"/>
1	Motion Request to Entry	By Security Supplier				<input type="checkbox"/>
1	Fire Alarm Pull Station	By Electrical Supplier				<input type="checkbox"/>
1	Access Controller	By Security Supplier				<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator / Single Door	SW200i-SA-5x5 SGL x 981mm Header	628 / US28 / Clear Anodized	Besam		<input type="checkbox"/>
1	Closer	351-O x Top Jamb x Installed in ADO Header	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>





2	Wave Actuator	CM-331/42W-SGLR	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>
1	Logic Relay	CX-33		Camden		<input type="checkbox"/>
2	Safety Sensor Kit	10LZRFLATSCAN-SWB	Black	BEA		<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm with auto operator supplier the location and quantity of wires required prior to pulling wires.
- Magnetic lock to be connected to fire alarm system.

Theory of Operation:

- Door is normally closed and locked.
- To enter present valid credential to momentarily unlock door then wave hand at exterior actuator or pull handle to open door.
- To exit, walk towards the door for motion sensor to momentarily unlock door then wave hand at interior actuator or push exit device push bar to open door.
- In the event of fire alarm or loss of power door remains unlocked.
- In the event of an emergency pull fire alarm pull station to unlock and open doors.
- Free egress always unless magnetic lock is energized.

-----End of Heading-----











Heading# 13

Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F198	Location:	Corridor 1F166	To	Change Room 1F198	Handing:	DA

Web Link

Site Verified

By Hardware Supplier					
1	Dbl. Acting Continuous Hinge	DSH1000-84C	628 / US28 / Clear Anodized	Markar	 <input type="checkbox"/>
1	Emergency Rel. Stop	ERS-MP-84C-HT	628 / US28 / Clear Anodized	Pemko	 <input type="checkbox"/>
1	Mortise Privacy Set w/ Indicator	V20-8265 LNL	630 / US32D / Satin Stainless Steel	Sargent	 <input type="checkbox"/>
1	Wall Stop	S120	630 / US32D / Satin Stainless Steel	Standard Metal	 <input type="checkbox"/>
1	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal	 <input type="checkbox"/>
1	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal	 <input type="checkbox"/>

Notes:

- Wall Stop requires blocking if installed on drywall partition to prevent future damage.

-----End of Heading-----





Heading#

14

Opening Information

Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	1F199	Location:	Corridor 1F166	To	WC 1F199	Handing:	DA
1	Door#	1F205	Location:	Radiation Therapy Corridor 1F225	To	Ch Rm. 1F205	Handing:	DA

Web Link

Site Verified

By Hardware Supplier

2	Dbl. Acting Continuous Hinge	DSH1000-84C	628 / US28 / Clear Anodized	Markar		<input type="checkbox"/>
2	Emergency Rel. Stop	ERS-MP-84C-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
2	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
2	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
2	Electric Strike	1600CS (Fail Safe)	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
2	Concealed Overhead Stop	1023RA	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
2	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>

By Automatics Supplier

2	Auto Operator	SW200i x Dbl. Acting Breakaway Arm x 1041mm Header	628 / US28 / Clear Anodized	Besam		<input type="checkbox"/>
2	Wave to Lock Kit	CX-WC16-PS	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

Theory of Operation:

- Door is normally closed and unlocked.
- To enter wave hand at exterior actuator or push lever to open door.
- Once inside and the door is closed, wave hand at wave to lock button to disable exterior actuator and electric strike.
- When exterior actuator is disabled, a red circular light on actuator illuminates to indicate the washroom is occupied.
- To exit wave hand at interior actuator or rotate lever and pull to open door.





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- In the event of an emergency press nurse call button for assistance.
 - In the event of fire alarm or loss of power door remains unlocked.
 - Free egress always.

.....End of Heading.....



Heading#

15





Opening Information					
Opening Type:	Single	Opening Size:	1220 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F200	Location:	Corridor 1F166	From	Recovery/Holding 1F200	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Passage Set	8215 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	Electric Strike	1600CS	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Concealed Overhead Stop	1025A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Armour Plate	K10A – 864 x 1154 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 1167 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Door Edge Guard	K42 x 2135 x 3M Tape (Size to Suit Door Height)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Frame Guard	K51 x 1220 x 3M Tape (Width to Suit Jamb Profile)	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK X (2x2135 + 1x1220)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator / Single Door	SW200i-SA-5x5 SGL x 1296mm Header	628 / US28 / Clear Anodized	Besam		<input type="checkbox"/>
2	Wave Actuator	CM-331/42W-SGLR	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

Theory of Operation:

- Door is normally closed and unlocked.
- To enter wave hand at exterior actuator or rotate lever and pull to open door.
- To exit wave hand at interior actuator or rotate lever and push to open door.





-
- In the event of fire alarm or loss of power door remains unlocked.
 - Free egress always.

.....End of Heading.....

Heading# 16











Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	1F206	Location:	Radiation Therapy Corridor 1F225	From	Change Room 1F206	Handing:	RHR
1	Door#	1F207	Location:	Radiation Therapy Corridor 1F225	From	Change Room 1F207	Handing:	RHR

Web Link

Site Verified

By Hardware Supplier					
2	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko	 <input type="checkbox"/>
2	Mortise Privacy Set w/ Indicator	V20-8265 LNL	630 / US32D / Satin Stainless Steel	Sargent	 <input type="checkbox"/>
2	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH	 <input type="checkbox"/>
2	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal	 <input type="checkbox"/>
2	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal	 <input type="checkbox"/>
4	Silencers	By Hollow Metal Frame Supplier	Grey		 <input type="checkbox"/>

.....End of Heading.....



Heading#

17





Opening Information					
Opening Type:	Pair	Opening Size:	2-915 x 2135 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F209	Location:	Radiation Therapy Corridor 1F225	From	Vestibule 1F209A	Handing:	RHRA

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Elec. Continuous Hinge	CFM83HD1-HT-PT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Power Transfer	CEPT-10	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
1	Auto Flush Bolt (Top)	2840	630 / US32D / Satin Stainless Steel	Rockwood		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Electric Strike	1600CS	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Coordinator	2672 x FB2	628 / US28 / Clear Anodized	Rockwood		<input type="checkbox"/>
2	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
2	Kick Plate	K10A – 305 x 865 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2135 + 1x1830)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Astragal Set	351CP x 2135	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>

By Security Supplier

2	Door Position Switch	MSS100-4Y	Black	Flair		<input type="checkbox"/>
1	Card Reader	By Security Supplier				<input type="checkbox"/>
1	Request to Exit	XMS	White	Securitron		<input type="checkbox"/>
1	Video Intercom	By Security Supplier				<input type="checkbox"/>
1	Remote Release	By Security Supplier				<input type="checkbox"/>
1	Access Controller	By Security Supplier				<input type="checkbox"/>
1	Power Supply	By Security Supplier - Located in Central Location				<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	SW200i-SA-5x5 Dual-Sequential x 1855mm Header	628 / US28 / Clear Anodized	Besam		<input type="checkbox"/>
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2	Wave Actuator	CM-331/42W-SGLR	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>
1	Logic Relay	CX-33		Camden		<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm with auto operator supplier the location and quantity of wires required prior to pulling wires.

Theory of Operation:

- Door is normally closed and locked.
- Emergency key in lockset will momentarily unlock door.
- To enter present valid credential to release electric strike and enable outside wave actuator. Then wave hand at exterior actuator to open door sequentially.
- To enter without valid credential, call through video intercom for staff to remotely unlock door. Then wave hand at exterior actuator to open doors.
- To exit wave hand at interior actuator to sequentially open doors or rotate lever and push to open door.
- Request to exit sensor alerts access control system of authorized exit.
- In the event of fire alarm or loss of power door remains locked.
- Free egress always.

.....End of Heading.....



Heading#

18





Opening Information					
Opening Type:	Single	Opening Size:	965 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F394	Location:	Patient Waiting Area 2 1F341	To	WC 1F394	Handing:	DA

Web Link

Site Verified

By Hardware Supplier

1	Dbl. Acting Continuous Hinge	DSH1000-84C	628 / US28 / Clear Anodized	Markar		<input type="checkbox"/>
1	Emergency Rel. Stop	ERS-MP-84C-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Electric Strike	1600CS (Fail Safe)	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Concealed Overhead Stop	1023RA	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 915 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 940 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	SW200i x Dbl. Acting Breakaway Arm x 1041mm Header	628 / US28 / Clear Anodized	Besam		<input type="checkbox"/>
1	Wave to Lock Kit	CX-WC16-PS	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

Theory of Operation:

- Door is normally closed and unlocked.
- To enter wave hand at exterior actuator or push lever to open door.
- Once inside and the door is closed, wave hand at wave to lock button to disable exterior actuator and electric strike.
- When exterior actuator is disabled, a red circular light on actuator illuminates to indicate the washroom is occupied.
- To exit wave hand at interior actuator or rotate lever and pull to open door.
- In the event of fire alarm or loss of power door remains unlocked.
- Free egress always.

-----End of Heading-----





Heading# 19

Opening Information





Opening Type:	Single	Opening Size:	915 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F423	Location:	Radiation Therapy Corridor 1F225	To	Change Room 1F423	Handing:	LH

Web Link

Site Verified

By Hardware Supplier

1	Dbl. Acting Continuous Hinge	DSH1000-84C	628 / US28 / Clear Anodized	Markar		<input type="checkbox"/>
1	Emergency Rel. Stop	ERS-MP-84C-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Privacy Set w/ Indicator	V20-8265 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	Wall Stop	CBH 140	630 / US32D / Satin Stainless Steel	CBH		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 865 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 890 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
2	Silencers	By Hollow Metal Frame Supplier	Grey			<input type="checkbox"/>

Notes:

- Wall Stop requires blocking if installed on drywall partition to prevent future damage.

-----End of Heading-----



Heading#

20





Opening Information					
Opening Type:	Pair	Opening Size:	2-915 x 2135 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F424	Location:	Radiation Therapy Corridor 1F225	To	Vestibule 1F424A	Handing:	RHA

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Elec. Continuous Hinge	CFM83HD1-HT-PT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Power Transfer	CEPT-10	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
1	Auto Flush Bolt (Top)	2840	630 / US32D / Satin Stainless Steel	Rockwood		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Mortise Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Electric Strike	1600CS	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Coordinator	2672 x FB2	628 / US28 / Clear Anodized	Rockwood		<input type="checkbox"/>
2	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
2	Kick Plate	K10A – 305 x 865 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2135 + 1x1830)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Astragal Set	351CP x 2135	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>

By Security Supplier

2	Door Position Switch	MSS100-4Y	Black	Flair		<input type="checkbox"/>
1	Card Reader	By Security Supplier				<input type="checkbox"/>
1	Request to Exit	XMS	White	Securitron		<input type="checkbox"/>
1	Video Intercom	By Security Supplier				<input type="checkbox"/>
1	Remote Release	By Security Supplier				<input type="checkbox"/>
1	Access Controller	By Security Supplier				<input type="checkbox"/>
1	Power Supply	By Security Supplier - Located in Central Location				<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	SW200i-SA-5x5 Dual-Sequential x 1855mm Header	628 / US28 / Clear Anodized	Besam		<input type="checkbox"/>
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2	Wave Actuator	CM-331/42W-SGLR	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>
1	Logic Relay	CX-33		Camden		<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm with auto operator supplier the location and quantity of wires required prior to pulling wires.

Theory of Operation:

- Door is normally closed and locked.
- Emergency key in lockset will momentarily unlock door.
- To enter present valid credential to release electric strike and enable outside wave actuator. Then wave hand at exterior actuator to open door sequentially.
- To enter without valid credential, call through video intercom for staff to remotely unlock door. Then wave hand at exterior actuator to open doors.
- To exit wave hand at interior actuator to sequentially open doors or rotate lever and push to open door.
- Request to exit sensor alerts access control system of authorized exit.
- In the event of fire alarm or loss of power door remains locked.
- Free egress always.

.....End of Heading.....

Heading#

21





Opening Information					
Opening Type:	Single	Opening Size:	1220 x 2135 x 45	STC Rating	None
Door Material:	SCWD-LL	Frame Material:	HMF-LL	Fire Rating	None

1	Total Openings							
1	Door#	1F426	Location:	Control Area 1F427	To	Orthovoltage Room 1F426	Handing:	RH

Web Link

Site Verified

***ALL HARDWARE PROVIDED BY VERITAS LL COMPLETE SYSTEM PACKAGE**

.....End of Heading.....



Heading#

22

Opening Information





Opening Type:	Single	Opening Size:	1220 x 2135 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F427	Location:	Radiation Therapy Corridor 1F225	To	Control Area 1F427	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	Electric Strike	1600CS	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	LFIC Rim Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Closer	DA-351-UO	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
1	Wall Stop	CBH 140	630 / US32D / Satin Stainless Steel	CBH		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 1170 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 1195 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2135 + 1x1220)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>

By Security Supplier

1	Door Position Switch	MSS100-4Y	Black	Flair		<input type="checkbox"/>
1	Card Reader	By Security Supplier				<input type="checkbox"/>
1	Request to Exit	XMS	White	Securitron		<input type="checkbox"/>
1	Access Controller	By Security Supplier				<input type="checkbox"/>
1	Power Supply	By Security Supplier - Located in Central Location				<input type="checkbox"/>

Notes:

- Wall Stop requires blocking if installed on drywall partition to prevent future damage.
- Theory of Operation:
 - - Door is normally closed and locked.
 - - Emergency key in lockset will momentarily unlock door.
 - - To enter present valid credential to unlock then push lever to open door.
 - - To exit rotate lever and pull to open door.
 - - Request to exit sensor alerts access control system of authorized exit.
 - - In the event of fire alarm or loss of power door remains locked.
 - - Free egress always.





End of Heading

Heading#

23

Opening Information					
Opening Type:	Single	Opening Size:	915 x 2135 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F428A	Location:	Vestibule 1F422	To	Vestibule 1F428A	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1-HT	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Storeroom Lockset	LC-8204 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	LFIC Rim Cylinder	9852IC x CMK x GMK	626 / US26D / Satin Chrome	ASSA		<input type="checkbox"/>
1	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Closer	351-UO x -351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 865 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 890 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2135 + 1x915)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Auto Door Bottom	434APKL x 915	719 Milled Aluminum	Pemko		<input type="checkbox"/>

End of Heading

Heading#

24

Opening Information





Opening Type:	Single	Opening Size:	915 x 2135 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1F428B	Location:	Vestibule 1F428A	To	Mechanical & Electrical Room 1F428	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	CFM83HD1	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Mortise Passage Set	8215 LNL	630 / US32D / Satin Stainless Steel	Sargent		<input type="checkbox"/>
1	Concealed Overhead Stop	1023A	630 / US32D / Satin Stainless Steel	ABH		<input type="checkbox"/>
1	Closer	351-UO x -351-B (Invert Mounting Plate)	689 / US28 / Painted Aluminum	Sargent		<input type="checkbox"/>
1	Kick Plate	K10A – 305 x 865 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Mop Plate	K10A – 152 x 890 x 3M Tape	630 / US32D / Satin Stainless Steel	Standard Metal		<input type="checkbox"/>
1	Gasketing	2891APK x (2x2135 + 1x915)	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Auto Door Bottom	420APKL x 915	719 Milled Aluminum	Pemko		<input type="checkbox"/>

.....End of Heading.....

END OF SCHEDULE

Glass and Glazing

PART 10R- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Glass and glazing.
- .2 Section excludes:
 - .1 X-ray protective glass or leaded glass: by Others.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Show details of each type of glazing system in conjunction with the framing system indicating type of glass, sizes, shapes, glazing material and quantity. Show details indicating glazing material, glazing thickness, bite on the glass and glass edge clearance.
- .4 Samples:
 - .1 Submit 305 mm (12") square samples of each type of glass indicated except for clear monolithic glass products, and 305 mm (12") long samples of each color required, except black, for each type of sealant or gasket exposed to view.
 - .1 Submit 3 control samples for each glass type showing maximum range of visible difference between units for the *Project*.
 - .2 Submit samples of glass showing each type of shape and finish of glass edge for exposed glass edges.
- .5 Test and evaluation reports:
 - .1 Obtain compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealant as well as other glazing materials including insulating units.
- .6 Manufacturer reports:
 - .1 Submit glass fabricator's product information and structural calculations indicating compliance with glazing standards established by the Glass Association of North America (GANA). Submittal to include thermal stress and structural load analysis of the proposed glass types, configuration and sizes.
- .7 Submit sample glazing warranty.

Glass and Glazing

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit maintenance and cleaning instructions for glass and glazing for incorporation into the operating and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002 1994.
 - .2 Installers / applicators / erectors:
 - .1 *Subcontractor:*
 - .1 Shall be thoroughly trained and experienced in skills required.
 - .2 Shall be completely familiar with referenced standards and requirements of the work of this section.
 - .3 Shall personally direct installation performed under this section.
 - .2 Foreperson experience: Shall have 10 years' experience, minimum, as glazing mechanic.
 - .3 Glazing mechanic experience: Shall have 3 years' experience, minimum, as glazers.

1.6 Delivery, Storage, and Handling

- .1 Protect glass from edge damage, dust, and contaminants during handling and storage.
- .2 Storage and protection: Protect glazing materials according to manufacturer's written requirements and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.

1.7 Field Conditions

- .1 Ambient Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by the glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation or other causes.
- .2 Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 4.4°C.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Special product warranty for tempered glass products:

Glass and Glazing

- .1 Warrant that tempered glass will not break spontaneously as a result of Nickel Sulfide (NiS) inclusions at a rate exceeding 0.8% (8/1000) for a period of five years from the date of manufacture. Warranty shall be manufacturer's standard form in which tempered-glass manufacturer agrees to replace tempered-glass units.

- .1 Duration: 5 years from date of manufacture for fully tempered glass.

PART 2- PRODUCTS

2.1 Performance/Design Requirements

.1 General:

- .1 Publications: Comply with recommendations in the publications below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section.

- .1 GANA Glazing Manual.
- .2 GANA Engineering Standards Manual.
- .3 GANA Laminated Glazing Reference Manual.
- .4 GANA Sealant Manual.

.2 Regulatory requirements:

.1 Fire rated glass:

- .1 Each lite shall bear permanent, non-removable label by accredited and recognized independent testing agency certifying it for use in tested and rated fire protective assemblies.

.3 Glass strength:

- .1 Design glass in conformance with the building code and the following requirements:

- .1 Minimum thickness of annealed or heat-treated glass products to be selected so the worst case probability of failure does not exceed the following:

- .1 8 breaks per 1000 for glass installed vertically less than 15 degrees from the vertical plane and under wind action.

- .2 Glass at guards, balustrades, and where glass is likely to be subjected to human impact shall comply with safety glass requirements of CAN/CGSB 12.20-M89 and CAN/CGSB 12.1-2017, DIN EN 14179-1:2005, where applicable, and building code.

- .3 Provide annealed, heat strengthened, and tempered lights where required by the building code, and where required for the various solar exposures on the building.

- .4 Glass thicknesses and glass types specified, indicated, or scheduled in the *Contract Documents* are minimums required. Modify glass thickness as required to satisfy design and building code requirements, and requirements of authorities having jurisdiction, and any such modifications shall be clearly indicated on shop drawings.

Glass and Glazing

- .4 Provide glass *Products* of uniform appearance, reflectivity, hue, shade, visible light transmittance, and colour when viewed from distance of 3 m (10 ft) to 30 m (100 ft) perpendicular to the glass or from 45 degree angle to the glass.
- .5 Protect laminated glass interlayer from damage or discolouration resulting from contact with deleterious and incompatible sealants, substances, and materials. Comply with manufacturer's recommended installation requirements.

2.2 Glass Manufacturers

- .1 Subject to compliance with the requirements of the *Contract Documents*, provide primary glass by one of the following float glass manufacturers:
 - .1 Cardinal Glass Industries.
 - .2 Guardian Industries, LLC.
 - .3 Pilkington North America.
 - .4 Vitro Architectural Glass.

2.3 Glass Materials

- .1 General:
 - .1 Single source responsibility: Provide materials from a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source and manufacturing plant for each type and class required.
- .2 Heat treated (tempered or heat strengthened) float glass:
 - .1 In accordance with CAN/CGSB 12.1-2017.
 - .2 Minimum thickness: 6 mm (1/4").
 - .3 Fabrication process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - .4 For uncoated glass, comply with requirements for Condition A in accordance with ASTM C1048-18.
 - .5 For coated vision glass, comply with requirements for Condition C (other coated glass) in accordance with ASTM C1048-18.
 - .6 Heat strengthened glass shall have surface compression of 24-52 MPa (3,500-7,500 psi).

2.4 Fire-Rated Glass

- .1 Fire-resistive rated, impact safety resistant glass, non-wired:
 - .1 In accordance with CAN/ULC-S104-15/CAN/ULC-S106-15, CPSC 16 CFR 1201 (Cat. I and II).
 - .2 Film faced and non-film faced glazing:
 - .1 Fire-protective-rated and impact safety-rated, transparent glazing material and listed for use in doors, sidelites, transoms, and borrowed lites in both interior and exterior applications, not functioning as a barrier.
 - .2 Surface finish:

Glass and Glazing

- .1 Premium Grade: transparent glass, polished for superior optical clarity.
- .3 *Acceptable Product:*
 - .1 Safti First 'SuperLite II-XL'.
 - .2 Saint Gobain 'Keralite Select F'.
 - .3 Schott 'Pyran Platinum F'.
 - .4 Technical Glass Products 'FireLite NT'.
- .2 Fire-resistive rated, impact safety resistant, heat barrier glass (non-wired):
 - .1 In accordance with CAN/ULC-S104-15/CAN/ULC-S106-15, CPSC 16 CFR 1201, Category II.
 - .2 Glass with intumescent interlayer:
 - .1 Fire-protective-rated and impact safety-rated, clear, high visible light transmission glass laminated with an intumescent interlayer, and listed for use in doors, sidelites, transoms, borrowed lites, and wall applications in both interior and exterior applications, and functioning as a barrier to both radiant and conductive heat.
 - .2 *Acceptable Product:*
 - .1 Safti First 'SuperLite II-XL'.
 - .2 Saint Gobain 'ContraFlam'.
 - .3 Technical Glass Products 'Pilkington Pyrostop'.

2.5 Glazing Materials (Non-Fire Rated)

- .1 Glazing materials; general: Select glazing sealants, tapes, gaskets and additional glazing materials of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
- .2 Glazing gaskets: Moulded or extruded gaskets of profile and hardness required to maintain watertight seal, made from the following:
 - .1 Preformed, EPDM to ASTM C864-05(2019).
- .3 Setting blocks: Moulded or extruded material with Shore, Type A Durometer hardness of 85, plus or minus 5, made from one of the following:
 - .1 Preformed, EPDM to ASTM C864-05(2019).
- .4 Spacers: Moulded or extruded blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated made from one of the following:
 - .1 Preformed, EPDM to ASTM C864-05(2019).
- .5 Edge blocks: Moulded or extruded material of hardness needed to limit glass lateral movement (side walking) made from one of the following:
 - .1 Preformed, EPDM to ASTM C864-05(2019).
- .6 Cleaners, primers and sealers: Type recommended by sealant or gasket manufacturer.
- .7 Polyurethane foam glazing tape:

Glass and Glazing

- .1 High density, closed-cell, flexible, non-extruding tape, adhesive backed one side only; recommended by manufacturer for exterior applications with nominal pressure in glazing channel.
- .2 Acceptable *Products*: As recommended by manufacturer suitable for conditions of application and use.

2.6 Fire Rated Glazing Accessories

- .1 Glazing tape; fire-rated glass (non-wired):
 - .1 Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapour seal.
- .2 Silicone sealant: One-part neutral curing silicone, medium modulus sealant, to ASTM C920-18, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.
 - .1 Acceptable *Products*:
 - .1 DOWSIL '795'.
 - .2 Momentive 'Silglaze-II 2800'.
 - .3 Tremco 'Spectrem 2'.
- .3 Setting blocks: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.
- .4 Cleaners, primers, and sealers: Type recommended by manufacturer of glass and gaskets.

2.7 Fabrication of Glazing Units

- .1 Fabricate glazing units in sizes required to fit openings, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - .1 Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
- .2 Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- .3 Grind smooth and chamfer, and polish exposed glass edges and corners, unless otherwise indicated.

PART 3- EXECUTION

3.1 Examination

- .1 Examine framing, glazing channels, and stops, with glazing installer present, for compliance with the following:
 - .1 Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

Glass and Glazing

- .2 Inspect butt and mitre joints in framing. Seal joints found to be open with a compatible sealant prior to glazing.
- .3 Glazing pockets and surfaces are free of dust, construction debris, and contaminants.
- .4 Presence and functioning of weep systems.
- .5 Minimum required face and edge clearances as per FGIA and GANA standards.
- .6 Effective sealing between joints of glass-framing members.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

- .1 Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- .2 Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.
- .3 Clean contact surfaces with solvent and apply primers to surfaces to receive tapes and sealants in accordance with the manufacturer's requirements. Ensure surfaces are free of moisture and frost.

3.3 Glazing - General

- .1 Comply with combined written requirements of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- .2 Adjust glazing channel dimensions as required by conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- .3 Protect glass edges from damage during handling and installation. Remove damaged glass from *Project* site and legally dispose of off *Project* site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- .4 Clean glazing rebate surfaces of traces of dirt, dust, or other contaminants.
- .5 Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- .6 Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- .7 Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- .8 Provide spacers for glass lites where length plus width is greater than 1270 mm (50").
 - .1 Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

Glass and Glazing

- .2 Provide 3.2 mm (1/8") minimum bite of spacers on glass and use thickness equal to sealant width.
- .9 Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel.
- .10 Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- .11 Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- .12 Glaze hollow metal doors and frames specified under work of Section 08 11 13 using tape glazing installation.
- .13 Install fire rated glazing in accordance with fire rated glazing *Product* manufacturer's written requirements and with current fire-resistance listing for each *Product*. Field cutting or tampering is not permissible.

3.4 Tape Glazing

- .1 Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- .2 Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- .3 Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- .4 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- .5 Do not remove release paper from tape until right before each glazing unit is installed.
- .6 Centre glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centres of openings.

3.5 Gasket Glazing (Dry)

- .1 Allow gaskets to relax and cut compression gaskets to lengths recommended by gasket manufacturer to fit openings to suit frame dimensions.
- .2 Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- .3 Installation with drive-in wedge gaskets: Centre glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centres of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .4 Installation with Pressure-Glazing Stops: Centre glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .5 Install gaskets so they protrude past face of glazing stops.

Glass and Glazing

3.6 Sealant Glazing (Wet)

- .1 Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- .2 Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- .3 Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.8 Protection

- .1 Take all precautions necessary to protect stored glass and installed glass from lime mortar, water run-off from concrete or copper, weld spatter, acids, roofing tar, solvents, abrasive cleaners, careless handling of construction machinery and equipment, and any other activities that could permanently damage the glass.

3.9 Adjusting and Cleaning

- .1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.
- .2 Final cleaning of glass in accordance with Section 01 77 00.

END OF SECTION

Applied Films

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Translucent film; applied to interior glazing.

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 Submit shop drawings showing applied film locations, film layout and pattern on glazing units.
- .4 Samples:
 - .1 Submit 3 - 200 mm x 200 mm (8" x 8") samples of each specified film type, pattern and colour.

1.3 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit maintenance and cleaning instructions for incorporation into operating and maintenance manuals.
 - .2 Instruct *Owner's* representative on proper care and maintenance for work of this section.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*. Shall have 5 years' experience, minimum, in application of *Products* specified.

1.5 Delivery, Storage, and Handling

- .1 Package materials and identify on attached labels the manufacturer, contents and material specification number.

1.6 Field Conditions

- .1 Conform to manufacturer's written documented temperatures, relative humidity, and substrate moisture content and temperature for application of materials of this section.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 Performance/Design Requirements

- .1 Applied film shall function as intended, and exhibit none of the following:
 - .1 Bubbling.
 - .2 Cracking.
 - .3 Crazing.
 - .4 Delamination.
 - .5 Discolouration.
 - .6 Peeling.

2.2 Materials

- .1 Applied films; translucent:
 - .1 Acceptable *Products*:
 - .1 3M Company 'Pressure Sensitive Adhesive Vinyl Film, Style 3M Dusted Crystal 7725SE-314'..
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3- EXECUTION

3.1 Examination

- .1 Examine glass surfaces to receive film and verify that they are free from defects and imperfections which will affect the final appearance of installed film. Correct such deficiencies before starting film application.

3.2 Preparation

- .1 Prepare surfaces for film application in accordance with film manufacturer's written requirements.
- .2 Window and window framing will be cleaned thoroughly with a neutral cleaning solution. Surface of glass shall be bladed with industrial razor to ensure the removal of any foreign contaminants in accordance with film manufacturer's instructions.
- .3 Towelling or other absorbent material shall be placed on the window sill or sash to absorb moisture accumulation generated by the film application.

3.3 Installation

- .1 Applied film; interior application:
 - .1 Apply film to indicated surface of glazing units in accordance with film manufacturer's written requirements, applied plumb, true and level over clean glazing, without air bubbles, wrinkles, blisters, and other defects.
 - .2 After installation, applied film shall be flat with no obvious concentrations of moisture, free of creases, free of tears, with no moisture dimples when viewed under normal conditions.

Applied Films

- .3 Film edges shall be cut neatly and square at a uniform distance of 1.5 mm (1/16") to 0.79 mm (1/32") from frame.

3.4 Adjusting and Cleaning

- .1 Clean film and glass surfaces so they are free of foreign matter using cleaners recommended by film manufacturer.

3.5 Protection

- .1 Comply with manufacturer's written requirements respecting protection.

END OF SECTION

Metal Supports for Gypsum Board

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Metal support systems for interior gypsum board partitions, interior ceilings, and interior assemblies as indicated.

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, including additional data as may be required to demonstrate compliance with the *Contract Documents*.
- .3 Engineered shop drawings:
 - .1 Submit engineered shop drawings for metal support systems at interior locations where noted as engineered.
- .4 Test and evaluation reports:
 - .1 Submit certified test results for each required fire resistance rated assembly for work of this section.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:
 - .1 *Subcontractor*: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

PART 2- PRODUCTS

2.1 Performance/Design Requirements - Fire Resistance Rated Assemblies

- .1 Where gypsum board systems with fire resistance ratings are indicated or required, provide materials and installations that are identical with those of applicable assemblies tested by fire testing laboratories acceptable to authorities having jurisdiction.

2.2 Materials - General

- .1 For sheet metal *Products*: Sheet metal thickness indicated herein pertains to the minimum base steel thickness exclusive of coating.
- .2 Protective coatings for metal supports and framing:
 - .1 Minimum corrosion protection: Z120 (G40) ASTM A653/A653M-18.
 - .2 Heavy duty corrosion protection where scheduled or indicated: Z275 (G90) ASTM A653/A653M-18.

Metal Supports for Gypsum Board

- .3 Sheet metal screws shall have a minimum coating thickness of 0.008 mm (0.0003") of zinc. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of *Consultant*.
- .4 Screws:
 - .1 Steel screws shall be equal to or exceed minimum diameter indicated on shop drawings.
 - .2 Penetration beyond joined materials shall be not less than 3 exposed threads.
 - .3 Thread types and drilling capability shall conform to manufacturer's recommendations.

2.3 Partition Support Materials

- .1 Interior non-loadbearing channel stud framing: to ASTM C645-24; roll formed from 0.836 mm (0.0329") minimum thickness unless otherwise indicated or as recommended by gypsum board manufacturer, galvanized steel sheet. Provide service holes starting at 450 mm (18") from bottom, then 914 mm (36") on centre to top of studs.
 - .1 Steel studs at door jambs and where indicated: 1.720 mm (0.0677") minimum thickness.
- .2 Interior floor and ceiling tracks (runners): to ASTM C645-24; in widths to suit stud sizes.
 - .1 Metal thickness: to match studs.
 - .2 For openings wider than 914 mm (36"), provide 0.836 mm (0.0329") minimum thickness for header.
- .3 Interior floor and ceiling track (runner) fasteners:
 - .1 To concrete and masonry: Use stub nails or power-driven fasteners.
 - .1 Power actuated fastening systems are not permitted.
 - .2 To suspended acoustic ceiling tile grid: Manufactured to fit applicable ceiling grid profile; CGC 'Partition Clip'.
- .4 Bracing channels: Minimum 19 mm x 10 mm x 1.087 mm (3/4" x 3/8" x 0.0428") cold rolled galvanized steel.

2.4 Ceiling Support Materials and Systems

- .1 General: Size ceiling support components to comply with ASTM C754-20 unless otherwise indicated, connections and restraint of wall and ceiling assemblies.
- .2 Main runners: Steel channels, hot or cold rolled; Z180 (G60) galvanized.
- .3 Hanger wire: in accordance with ASTM A641/A641M-19, soft, Class 1 galvanized, minimum 4.064 mm (0.160", 8 AWG).
- .4 Hanger rods and flats: Mild steel with zinc coating, galvanized for exterior applications.
 - .1 General: Size devices for 5 times load imposed by completed system as determined in accordance with ASTM E488/E488M-22 and as required in accordance with engineered shop drawings.
 - .2 Screws, clips, bolts, concrete inserts or other devices for ceiling hangers whose suitability for use intended has been proven through standard construction practices or by certified test data.

Metal Supports for Gypsum Board

- .3 Hangers: Comply with ASTM C754-20 for maximum ceiling area and loads to be supported.
- .4 Interior concrete ceiling anchors:
 - .1 *Acceptable Products:*
 - .1 ITW Ramset/Red Head 'Dynabolt Sleeve Anchor TW-1614' or 'Redi-Drive Tie Drive' or 'Redi-Drive' with angle clip.
 - .2 ITW Ramset/Red Head 'Trubolt' or 'Dynabolt' anchors complete with galvanized angle clip.
 - .3 Hilti 'Kwik-Bolt 3' and 'HHDCA 1/4 Ceiling Hangers'.
- .5 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable product lines specified in preceding paragraphs.
- .5 Tie wire: 1.19 mm (0.047", 18 AWG) minimum zinc coated, soft-annealed wire, to ASTM A641/A641M-19.
- .6 Furring anchorages: 1.62 mm (0.0637", 16 AWG) galvanized wire ties, manufacturer's standard wire type clips, bolts, nails or screws as recommended by furring manufacturer and complying with ASTM C754-20.
- .7 Runner (carry) channels: 1.367 mm (0.0538") thick cold rolled steel, primer painted or zinc coated for interior locations, to ASTM C754-20, with minimum 228 MPa yield strength:
 - .1 38 mm x 12.7 mm (1-1/2" x 1/2") where supported at centres of 914 mm (36") maximum.
 - .2 38 mm x 19 mm (1-1/2" x 3/4") where supported at centres of 1220 mm (48") maximum.

2.5 Furring

- .1 Furring channels: 0.836 mm (0.0329") minimum typical thickness, cold rolled steel, wiped coated, nominal size of 22 mm (7/8") depth x 35 mm (1-3/8") face, hat type with knurled face.
- .2 Resilient furring channels:
 - .1 *Acceptable Product:*
 - .1 Bailey Metal 'Resilient Channel'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .3 Z-furring members: Galvanized steel z-shaped furring members; ASTM A653/A653M-18, G60, 0.836 mm (0.0329") minimum thickness of base metal, of depth indicated, designed for mechanical attachment of insulation boards or blankets.
- .4 Fasteners for furring members: Type and size recommended by furring manufacturer for substrate and application indicated, load rating and spacing to support materials carried by assembly with factor of safety of 3x per fastener manufacturer data sheets.

2.6 Accessories

- .1 Backer plates:

Metal Supports for Gypsum Board

- .1 Metal backer plates: Steel, galvanized; minimum 150 mm (6") wide x 0.836 mm (0.0329") minimum x length and width to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories.
- .2 Elimination of backer plates or direct attachment of accessories or equipment to studs will not be permitted.

PART 3- EXECUTION

3.1 Installation General

- .1 Comply with ASTM C754-20 and manufacturer's requirements, except as modified herein. Do not bridge building expansion joints with support system. Frame both sides of joints with furring and other supports as indicated.
- .2 Provide and install studs, framing, shimming, and furring to provide proper support for gypsum board to achieve the following installation tolerances:
 - .1 Do not exceed 3 mm (1/8") in 3 m (10') variation from plumb, level, and plane.
 - .2 Do not exceed 10 mm (3/8") from drawings locations.
 - .3 Do not exceed 1.5 mm (1/16") variation between planes of abutting edges or ends.
 - .4 Install each framing member so fastening surfaces vary not more than 3.2 mm (1/8") from the plane formed by faces of adjacent framing.
 - .5 In double stud walls, do not bridge across studs on opposite sides of wall with gypsum board or metal cross bracing.
- .3 Give complete cooperation and direction to trades erecting framing and furring over which this work is applied. Coordinate finished joint location with framing.
- .4 Coordinate installation and cooperate with mechanical and electrical work to accommodate mechanical electrical items and any other work required to be incorporated into or coordinated with the partitions, ceiling and soffit systems.
 - .1 Where the presence of suspended ductwork or other mechanical or electrical services or devices above ceiling framing conflicts with ceiling framing suspension points from structure above, provide bridging framing below conflicting work as required to support ceiling framing on specified intervals.
 - .2 Do not suspend ceiling framing from mechanical or electrical suspension systems unless agreement is obtained in writing from engineer for *Subcontractor* installing such framing that additional imposed loads are acceptable; obtain *Consultant's* acceptance before proceeding.
- .5 Provide clearances between work of this section and structural elements to prevent transference of structural loads.
- .6 Do not bridge building expansion joints with steel framing or furring members. Independently frame both sides of joints with framing of furring members or as indicated.
- .7 Size framing systems according to manufacturer's engineered load tables, to meet allowable deflection without permanent deformation.
 - .1 Maximum allowable deflection: L/240.

Metal Supports for Gypsum Board

3.2 Blocking

- .1 Attach to framing adequate backer plates to support the load of, and to withstand the withdrawal and shear forces imposed by, items installed upon the work of this section.

3.3 Furring - General

- .1 Furring indicated in *Contract Documents* is schematic. Do not regard as exact or complete. Provide all necessary framing and furring to support gypsum board in accordance with manufacturers' specifications.
- .2 Shim furring as required to achieve required installation tolerances.
- .3 Leave finished work rigid, secure, square, level, plumb, curved to detailed radius and erected to maintain finish gypsum board line dimensions and contours. Make allowance for thermal movement.
- .4 Thermally separate metal studs from exterior concrete or masonry.

3.4 Suspended and Furred Ceilings

- .1 Arrange hangers for suspended gypsum board ceilings to provide support independent of walls, columns, pipes, ducts; erect plumb, and securely anchored to structural frame, or embed in concrete slabs.
- .2 Keep lateral braces at hangers back 450 mm (18") minimum unless otherwise noted.
- .3 Space hangers at 914 mm (36") on centre maximum along runner channels, and not more than 150 mm (6") from ends.
- .4 Space runner channels at 1220 mm (48") on centre, maximum, and not more than 150 mm (6") from boundary walls, interruptions of continuity, and changes in direction. Run channels transversely to structural framing members.
- .5 Where splices are necessary, lap members at least 200 mm (8") and wire each end with 2 loops. Avoid clustering or lining up of splices.
- .6 Attach to rod hangers by bending hanger sharply under bottom flange of runner, and securely wiring in place with saddle tie.
- .7 Erect cross furring channels transversely across runner channels at 400 mm (16") on centre maximum, 305 mm (12") on centre at fire rated assemblies, at not more than 150 mm (6") from boundary wall openings, interruptions in ceiling continuity, and changes in direction.
- .8 Secure furring channels to each support with purpose-made slips or wire tie. Splice joints by lapping channels and tying together.
- .9 Level cross furring channels to maximum tolerance of 3 mm in 3 m (1/8" in 10 ft).
- .10 Install ceiling framing assemblies at interface with suspended acoustical ceilings specified in Section 09 51 23, to project minimum of 100 mm (4") above acoustic tile suspension assemblies.

3.5 Wall Furring

- .1 Install steel furring for braced walls, free standing walls, walls that are furred out as indicated.

Metal Supports for Gypsum Board

- .2 Frame openings and around built-in equipment, cabinets, access panels, on 4 sides, with channels. Extend furring into reveals. Check clearances with equipment suppliers.
- .3 Provide bulkheads and boxed-in duct shafts, for beams, columns, pipes and around exposed services where indicated. Install 19 mm (3/4") channels at corners and at 305 mm (12") on centre.

3.6 Resilient Furring

- .1 Ceilings:
 - .1 Fasten the resilient furring perpendicular to the ceiling framing every 305 mm (12").
 - .2 Fasten the first furring member 150 mm (6") from the wall.
 - .3 Fasten the second furring member 305 mm (12") from the same wall.
 - .4 Fasten the last furring member 150 mm (6") from the opposite wall.
- .2 Partitions:
 - .1 Install resilient furring with outer leg oriented upward.
 - .2 Fasten the resilient furring maximum 610 mm (24") on centre.
 - .3 Fasten the first furring member 50 mm (2") from the floor. Install 150 mm (6") continuous strip of 12.7 mm (1/2") gypsum board along base of partitions where resilient furring installed.
 - .4 Fasten the second furring member 610 mm (24") from the floor.
 - .5 Fasten the last furring member 150 mm (6") from the ceiling.
- .3 Secure to each support with 25 mm (1") gypsum wallboard screw.
- .4 Provide resilient furring channel transverse to framing members, or as indicated.

3.7 Metal Stud Partition Framing

- .1 Provide partition tracks (runners) at floor and underside of structural assembly and as follows:
 - .1 Align accurately and lay out according to partition layout.
 - .2 Secure runners to concrete, access flooring and to concrete slabs, as applicable, with screwed or shot fasteners located 50 mm (2") from each end and spaced at maximum 610 mm (24") on centre.
 - .3 At partition corners, extend one runner to end of corner and butt other runner to it, allowing necessary clearance for gypsum board thickness. Runners should not be mitred.
- .2 Unless otherwise indicated, place interior studs vertically at centres as follows:
 - .1 Provide studs at 400 mm (16") on centre, and as specially spaced in accordance with details indicated.
 - .2 Provide studs not more than 50 mm (2") from abutting walls, openings and each side of corners.
 - .3 Provide freedom for 19 mm (3/4") deflection under beams, structural slabs and the like to avoid transmission of structural loads to studs, or install 50 mm (2") leg ceiling tracks.

Metal Supports for Gypsum Board

- .3 Install studs in tracks at floor and ceiling.
- .4 Where horizontal runs of service lines are scheduled to be installed, arrange with applicable trades and install studs simultaneously with services.
- .5 At openings in stud walls, erect track at head and sills to accommodate intermediate studs. At each end of track, cut out flanges, turn up web, and fasten to studs. Install intermediate studs above and below openings in same manner and spacing as wall studs. Install double studs at each jamb, and double tracks at head of door openings.
- .6 At partitions requiring fire rating, erect in accordance with requirements of listing.
- .7 Size studs, connections, and runners to carry loads according to stud manufacturer's load tables, at 24 kg/m² (5 lb/ft²) live load to meet maximum allowable deflection limits. Where depth of stud is indicated, size metal thickness to meet allowable deflection limits.
- .8 Provide three studs at corner and intermediate intersections of partitions.
- .9 Coordinate work with others installing horizontal runs of service lines so that work is done simultaneously. Where standard holes are too small for installed services, notch studs, and splice notched flanges with splice pieces 305 mm (12") longer than notches, each fastened with 2 screws.
- .10 Coordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .11 Coordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other sections.
- .12 Unless otherwise indicated, partitions, together with gypsum board facings, shall extend above ceilings to underside of structure above.
- .13 Chase walls:
 - .1 Provide chase walls consisting of two parallel steel stud partitions.
 - .2 Provide cross bracing consisting of metal furring, located at quarter points on each pair of studs. Attach cross bracing to studs with metal screws.
- .14 Lateral support bracing channels:
 - .1 Stiffen partitions over 3 m (10') in vertical span, at mid-height to maximum vertical spacing of 2440 mm (8') on centre, with at least one 19 mm (3/4") horizontal bracing channel, extending full length of partition, overlapping at least two stud spaces at ends of bracing channels.
 - .2 Stiffen partitions at not more than 150 mm (6") from the top and bottom of openings and across two full stud spaces at each side of openings with horizontal bracing channel.
- .15 Install steel stud reinforcement 1.720 mm (0.0677") at door frames and brace above ceiling. Secure to top and bottom structure with angle brackets and anchors.

3.8 Control Joints

- .1 Control joints: in accordance with Section 09 29 00.

Metal Supports for Gypsum Board

3.9 Concrete Anchors

- .1 Provide anchors and anchorage points in reinforced concrete floor slab underside in accordance with gypsum board manufacturer's suspension requirements. Drill holes with carbide-tipped drill bits conforming to ANSI B212.15-1994 (R2000).
- .2 Provide anchors; minimum installation depth, and method of expansion as recommended by the anchor manufacturer.

3.10 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

END OF SECTION

Gypsum Board

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Gypsum board; paper-faced.
 - .2 Gypsum board; fire-rated, paper-faced.
 - .3 Gypsum board accessories and miscellaneous related materials.
- .2 Section excludes:
 - .1 Lead foil for gypsum board X-ray shielding: by Others.

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 Fire-rated assembly listings and STC assembly ratings:
 - .1 Submit fire-rated assembly listings for each required fire resistance rated assembly for work of this section.
 - .2 Submit STC assembly ratings for each required STC rated assembly for work of this section.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*: Shall have 10 years' experience, minimum, in successful installation of work of type and quality indicated and specified.

PART 2- PRODUCTS

2.1 Performance/Design Requirements

- .1 Single source responsibility: Obtain gypsum and cement board products from a single manufacturer.
- .2 Fire resistance rating:
 - .1 Construct fire resistance rated assemblies in accordance with listing and CAN/ULC S101-14.
- .3 Paper-faced gypsum board: in accordance with ASTM C1396/C1396M-17.
- .4 Glass scrim gypsum board: in accordance with ASTM C1658/C1658M-18.
- .5 Fire rated in accordance with listed assemblies where indicated: Type X or Type C.

2.2 Gypsum Board Panels

- .1 Gypsum board; paper faced:

Gypsum Board

- .1 Acceptable *Products*:
 - .1 CertainTeed 'Regular Gypsum Board'.
 - .2 CGC 'Sheetrock Brand Gypsum Panel'.
 - .3 Georgia-Pacific 'ToughRock Gypsum Board'.
- .2 Gypsum board; fire-rated, paper faced:
 - .1 Acceptable *Products*:
 - .1 CertainTeed 'Type X and Type C'.
 - .2 CGC 'SHEETROCK Brand Firecode X and Firecode C'.
 - .3 Georgia-Pacific 'ToughRock Fireguard X Gypsum Board and ToughRock Fireguard C Gypsum Board'.
 - .4 PABCO Gypsum 'QuietRock ES'.

2.3 Attachment Materials

- .1 Screws; for gypsum board: bugle head, fine thread, self-tapping, Type W or S or S-12 point to suit framing type and metal gauge, with corrosion resistant finish in accordance with ASTM C1002-07/ASTM C954-18.
 - .1 Screw sizing:
 - .1 #6 x 25 mm (1") for single thickness board fastening.
 - .2 #6 x 32 mm (1-1/4") for single thickness 15.9 mm (5/8") board fastening.
 - .3 #7 x 41 mm (1 5/8") for double thickness board fastening.
- .2 Tie wire: 1.6 mm (0.063") diameter galvanized soft annealed steel wire.

2.4 Accessories

- .1 Accessories: in accordance with ASTM C1047-19 unless otherwise indicated, maximum length pieces per location. Flanges shall be free from dirt, grease, or other material that adversely affects the bond of joint treatment or decoration.
- .2 Trims:
 - .1 Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - .1 Shapes:
 - .1 Corner bead.
 - .1 Mechanically fastened corner beads at impact resistant gypsum walls.
 - .2 "L" or "LC" beads.
 - .3 Reveal trims.
 - .4 Control joints, certified by manufacturer for use at fire resistance rated assemblies as required.
- .3 Aluminum trims: extruded accessories of profiles and dimensions as indicated.
 - .1 Alloy and temper with not less than the strength and durability properties of ASTM B221 (ASTM B221M), Alloy 6063-T5.

Gypsum Board

- .2 Shapes:
 - .1 Z reveal.
 - .2 Reveals and moldings at round columns.
 - .3 Acceptable manufacturers:
 - .1 Fry Reglet.
 - .2 Gordon Interior Specialties.

2.5 Related Support Assemblies and Backer Plates

- .1 Metal support systems and backer plates at interior assemblies: in accordance with Section 09 22 00.

2.6 Joint Treatment Materials

- .1 General: Comply with ASTM C475/C475M-17(2022).
- .2 Joint tape: in accordance with manufacturer's written requirements.
- .3 Joint compound for interior gypsum board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - .1 Prefilling: Use setting-type compound as recommended by panel board manufacturer.
 - .2 Embedding and first coat: Use setting-type or taping compound as recommended by panel board and trim accessory manufacturers.
 - .3 Fill and finish coats: Use sanding type setting-type or taping compound as recommended by panel board manufacturer.

2.7 Acoustic Wall Assembly Materials

- .1 Acoustic sealant; concealed locations: to meet material requirements as listed in Part 9 of ASTM C919-24, including ASTM C834-17 or ASTM C920-18:
 - .1 Acceptable *Products*:
 - .1 Hilti Canada Corp 'CS-S SA Light'.
 - .2 Owens Corning 'QuietZone Acoustic Sealant'.
 - .3 Pecora 'BA-98'.
 - .4 Pecora 'AC-20'.
 - .5 Tremco 'Tremflex 834'.
 - .6 Substitutions: in accordance with Section 01 25 00.
- .2 Acoustic sealant; exposed locations, acrylic:
 - .1 Acrylic/latex acoustic sealant, Type S, Grade NS, Class 12.5 to ASTM C920-18, maximum VOC content 60 g/L, non-hardening or ASTM C834-17, Type OP, Grade -18° C.
 - .2 For exposed sealants use paintable sealant products, do use non-skinning type products where they are exposed to view or where sealant products may deteriorate (stain or bleed into) into painted surfaces.

Gypsum Board

- .3 *Acceptable Products:*
 - .1 Hilti Canada Corp 'CS-S SA Light'.
 - .2 Master Builders Solutions Canada 'MasterSeal NP 520'.
 - .3 Owens Corning 'QuietZone Acoustic Sealant'.
 - .4 Pecora 'AC20'.
 - .5 Tremco 'Tremflex 834'.
- .3 Smoke and acoustic sealant; concealed and exposed locations, non-fire-rated acoustic assemblies:
 - .1 Acrylic smoke and acoustic sealant, in accordance with ASTM C834-17 maximum VOC content 60 g/L, paintable, Flame Spread Value of maximum 25 to CAN/ULC-S102-10.
 - .2 Sealant shall not deteriorate (stain or bleed into) painted surfaces.
 - .3 *Acceptable Products:*
 - .1 Hilti Canada Corp 'CS-S SA Light'.
 - .2 Tremco 'Tremstop Smoke & Sound Sealant'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Acoustic sealant for plenum locations: Smoke-seal sealant with flame-spread not more than 25 and smoke developed classification not more than 50 to CAN/ULC-S102-10, in accordance with Section 07 84 00.
- .5 Acoustic compound: premixed perlite plaster.
- .6 Acoustic (sound attenuation) insulation:
 - .1 Mineral-fibre sound attenuation batts: in accordance with CAN/ULC S702.1-14, Type 1, fire resistant and non-combustible to CAN/ULC-S114-18, high density for sag-free, tight fitting installation.
 - .1 Density: minimum 40 kg/m³ (2.5 lbs/ft³).
 - .2 *Acceptable Products:*
 - .1 Johns Manville 'MinWool Sound Attenuation Fire Batts'.
 - .2 Owens-Corning 'Thermafiber SAFB'.
 - .3 Rockwool 'AFB'.

2.8 Access Doors

- .1 Access doors: in accordance with Divisions 21, 22, and 23 and Divisions 26, 27, and 28.

PART 3 - EXECUTION

3.1 Installation

- .1 General:
 - .1 Comply with ASTM C840-18b, GA 216-24, GA 600-24, and manufacturer's written requirements, except as otherwise indicated.
 - .2 Do not bridge building expansion joints with support system.

Gypsum Board

- .3 Frame both sides of joints with furring and other supports as indicated.
- .2 Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1.6 mm (1/16") open space between boards. Do not force into place.
- .3 Cover both faces of stud partition framing with gypsum board in concealed spaces (above ceiling, and the like) unless otherwise indicated, except in chase walls which are properly braced internally.
- .4 Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cut-outs.
- .5 Apply components of fire-rated assemblies in conformance with indicated designs.
- .6 Do not apply gypsum board in close proximity to hot pipes or heating ducts.
- .7 Install materials with the minimum number of joints. Tightly butt joints, without force, and neatly align them.
- .8 Frame openings on every side. Provide clearances with services.
- .9 Work shall include bulkheads over doors, frames, screens, and changes in ceiling levels, pipe space and as indicated.
- .10 Provide clearances between work of this section and structural elements to prevent transference of structural loads in accordance with Section 09 22 00.
- .11 Tolerances:
 - .1 Do not exceed 3 mm (1/8") in 3 m (10') variation from plumb, level, and plane in exposed surfaces, except at end joint between gypsum board panels.
 - .2 Do not exceed 10 mm (3/8") from indicated location.
 - .3 Do not exceed 1.5 mm (1/16") variation between planes of abutting edges or ends.
 - .4 Surface flatness shall not exceed 1.5 mm (1/16") within 305 mm (12") straight edge. For non-tapered-edge end joints between boards, measure flatness tolerance with end of straight end at centreline of joint.

3.2 Accessories

- .1 At external corners install corner trim secured to framing at 230 mm (9-1/16") on centre on both flanges with screw fasteners or clinch tool.
- .2 Secure casing trim at board edges where exposed to view, where board butts against other materials with no trim to conceal junction, at perimeter of ceiling surfaces at tops of partitions where they stop against continuous ceiling surfaces, and where indicated.
- .3 Erect accessories straight, plumb or level, rigid and at proper plane.
- .4 Use full length pieces.
- .5 Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners, free from rough edges. Secure in accordance with manufacturer's specifications unless otherwise required.
- .6 Installation tolerances:
 - .1 Alignment with board panels shall not exceed tolerances specified above.
 - .2 End joints shall be flush aligned to maximum offset of 0.5 mm (0.020").

Gypsum Board

3.3 Board Application - General

- .1 Before installation of board commences, ensure that internal services have been installed, tested, and approved; conduits, pipes, cables, and outlets are plugged, capped, or covered; and that fastenings and supports installed by others are in place.
- .2 Extend board into door, window, and other openings, reveals, behind fitments, and other applied items and on metal stud partitions to structure above unless indicated otherwise.
- .3 Apply board with long dimension perpendicular to supports, unless otherwise indicated.
- .4 Locate joints on opposite sides of partitions on different studs, and at least 305 mm (12") from opening jambs.
- .5 Install board to minimize joints, and align end joints to be the least objectionable (where they are unavoidable), according to the indicated lighting design. Locate joints in ceilings where least prominently discerned, and never line them up with opening edges.
- .6 Form smooth joints at ends and at field cut edges of board panels.
- .7 Fasten board to metal support members by metal gypsum board screws, 9.5 mm (0.374") minimum to, and 12.7 mm (1/2") maximum from, centre of joints.
 - .1 Space screws:
 - .1 At fire rated board as per fire-rated assembly.
 - .2 At typical board walls at 400 mm (16") on centre at edges and field unless otherwise required.
 - .3 At typical board ceilings at 305 mm (12") on centre at edges and field unless otherwise required.
- .8 Offset gypsum board joints 150 mm (6") minimum from corners of openings.
- .9 Locate gypsum panel product joints so that no joint will align with the edge of an opening unless control joints are to be installed at these locations.
- .10 Replace damaged or weathered sheathing boards.

3.4 Acoustic Wall Assemblies

- .1 Acoustical sealant and plaster:
 - .1 Apply acoustical sealant to seal gaps in accordance with ASTM C919-24 and in accordance with the STC rated assembly.
 - .2 Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919-24 and with manufacturer's written requirements for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
 - .3 Clean substrate, remove debris and deleterious substances.
 - .4 Apply sealant to close voids; no leaks around track and gypsum board.
- .2 Sound attenuation insulation:
 - .1 Install sound attenuation insulation to fill cavity unless otherwise indicated.

Gypsum Board

- .2 Trim insulation to provide close-fit contact to framing assemblies and fill the partition cavity or acoustic insulation assemblies to thicknesses specified or indicated.
- .3 Maintain air space between backs of sound attenuation insulation and back of opposite partition face layer, as applicable.
- .4 Cut insulation to provide close-fit contact around electrical boxes, pipes, and other obstructions and penetrations through and within acoustic assemblies.
- .5 Extend acoustic partition assemblies to underside of structure. Incorporate approved provision to prevent transmittance of structural deflection to partition assembly.
- .6 Staple sound attenuation insulation where required by manufacturer's installation requirements.
- .7 Where studs are not faced with gypsum board on both sides, mechanically fasten wire mesh to non-faced side of stud to retain insulation.
- .8 Mechanically attach sound attenuation insulation in wall assemblies where cavity of wall assembly is greater than 150 mm (6").
- .9 Secure insulation in such a manner that it will not sag or settle away from required locations.
- .3 Sound flanking paths:
 - .1 Where sound rated partition walls intersect non rated gypsum board partition walls, extend sound rated construction to completely close sound flanking paths through non rated construction.
 - .2 Seal joints between face layers at vertical interior angles of intersecting partitions.

3.5 Finishing

- .1 Provide levels of gypsum board finish for locations as follows, in accordance with GA 214-21.
 - .1 Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
 - .2 Level 2: Gypsum board substrate at applied hard surfaces, except remove tool marks and ridges.
 - .3 Level 3: Skimming of existing drywall at new commercial grade vinyl wallcovering.
 - .4 Level 4: Exposed gypsum board surfaces, except where another finish level is indicated.
 - .5 Level 5: Exposed gypsum board surfaces where indicated or scheduled.
- .2 Interior gypsum board:
 - .1 Prefill:
 - .1 Use setting-type joint compound. Mix joint compound according to manufacturer's written requirements.
 - .2 Fill joints between boards flush to top of eased or beveled edge.
 - .3 Fill joints of gypsum board above suspended ceilings in fire rated partitions.

Gypsum Board

- .4 Wipe off excess compound and allow compound to harden.
- .5 Prefill joint gaps not greater than 3.2 mm (1/8") with either ready-mix or setting type joint compound; prefill joint gaps greater than 3.2 mm (1/8") with setting-type joint compound.
- .2 Taping (Level 1):
 - .1 Butter taping compound into inside corners and joints.
 - .2 Centre tape over joints and press down into fresh compound.
 - .3 Remove excess compound.
 - .4 Tape joints of gypsum board above suspended ceilings.
- .3 First coat (Level 2):
 - .1 Use taping or all-purpose drying-type compound.
 - .2 Immediately after bedding tape, apply skim coat of compound and allow to dry completely in accordance with manufacturer's written requirements.
 - .3 Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.
 - .4 Cover fastener heads and accessories with 1 coat of joint compound.
- .4 Second coat (Level 3): After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 50 mm (2") beyond edge of first coat.
 - .1 Cover fastener heads and accessories with total of 2 separate coats of joint compound.
- .5 Third coat (Level 4):
 - .1 After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 50 mm (2") beyond edge of second coat.
 - .2 Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
 - .3 Finished joints will be accepted with a camber not greater than 1 mm (1/32") and shall be seamless, plumb, true and flush and with square, neat corners.
 - .4 Cover fastener heads and accessories with total of 3 separate coats of joint compound.
 - .5 Where new partitions align with existing gypsum board, apply required amount of skim coats to make transition inconspicuous from a distance of 914 mm (36").
 - .6 Completed installation at interface between new and existing construction shall provide an inconspicuous joint.
- .6 Skim coat (Level 5):
 - .1 After the fourth coat has dried, apply skim coat over exposed surfaces of gypsum board in accordance with manufacturer's written requirements.

Gypsum Board

- .2 After skim coat has dried, touch-up and sand to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
- .3 Joint compound:
 - .1 Apply finish coat of compound feathering 75 to 100 mm (3" to 4") beyond tape edges.
 - .2 Feather coats onto adjoining surfaces so that camber is maximum 0.79 mm (1/32").
- .4 Trim:
 - .1 Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
 - .2 Install metal corner beads at external corners.
 - .3 Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi exposed, and where gypsum base terminates against dissimilar material.
 - .4 Erect beads plumb or level, with minimum joints.
- .5 Control joints:
 - .1 Provide control joints set in board facing. Support control joints with studs or furring channels on both sides of joint.
 - .2 Provide control joints in required locations
 - .1 Review control joint locations with *Consultant* prior to installation.
 - .3 Install control joints where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the building structure.
 - .4 Install control joints where a wall or partition runs in an uninterrupted straight plane exceeding 9100 mm (30 linear feet).
 - .5 Install control joints in interior ceilings:
 - .1 With perimeter relief:
 - .1 Linear dimensions between control joints shall not exceed 15000 mm (50 ft) and total area between control joints shall not exceed 230 m² (2500 ft²).
 - .2 Without perimeter relief:
 - .1 Linear dimensions between control joints shall not exceed 9100 mm (30 ft) and total area between control joints shall not exceed 84 m² (900 ft²).
 - .6 Install control joints where ceiling framing members change direction.
 - .7 Where a control joint occurs in an acoustical or fire-rated system, provide blocking behind the control joint by using a backing material such as 16 mm (5/8") Type X gypsum panel products, mineral fibre, or other tested equivalent. Construct through-wall control joints at fire-rated assemblies in accordance with assembly listing requirements.
 - .8 Line up control joints with joints in other construction or with centre lines of mullions, columns, piers, or similar building elements, where accepted by *Consultant*.

Gypsum Board

- .9 Install control joints straight and true.
- .10 Ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners. If control joints are not used, additional reinforcement is required at corners to distribute concentrated stresses.
- .11 Locate board joints so that no joint will align with the edge of an opening unless control joints are to be installed at these locations.

3.6 Fire Separations

- .1 Install fire-rated assemblies in accordance with assembly listing requirements in order to obtain fire ratings indicated and as required by authorities having jurisdiction.
- .2 Vertical bulkheads in ceiling spaces over fire rated partitions, doors and the like shall have same fire rating as the partition over which they occur. Such bulkheads shall be of gypsum board construction unless otherwise indicated.
- .3 Use fire rated gypsum wallboard as specified.
- .4 Where lighting fixtures, diffusers, and the like are recessed into fire rated ceilings or bulkheads, provide enclosure to maintain required fire rating. Form removable panel to give access to fixture outlet box.
- .5 Where fire hose cabinets or other fixtures or equipment are recessed in fire rated walls or partitions, provide gypsum board enclosure or backing to maintain required fire rating, unless otherwise detailed.

3.7 Access Doors

- .1 Install access doors to mechanical and electrical fixtures specified in respective sections of Divisions 21, 22, and 23 and Divisions 26, 27, and 28.
- .2 Access doors shall be as supplied by Divisions 21, 22, and 23 and Divisions 26, 27, and 28. Locations to be reviewed and confirmed by *Consultant*.
- .3 Install access panels in locations to be determined by coordination with trades installing mechanical, electrical and other building services and consultation with *Consultant*.
- .4 Rigidly secure frames to furring or framing systems.

3.8 Adjusting and Cleaning

- .1 Remove debris and rubbish from wall and ceiling cavities before enclosing with board.
- .2 Clean up and remove surplus materials and rubbish resulting from the work of this section upon completion.
- .3 Clean off beads, casings, joint compound droppings and the like, leave the work of this section ready for painting trades.

END OF SECTION

Gypsum Sheathing Board

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Gypsum sheathing board at wall assemblies.
 - .2 Sheathing board accessories and miscellaneous related materials.
- .2 Section excludes:
 - .1 Gypsum sheathing board at roof assemblies: in accordance with Section 07 01 50.

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 Fire-rated assembly listings:
 - .1 Submit fire-rated assembly listings for each required fire resistance rated assembly for work of this section.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*: Shall have 10 years' experience, minimum, in successful installation of work of type and quality indicated and specified.

1.4 Product Handling

- .1 Product handling shall be in accordance with Section 01 60 00 as supplemented by the requirements of this section.
- .2 Handle gypsum panel products and accessories in accordance with GA 253-21 and GA 801-2023.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Single source responsibility:
 - .1 Provide gypsum board *Products* from one manufacturer for the work of this section.
- .2 Fire resistance rating:
 - .1 Construct fire resistance rated assemblies in accordance with listing and CAN/ULC S101-14.

2.2 Sheathing Board Panels

- .1 Gypsum sheathing board:
 - .1 In accordance with ASTM C1177/C1177M-13.

Gypsum Sheathing Board

- .2 Exterior grade.
- .3 Glass mat faced.
- .4 Fire rated in accordance with listed assemblies where indicated: Type X or Type C.
- .5 Acceptable *Products*:
 - .1 CertainTeed 'GlasRoc Sheathing'.
 - .2 CGC 'Securock UltraLight Glass-Mat Sheathing'.
 - .3 Georgia-Pacific 'DensGlass Sheathing'.

2.3 Fasteners

- .1 Screws: in accordance with exterior sheathing board manufacturer's installation requirements to comply with design wind loads.
 - .1 Provide thermoset polyester coated screws formulated to provide enhanced corrosion protection.

2.4 Accessories

- .1 Joint sealants; penetrations, cutouts, or other small openings: In accordance with Section 07 92 00.

2.5 Related Support Assemblies

- .1 Wind bearing metal studs at wind bearing exterior assemblies: in accordance with Section 05 41 13.

PART 3 - EXECUTION

3.1 Installation

- .1 Gypsum sheathing board: Install sheathing in accordance with manufacturer's written requirements and applicable instructions in GA 253-21, ASTM C1280-18, and ASTM C1397-13(2019). Do not bridge building expansion joints with support system. Frame both sides of joints with furring and other supports as indicated.
- .2 Use maximum board lengths to minimize number of joints. Stagger sheathing joints, offset by at least one framing member. Offset board joints 150 mm (6") minimum from corners of openings.
- .3 Install sheathing with exterior board side facing exterior. Butt boards together for a light contact at edges and ends with not more than 1.6 mm (1/16") open space between boards. Do not force into place.
- .4 Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
- .5 Locate fasteners minimum 10 mm (3/8") from edges and ends of sheathing boards.
- .6 Provide fasteners in accordance with manufacturer's written requirements to comply with design wind loads.
- .7 Provide clearances between work of this section and structural elements to prevent transference of structural loads, and in no case less than 16 mm (5/8").

Gypsum Sheathing Board

- .8 Sheathing shall not be continuous through building construction joints.
- .9 Replace damaged or weathered sheathing boards.

3.2 Fire Rated Assemblies

- .1 Install fire-rated assemblies in accordance with assembly listing requirements in order to obtain fire ratings indicated and as required by authorities having jurisdiction.
- .2 Use fire rated sheathing panels as specified.

END OF SECTION

Acoustical Tile Ceiling Systems

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Acoustical tile ceiling systems (ACT1).

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Cooperate with mechanical and electrical *Subcontractors*.
 - .2 Coordinate layout and installation of acoustic ceiling units and suspension systems components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, partition system, fire suppression system components and other work required to be incorporated in or coordinated with the ceiling system.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Submit manufacturer's standard details.
 - .2 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, location of access splines, and acoustical unit support at ceiling fixture.
 - .3 Submit reflected ceiling plans for special grid patterns as indicated.
- .4 Samples:
 - .1 Submit sample of each component of ceiling system. Samples shall fully represent materials to be supplied in colour, texture, finish and construction.
 - .2 Submit samples, load test data and design tables for each type of insert to be used in the *Work* for hanger supports.
- .5 Certificates:
 - .1 Submit certificate of compliance stating that the suspension system provided, including materials and installation, comply with the requirements of the *Contract Documents*.

Acoustical Tile Ceiling Systems

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance data:
 - .1 Submit maintenance and cleaning instructions for acoustical ceiling systems for incorporation into the maintenance manuals.
- .3 Maintenance materials:
 - .1 Deliver for maintenance use, 2% of each type and colour of suspension components and acoustical tiles used in the *Work*.
 - .2 Pack panels in suitable containers, clearly dated and identified as to type and location of installation in the *Work*, and store where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:
 - .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

1.6 Delivery, Storage, and Handling

- .1 Ship exposed members and mouldings in rigid crates to avoid damage. Bent or deformed material shall be rejected. Baked enamelled members shall be suitably wrapped and protected against damage.
- .2 Deliver acoustical ceiling units to the *Place of the Work* in original, unopened packages and store in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- .3 Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
- .4 Handle acoustical ceiling units carefully to avoid chipping edges or damaging units.

1.7 Field Conditions

- .1 Commence installation after building is enclosed with windows and exterior doors in place and glazed, and roof watertight.
- .2 Interior temperature of building to range from 15°C to 30°C and relative humidity of not more than 70% before and during installation. Maintain uniform temperatures for 72 hours prior to commencement of the work of this section and maintain temperature until completion of the work of this section.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

Acoustical Tile Ceiling Systems

PART 2- PRODUCTS

2.1 Performance/Design Requirements

- .1 Design suspension systems for a maximum mid-span deflection not exceeding $L/360$ in accordance with ASTM C635/C635M-22 deflection test.
- .2 Design suspension system to support safely, and without distortion, the superimposed loads of:
 - .1 Air supply diffusers and return grilles.
 - .2 Lighting fixtures.

2.2 General

- .1 Single source responsibility: Obtain each type of acoustical ceiling unit and suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the *Work*. Products installed as part of the work of this section shall be from same production run.

2.3 Acoustical Tiles

- .1 Lay-in acoustical tiles (ACT1):
 - .1 Suspension system: 24 mm (15/16") grid.
 - .2 Flame spread:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): 25.
 - .2 Smoke Developed Value (SDV): 50.
- .3 Acceptable *Products*:
 - .1 In accordance with Finish Schedule.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.4 Metal Suspension Systems

- .1 Hanger anchorage devices: Screws, clips, bolts, concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3 x calculated load supported except size direct pull-out concrete inserts for 5 x calculated loads.
- .2 Concrete hanger anchors; post installed: Steel eye bolts and nuts to suit ceiling hangers with capability to sustain, without failure, a load equal to 4 times that imposed by ceiling construction, as determined by testing per ASTM E488/E488M-22, conducted by a qualified independent testing laboratory.

Acoustical Tile Ceiling Systems

- .1 Dynabolt Sleeve Anchor 'TW-1614' or Readi-Tie-Drive 'TD4-112' tie wire anchor by ITW Ramset/Red Head.
- .2 Kwik-Bolt III 'HHDCA 1/4' tie wire anchor by Hilti Corporation.
- .3 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable product lines specified in preceding paragraphs.
- .3 Hangers and tie wire: Galvanized wire, recommended by manufacturer of suspension system, minimum 2.66 mm (0.1") (12 gauge).
- .4 Suspension system accessories:
 - .1 Splices, clips, and perimeter moulding, of manufacturer's standard type to suit the applicable conditions unless special conditions and access area are shown or specified.
 - .2 Angle wall mouldings; hemmed with prefinished exposed flanges:
 - .1 For 24 mm (15/16") grid applications; angle moulding with exposed bottom flange of 22 mm (7/8").
 - .1 Armstrong '7803'.
 - .2 CertainTeed 'WA15-15'.
 - .3 CGC 'M7'.
- .5 Standard suspension system, non fire-rated:
 - .1 Heavy duty in accordance with ASTM C635/C635M-22, 24 mm (15/16") interlocking tee system, designed to support acoustical panels in patterns indicated with deflection of main tees less than L/360, consisting of main tees and cross tees. The system shall provide lock joint intersections of cross and main tees.
 - .2 Acceptable *Products*:
 - .1 Armstrong 'Prelude XL 15/16" Exposed Tee Systems'.
 - .2 CertainTeed '15/16" Classic Stab System'.
 - .3 CGC 'DX'.
- .6 Acoustical sealant: Non-drying, non-hardening, non-skinning, non-staining, non-bleeding, gunnable sealant complying with requirements specified in Section 07 92 00.

2.5 Metal Finish

- .1 Metal exposed in finished work shall have a pre-coated baked enamel finish in non-yellowing colour. Submit paint formulation of grid system to lighting fixture, speaker grille, sprinkler and diffuser manufacturers to ensure consistency of colour, sheen and texture of exposed metal components in the ceiling assemblies.
 - .1 Colour: Flat white.

Acoustical Tile Ceiling Systems

PART 3- EXECUTION

3.1 Installation - General

- .1 Install ceiling panels and metal suspension system in accordance with manufacturer's directions. Where manufacturer's directions are at variance with *Contract Documents*, notify *Consultant* before proceeding with installation.
- .2 Do not commence installation until work above suspended ceiling has been completed, inspected and accepted.

3.2 Installation - Suspension System

- .1 Install suspension system rigid, secure, square, level and plumb, framed and erected to maintain dimensions and contours indicated, and in accordance with ASTM C636/C636M-19, Cisca installation standards and any other applicable national or local code requirements. Make allowance for thermal and structural movement.
- .2 Attach hangers to structure with inserts and hanger supports. Do not use powder activated fasteners.
- .3 Support hangers for suspended ceiling grid independent of walls, columns, pipes and ducts.
- .4 Space hangers for ceilings at maximum 1220 mm (48") on centre in both directions. Provide additional hangers as required to comply with manufacturer's written installation requirements.
- .5 Locate hangers at not more than 150 mm (6") from ends of main tee members.
- .6 Install exposed tee members to pattern indicated. Securely attach hangers to main tee members.
- .7 Exposed tees shall be as long as possible to minimize joints. Make joints square, tight, flush and reinforce with splines. Distribute joints to prevent clustering in one area.
- .8 Space tee bars to suit ceiling panels and as detailed, and to accommodate lighting fixtures, diffusers and return grilles.
- .9 Cooperate in the installation of ceiling systems, making adjustments where required to ensure that the lighting fixtures, supply diffusers, exhaust grilles and other built-in items properly fit into ceiling module and finish flush with rest of ceiling.
- .10 Restrict creep inside module panels so that strips are centred on module lines.
- .11 Install edge moulding as detailed where ceiling abuts vertical surfaces. Lap corners, use maximum lengths to minimize joints. Make joints square, tight and flush.
 - .1 Screw attach mouldings to substrates at intervals not more than 400 mm (16") on centre and not more than 210 mm (8") from ends, levelling with suspension system. Lap corners accurately and connect securely.

Acoustical Tile Ceiling Systems

3.3 Installation - Tiles

- .1 Take precautions during installation to ensure tile edges are not chipped or otherwise damaged.
- .2 Minimize field cutting. Rectify cut tile edges of tile to match factory cut edge profile and colour.
- .3 Install acoustical tiles to form horizontal and level ceiling with parts flush and joints butted tightly to hairline appearance.
- .4 Distribute variations in colour and texture of panels to obtain a uniform appearance.

3.4 Installation - Tolerances

- .1 Allowable tolerances: in accordance with ASTM C636/C636M-19.
- .2 Install suspension systems level to tolerance of 1:1200.
- .3 Install edge mouldings level to tolerance of 3 mm in 3660 mm (1/8" in 12'-0").

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.6 Adjusting and Cleaning

- .1 Replace uneven, defective or damaged materials and finishes, eliminate waves, remove soiled or stained areas.
- .2 Clean dirty and discoloured surfaces of acoustical units and suspension system according to manufacturer's recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Resilient base.
 - .2 Metal top and edge trim for Sheet Wall Protection (WPX).

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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.
 - .2 Selection samples:
 - .1 Submit manufacturer's range of pattern and colours available for *Consultant's* selection.
 - .3 Samples for verification: Submit 3 samples of the following:
 - .1 305 mm (12") long samples of each colour and type of base material. Include sample of outside corner of base.
 - .2 100 mm (4") long samples of each colour and type of floor transition trims.
- .3 Manufacturer's instructions:
 - .1 Submit manufacturer's installation instructions for *Products* proposed for use in the work of this section.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Provide minimum 2% of each colour, pattern and type of resilient base required for this project.
 - .2 Maintenance materials to be same production run as installed materials.
 - .3 Suitably package for protection and storage, each identified with name of manufacturer and material.
 - .4 Tag and store where directed by *Owner*.

Resilient Base and Accessories

1.5 Quality Assurance

.1 Qualifications:

.1 Installers:

- .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

.2 Mock-up:

- .1 Resilient base mock-up shall include at least one inside corner, one outside corner plus 20 m (65'-0") of straight run.
- .2 Locate at the *Place of the Work* as part of final installation.
- .3 Location of installation shall be determined by *Consultant*.

1.6 Field Conditions

.1 Ambient conditions:

- .1 Install materials of this section only when surfaces and air temperatures have been maintained between 21°C and 29.4°C for 7 days preceding installation, and will be so maintained during installation and for 48 hours thereafter. Maintain a minimum temperature of 13°C after above period.
- .2 Verify that adequate ventilation is provided during installation and curing of materials of this section.
- .3 Applications exposed to intense or direct sunlight, protect *Products* during the conditioning, installation, and adhesive curing periods, by covering the light source.
- .4 Allow coiled material to lay flat for at least 24 hours at 18°C prior to installation, and maintain this temperature during installation.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 General

- .1 Single source responsibility: Obtain each type of resilient *Product* from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the *Work*. Products installed as part of the work of this section shall be from same production run.

2.2 Resilient Base

.1 Rubber base types (RB1):

- .1 Manufactured from thermoplastic rubber formulation meeting ASTM F1861-21, Type TP, Group 1 (Solid).
- .2 Rubber base; wall base:
 - .1 Acceptable *Products*:
 - .1 In accordance with Finish Schedule.

Resilient Base and Accessories

- .1 3.2 mm (1/8") thick, complete with site formed inside and outside corners.
- .2 Height: 150 mm.
- .3 Colour: In accordance with Finish Schedule.
- .2 Substitutions: in accordance with Section 01 25 00.

2.3 Accessories

- .1 Block wall filler: Filler type as recommended by resilient base manufacturer to suit substrate and compatible with materials.
- .2 Primers and adhesives: Types as recommended by resilient product manufacturer compatible with materials and to suit substrate types.
- .3 Sealant:
 - .1 Medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-18, Type S, Grade NS.
 - .2 Colour: Clear.
 - .3 Acceptable Manufacturers:
 - .1 Dowsil.
 - .2 Momentive.
 - .3 Tremco.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that field conditions have been provided as requested and specified.
- .2 Substrates shall be firm, structurally sound, sufficiently porous, and dry.
- .3 Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.
- .4 Examine substrates in advance of application of products to ensure that substrates are protected against entry of water and moisture.
- .5 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- .6 Failure to call attention to defects or imperfections will be construed as acceptance and approval of the substrate. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- .7 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

3.2 Preparation

- .1 Substrates shall be free of deleterious material that may inhibit bond strength or act as a bond breaker. Remove such contaminants and deleterious material using mechanical methods recommended by manufacturer. Do not use chemical abatement methods.

Resilient Base and Accessories

- .2 Fill gaps, voids, and cracks, and remove ridges, or other defects which will ghost or telegraph through finished product installation.
- .3 Expansion joints, isolation joints, and other movement joints in substrates shall not be filled with patching or levelling compound.
- .4 Sweep and vacuum clean substrates minimum 24 hours prior to alkalinity, moisture, and adhesion testing. Do not use sweeping compounds.
- .5 Notify *Consultant* of any substrate or levelling compound defects or installation conditions that may result in unsatisfactory performance.
- .6 Do not install products until they are same temperature as space where they are to be installed.
- .7 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. Do not use sweeping compounds.
- .8 Where flooring adjoins thicker floor materials, apply levelling screed, feather out to make up difference in level between materials.
- .9 Spray paints, permanent markers and other indelible ink markers shall not be used to write on the back of the resilient material or used to mark the substrate as they could bleed through and permanently stain the resilient material. If such contaminants are present on the substrate they shall be mechanically removed prior to the installation of the resilient material.

3.3 Installation of Resilient Base

- .1 Spread adhesive to ribbed surface (back) of wall base with a 3 mm (1/8") square-notched trowel; allow slight set-up, then bring base into contact with substrate. Ensure full adhesion of base to substrate. Adhesive should cover 80% of back surface. Leave a 6 mm (1/4") uncovered space at the top of the wall base to prevent the adhesive from oozing onto the wall above the base when installed.
- .2 Position wall base on wall surface and roll with hand roller. Always roll back to starting point to prevent stretching the wall base.
- .3 Set base to ensure installation over finished flooring material is free of gaps.
- .4 Install base in longest lengths possible, minimum 2440 mm (8'). Adhere toe of base to substrate, and ensure edge of toe is straight.
- .5 Scribe and fit to door frames and other obstructions.
- .6 Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners.
- .7 Provide joints in base over substrate control joints.
- .8 Field-made inside corners:
 - .1 Install wall base to terminate into the corner with a mitre cut.
 - .2 Position another piece of wall base on opposing wall, without adhesive, approximately 25 mm (1") from the installed piece.

Resilient Base and Accessories

- .3 Utilizing the dividers, place the hooked end at the top of the installed piece and the pointer end on the top of the uninstalled piece. Carefully, move the dividers downward in a straight vertical motion, allowing the hooked end of the dividers to follow the profile of the installed piece. At the same time, place adequate pressure on the pointer end to transfer and/or scribe the profile onto the surface of the uninstalled piece.
- .4 Use a utility knife to cut the pattern on the uninstalled wall base, apply adhesive, and position the trimmed section into place.
- .9 Field-made outside corners:
 - .1 Install wall base to terminate into the corner with a mitre cut.
 - .2 Stop application of adhesive to wall base approximately 450 mm (18") from the outside corner of the wall.
 - .3 Position the wall base at the corner and pencil line the back of the wall base where the bend is desired.
 - .4 Lay the wall base on the floor with the back up. Utilizing a top-set or pull-type gouge tool, make a shallow notch along the pencil line.
 - .5 Notch depth should not exceed one-quarter the total thickness of the wall base.
 - .6 Reposition the wall base corner on the wall. The corner of the wall should fit snugly into the notched recess on the back of the wall base.
 - .7 Apply adhesive and roll firmly into place.

3.4 Installation Tolerances

- .1 Resilient base: Install straight and level to variation of 3 mm (1/8") over 3 m (10'-0").

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.6 Adjusting and Cleaning

- .1 Remove adhesive from surfaces as work progresses in manner described by manufacturer.
- .2 Thoroughly clean surfaces in accordance with manufacturer's written requirements.

END OF SECTION

Rubber Sheet Flooring

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Rubber sheet flooring (RBF1) (RBF2).

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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 Show sheet flooring roll and width layout as related to *Consultant's* floor pattern including borders and accents including where flooring materials meet other floor materials.
 - .2 Show locations of seams, floor drains, floor plates, and where flooring meets other flooring.
- .4 Samples:
 - .1 Samples for verification:
 - .1 Flooring: In manufacturer's standard size, but not less than 150 mm (6") x 230 mm (6" x 9") sections of each different colour and pattern of floor covering required.
 - .2 Heat-welding bead: Manufacturer's standard-size samples, but not less than 230 mm (9") long, of each colour required.
 - .3 Transition trim: Manufacturer's standard size samples, but not less than 100 mm (4") long, of each colour required.
 - .4 Seam samples: For each floor covering product, colour, pattern, and seam required, installer shall provide a 150 mm x 230 mm (6" x 9") sample directly applied to a rigid backing material with the seam running lengthwise and in the center of the sample.
- .5 Test and evaluation reports:
 - .1 Submit moisture, alkalinity, and adhesive bond test results.
- .6 Manufacturer's instructions:
 - .1 Submit manufacturer's installation instructions for *Products* proposed for use in the work of this section.

Rubber Sheet Flooring

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Submit width of material x length to provide 2% of each colour in full running length, pattern and type flooring material required for this project for maintenance use.
 - .2 Maintenance materials to be same production run as installed materials.
 - .3 Suitably package for protection and storage, each identified with name of manufacturer and flooring material.
 - .4 Tag and store where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
 - .1 Prior to commencing flooring installation for this section, prepare full room mock-up (room size at least 10 m² (100 ft²) in area) for acceptance by the *Consultant*.
 - .2 Mock-up shall include flooring showing edge treatment and relationships to adjoining surfaces.
 - .3 Location of installation shall be determined by *Consultant*.
 - .4 Do not proceed with flooring specified in this section until mock-up has been accepted by *Contractor* and *Consultant*.

1.6 Field Conditions

- .1 Ambient conditions:
 - .1 Install materials of this section only when surfaces and air temperatures have been maintained between 18.4°C and 29.4°C for 48 hours preceding installation, and will be so maintained during installation and for 48 hours thereafter. Maintain a minimum temperature of 13°C after above period. Relative humidity shall be 50 +/- 10%.
 - .2 Ensure that adequate ventilation is provided during installation and curing of materials of this section.
 - .3 In areas that are exposed to intense or direct sunlight, *Products* shall be protected during the conditioning, installation, and adhesive curing periods, by covering the light source.

Rubber Sheet Flooring

- .4 Allow products to acclimatize in installation area for a minimum 24 hour prior to installation.

1.7 Delivery, Storage, and Handling

- .1 Package flooring materials and identify contents of each package.
- .2 Store materials for a minimum of 24 hours immediately before installation to comply with temperatures specified under Field Conditions.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 2 years.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Slip resistance: Floors shall have a wet Dynamic Coefficient of Friction (DCOF) of 0.42 or greater in accordance with ANSI A326.3.
- .2 Rubber sheet flooring shall not:
 - .1 Become stained or discoloured due to slab markings.
 - .2 Delaminate from substrates.
 - .3 Have welded seams which separate.

2.2 General

- .1 Single source responsibility: Obtain each *Product* from a single source with resources to provide products of consistent quality in appearance and physical properties, same production run. Products installed as part of the work of this section shall be from same production run.

2.3 Rubber Sheet Flooring (RBF1) (RBF2)

- .1 In accordance with ASTM F1303-04(2021), Type I, colours and pattern shall be dispersed throughout the thickness of the wear layer.
- .2 Thickness:
 - .1 3.0 mm (0.125").
- .3 Colour:
 - .1 RBF1: In accordance with the Finish Schedule.
 - .2 RBF2: In accordance with the Finish Schedule.
- .4 Acceptable *Products*:
 - .1 (RBF1) (RBF2): In accordance with the Finish Schedule.

Rubber Sheet Flooring

2.4 Miscellaneous Materials

- .1 Seam construction:
 - .1 Hot welded joints: provide welding rod matched to floor pattern/colour selected.
 - .2 Colours: To later selected by *Consultant* from full colour range.
- .2 Primers and adhesives:
 - .1 Types as recommended by resilient flooring manufacturer compatible with materials and to suit substrate types and to comply with warranty requirements.
- .3 Patching and levelling compound:
 - .1 Trowel applied Portland cement based, moisture, mildew, and alkali-resistant.
 - .2 Minimum compressive strength after 28 days shall be minimum 3,500 psi when tested in accordance with ASTM C109 or ASTM C472.
 - .3 Gypsum based compounds are not acceptable.
 - .4 Acceptable manufacturers:
 - .1 Ardex.
 - .2 Mapei.
 - .3 Substitutions: in accordance with Section 01 25 00.
 - .5 Acceptable *Product*: type as recommended by flooring manufacturer for existing substrate conditions.
- .4 Cleaning solution:
 - .1 Acceptable *Products*: type as recommended by flooring manufacturer.
- .5 Site fabricated flash cove base accessories:
 - .1 Resilient cove cap: Tarkett SCC-XX-A or approved alternate, 19 mm (3/4") x 3 mm (1/8") J-profile, colour to later selection by *Consultant*.
 - .1 Locations as indicated or scheduled.
 - .2 Plastic filler; for sealing joints between top of wall base or integral cove cap and irregular wall surfaces: Low VOC, plastic filler applied according to flooring manufacturer's recommendations.
 - .3 Fillet support strip; for integral cove base: minimum radius of 25 mm (1") of plastic.
 - .4 Resilient transition trims: in accordance with Section 09 65 13.
- .6 Sealant: Mildew resistant sealant in accordance with Section 07 92 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that field conditions have been provided as requested and specified.
- .2 Verify that substrates have been provided as specified without holes, protrusions, cracks greater than 1.6 mm (0.06") wide, unfilled control joints, depressions greater than 3 mm (1/8") deep, or other major defects.

Rubber Sheet Flooring

- .3 Substrates shall be firm, structurally sound, sufficiently porous, and dry.
- .4 Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.
- .5 Examine floors in advance of application of flooring to ensure that floors are protected against entry of water and moisture. Perform compatibility test with primer/adhesive and substrate.
- .6 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- .7 Failure to call attention to defects or imperfections will be construed as acceptance and approval of the substrate. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- .8 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

3.2 Preparation

- .1 Comply with recommendations of ASTM F710-22.
- .2 Substrates shall be free of wax, oil, silicone, soap, grease, dust, solvents, sealers, curing compounds, hardeners, alkaline salts, excessive carbonation or laitance, mould, mildew, paints, varnish, asphalt, residual adhesives, adhesive removers, or other contaminants or deleterious material that may inhibit bond strength or act as a bond breaker. Remove such contaminants and deleterious material using mechanical methods recommended by manufacturer. Do not use chemical abatement methods.
- .3 Concrete substrates that are loose, sandy, scaly, or have a white powdery surface are not acceptable. Substrates shall be mechanically prepared.
- .4 Flooring substrates shall be smooth and level within a tolerance of 3 mm (1/8") in a 3 m (10'-0") radius.
- .5 Fill surface cracks, holes, score marks, depressions, and grooves, and repair surface spalls with Portland cement patching or levelling compound.
- .6 At door opening locations where finished flooring is adjacent to weather-stripping or automatic door bottoms provide trowel-applied levelling compound to provide full contact between finished flooring and weather-stripping or automatic door bottoms. Taper trowel-applied levelling compound to transition with adjacent flooring substrate to provide smooth and seamless transition at maximum slope of 3:1000 (height to distance) ratio.
- .7 Expansion joints, isolation joints, and other movement joints in substrates shall not be filled with patching or levelling compound.
- .8 Remove bumps, high spots, peaks and ridges to produce a uniform and smooth substrate.
- .9 Prepare substrates so that installation of flooring shall not show telegraphing of substrate.
- .10 Remove chalking and dusting and loose material from concrete surfaces with wire brushed or by scraping.
- .11 Sweep and vacuum clean substrates minimum 24 hours prior to alkalinity, moisture, and adhesion testing. Do not use sweeping compounds.

Rubber Sheet Flooring

- .12 Notify *Consultant* of any substrate or levelling compound defects or installation conditions that may result in unsatisfactory performance.
- .13 Prepared concrete substrate shall have a finish equivalent to a magnesium trowel finish. Shiny, slick, non-porous, or overly porous substrates are not acceptable and shall require additional preparation prior to installation of flooring products. Prepared concrete substrates shall have a Concrete Surface Profile #3 to #5 in accordance with International Concrete Repair Institute (ICRI).
 - .1 Substrate to be approved in writing by flooring manufacturer prior to application of flooring.
 - .2 Submit written report to *Consultant* following procedures for manufacturer's field review in accordance with Section 01 45 00.
- .14 Alkalinity, moisture, and adhesion testing:
 - .1 Test substrates in accordance with paragraph 3.5 Field Quality Control after mechanically preparing subfloor or applying patching and levelling compounds.
 - .2 Proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.
- .15 Do not install floor coverings until they are same temperature as space where they are to be installed.
 - .1 Move floor coverings and installation materials to acclimatize in spaces where they will be installed at least 48 hours in advance of installation.
- .16 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. Do not use sweeping compounds.
- .17 Where flooring adjoins thicker floor materials, apply levelling screed, feather out to make up difference in level between materials to achieve flush floor finish between adjacent flooring materials unless otherwise indicated.
- .18 Spray paints, permanent markers and other indelible ink markers shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and permanently stain the flooring material. If such contaminants are present on the substrate they shall be mechanically removed prior to the installation of the flooring material.

3.3 Flooring Installation

- .1 Apply adhesive uniformly and install flooring in accordance with flooring manufacturer's requirements. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .2 Allow material to relax unrolled overnight, minimum 12 hours in installation areas.
- .3 Install rolls and cuts in sequence following manufacturer's installation requirements/diagrams.
 - .1 Lay flooring with joints parallel to building lines to produce symmetrical pattern and minimum joints.
 - .2 Place seams in inconspicuous and low-traffic areas, at least 150 mm (6") away from parallel joints in levelling underlayment, concrete joints, saw cuts and other type of joints.

Rubber Sheet Flooring

- .3 Avoid cross seams.
- .4 Lay sheet flooring centered in corridors, with equal sized sheet to either side of center sheet.
- .5 Mitre intersections at corridors typically. "T" type corridors shall be butt type installation.
- .6 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
- .7 Layout seaming uniformly, using full length flooring typically, minimum flooring size of not less than roll width. Limit quantity of less than full length floor pieces at corridors to maximum of 1.
- .8 Layout flooring to match reviewed shop drawings floor pattern including borders and accents.
- .9 Match edges of floor coverings for colour shading at seams.
- .4 Cutting and fitting sheets:
 - .1 Cut pieces to length allowing approximately 75 mm (3") to 150 mm (6") excess for trimming.
 - .2 Cut sheet and fit neatly around fixed objects without gaps.
 - .3 Install one sheet at a time in wet adhesive.
 - .4 Roll the flooring immediately in both directions using 45 kg (100 lb) three-section roller.
- .5 As installation progresses, roll flooring with 75 kg (165 lb) roller to ensure full adhesion, remove adhesive ridges, and entrapped air.
- .6 Where cove base is not required, seal joint at wall with manufacturer's approved sealant.
- .7 Apply adhesive uniformly and at spreading rates in accordance with adhesive manufacturer's requirements. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .8 Obtain 100% adhesive coverage to flooring backing.
- .9 Install flooring to entire area indicated or scheduled, including coverplates occurring within finished floor areas. Maintain overall continuity of colour and pattern with pieces of flooring installed on cover plates. Tightly butt edges to perimeter of floor around cover plates and to cover plates. Cut flooring to floor drains occurring within finished floor
- .10 Heat-welded seams:
 - .1 Weld seams in accordance with ASTM F1516-13(2018).
 - .2 Wait minimum of 24 hours after flooring installation before grooving and heat welding seams.
 - .3 Prepare, weld, and trim seams to produce flat surfaces flush with adjoining floor covering surfaces.
 - .4 Rout joints to approximately 2/3 of the thickness of the material and use welding bead to permanently fuse sections into a seamless floor covering. Groove shall be between 3 mm (0.118") and 3.5 mm (0.138") wide.

Rubber Sheet Flooring

- .5 Using a weld plate and skiving knife to make first cut and allow weld rod to fully cure to room temperature.
- .6 Using a skiving knife only, finish the trimming of the remainder of the weld. The finish should be smooth and on the same level as the flooring.
- .7 Trimming of welded joint while warm is not permitted unless final trimming is performed after weld has cooled to flooring temperature. Excess weld shall be removed using a heated standard putty knife.
- .8 Roll the seam area with 45 kg (100 lb) three-section roller.
- .9 Maximum variation of welds from plane or from straight: 6 mm (1/4") in 3 m (10 ft) length using a 3 m (10 ft) straight edge.
- .11 Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogenous free of substrate lines, pockets, bumps and unevenness.

3.4 Site Fabricated Flash Cove Wall Base Installation

- .1 For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide continuous cove strip filler applied according to the manufacturer's recommendations.
- .2 Provide a fillet support strip for integral cove base.
- .3 Provide top caps for integral flash cove applied according to the manufacturer's recommendations.
 - .1 Install straight and level to variation of 1:1000.
 - .2 Scribe and fit to door frames and other obstructions.
 - .3 Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners.
 - .4 Provide joints in base over substrate control joints.
 - .5 Taper/trim cove former to reduce radius to less than 12.7 mm (1/2") at door frame or similar abatement conditions.
- .4 Seal trim to wall substrate with sealant bead, colour to *Consultant's* selection.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and as follows:
 - .1 Field tests and inspections:
 - .1 Test for moisture vapour transmission in accordance with ASTM F710-22 and ASTM F1869-23 or ASTM F2170-19a in accordance with manufacturer's written flooring installation requirements. Results must not exceed 170 µg/m² (3 lb per 1,000 ft²) in 24 hours when tested to ASTM F1869-23, or exceed 75% when tested to ASTM F2170-19a.
 - .2 Test for surface pH. Levels of pH shall not exceed the written recommendations of the flooring manufacturer and adhesive manufacturer. Test in accordance with ASTM F710-22.

Rubber Sheet Flooring

- .3 For each test type: Conduct 3 tests for flooring applications up to 93 m² (1000 ft²) in area, and 1 additional test for each additional 93 m² (1000 ft²) of flooring area.
- .2 Adhesion bond test:
 - .1 Proceed with bond test after substrates have been prepared and alkalinity and moisture test have been completed.
 - .2 Select six substrate test areas, each 915 mm (3'-0") x 915 mm (3'-0") in size. Test areas shall be spaced a minimum 1220 mm (48") apart.
 - .3 Cut 915 mm (3'-0") x 915 mm (3'-0") panels from specified material.
 - .4 Using the specified adhesive, glue down each panel using adhesive manufacturer's recommended trowel.
 - .5 After 72 hours, attempt to remove the panels of flooring by pulling up from the corners.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.6 Adjusting and Cleaning

- .1 Remove excess adhesive from surfaces of the sheet flooring and base as work progresses.
- .2 Thoroughly clean surfaces in accordance with manufacturer's recommendations.

3.7 Protection

- .1 Prohibit foot traffic on installed flooring for a period of 24 hours after installation. No heavy traffic, rolling loads, or furniture placement are permitted for a minimum of 72 hours after installation.
- .2 Protect new floors from time of final set of adhesive until final inspection.
- .3 Install floor protection in areas where work, repairs and installation of equipment, and foot traffic will occur.

3.8 Maintenance

- .1 Perform initial maintenance according to the manufacturer's written requirements.
- .2 Allow flooring to dry prior to applying protection.

END OF SECTION

Wall Coverings

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Vinyl wall coverings (WG1).

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Samples:
 - .1 Submit 305 mm (12") square samples of each colour and texture of wall covering.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products* specified and with approval and training of *Product* manufacturer.

1.6 Field Conditions

- .1 Do not install wall coverings until wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at the levels indicated when the site is occupied for its intended use.
- .2 Unwrap wall covering and allow acclimatizing in installation area for 24 hours before application.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Fire resistance rating: Provide products that are identical with those of specified test method by qualified testing agency.
- .2 Flame spread: Maximum values in accordance with CAN/ULC-S102-10.
 - .1 Flame Spread Value (FSV): 25.
 - .2 Smoke Developed Value (SDV): 50.

Wall Coverings

2.2 Wall Coverings

- .1 Wall covering (WG1):
 - .1 Self-adhesive vinyl film with digitally printed graphics.
 - .2 Ink: VOC-free latex ink.
 - .3 Artwork: Print assets to be provided by Owner.
 - .4 Acceptable *Product*: Refer to Finish Schedule.
 - .1 Substitutions in accordance with Section 01 25 00.

2.3 Accessories

- .1 Primer: Type as recommended by wall covering manufacturer to suit substrate type and compatible with wall covering adhesive.

PART 3- EXECUTION

3.1 Examination

- .1 Examine substrates and conditions for compliance requirements affecting performance of *Work*. Proceed with installation only after unsatisfactory conditions have been corrected.
- .2 Examine substrates and installation conditions to ensure surface conditions meet or exceed a Level 4 finish, GA 214-21, Recommended Levels of Gypsum Board Finish.

3.2 Preparation

- .1 Substrates surfaces shall be solid and dry.
- .2 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion.
- .3 Where gypsum board substrates do not have a Level 4 finish, prepare gypsum board surfaces to meet or exceed a Level 4 finish, GA 214-21, Recommended Levels of Gypsum Board Finish.
- .4 Work penetrating substrate shall be completed before installing wall covering.
- .5 Prime substrate surfaces to receive wall covering.
- .6 Prepare surfaces for film application in accordance with film manufacturer's written requirements.

3.3 Installation

- .1 Wall covering film application:
 - .1 Apply film to indicated surface in accordance with film manufacturer's written requirements, applied plumb, true and level over substrate, without air bubbles, wrinkles, blisters, and other defects.
 - .2 After installation, applied film shall be flat, free of creases, free of tears, with no dimples when viewed under normal conditions.
 - .3 Film edges shall be cut neatly and square.

Wall Coverings

3.4 Adjusting and Cleaning

- .1 Clean film surfaces so they are free of foreign matter using cleaners recommended by film manufacturer.

3.5 Protection

- .1 Comply with manufacturer's written requirements respecting protection.

3.6 Adjusting and Cleaning

- .1 Leave completed work smooth; clean, without wrinkles, gaps, overlaps or air pockets.

END OF SECTION

Hygienic Wall Panel System

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Hygienic wall panel system (WPX).

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordination of work: coordinate layout, penetrations and installation of work of this section with work of other sections.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data:
 - .1 Submit *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit shop drawings to show layout, treatment at walls, and other objects. Indicated details of proposed treatment where materials meet other materials.
- .4 Samples:
 - .1 Submit sample panels in triplicate on 305 mm x 305 mm (12"x 12") showing each finish and colour.
 - .2 Submit samples of each accessory type product specified.
 - .3 Identify each sample as to project, finish, colour name, number.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

Hygienic Wall Panel System

1.6 Field Conditions

- .1 Install hygienic wall system only when surfaces and air temperatures have been maintained between 18°C and 26°C for twenty four (24) hours preceding installation, and will be so maintained during installation and for forty eight (48) hours thereafter.
- .2 Commence installation after building has been enclosed and dust generating activities have been completed.
- .3 Ensure that adequate ventilation is provided during installation and curing of adhesive.

1.7 Delivery, Storage and Handling

- .1 Package materials and identify contents of each package.
- .2 Store materials for a minimum of 8 hours before installation on a solid flat surface and preconditioned for approximating the operating environment of the finished room.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 Performance/Design Requirements

- .1 Flame spread:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): 15.
 - .2 Smoke Developed Value (SDV): 200.

2.2 Hygienic Panel Wall System

- .1 Description:
 - .1 Hygienic, impact resistant, water-resistant, low VOC, antimicrobial, PVC wall system.
 - .2 Surface: smooth.
 - .3 Antimicrobial: HACCP certified.
 - .4 Impact resistance: in accordance with ASTM D5420-21, exceeds 160 inch lbs.
 - .5 Fungi resistance: zero, in accordance with ASTM G21-15(2021)e1.
 - .6 Mold resistance: 10, in accordance with ASTM D3273-21.
 - .7 UV exposure: in accordance with ASTM G154-23.
 - .8 Inside and outside corners: Formed.
 - .9 Colour and pattern:
 - .1 WP1: In accordance with the Finish Schedule.
 - .2 WP2: In accordance with the Finish Schedule.
 - .3 WP3: In accordance with the Finish Schedule.
 - .4 WP4: In accordance with the Finish Schedule.

Hygienic Wall Panel System

- .5 WP5: In accordance with the Finish Schedule.
- .6 WP6: In accordance with the Finish Schedule.
- .10 *Acceptable Products:*
 - .1 WP1: In accordance with the Finish Schedule.
 - .2 WP2: In accordance with the Finish Schedule.
 - .3 WP3: In accordance with the Finish Schedule.
 - .4 WP4: In accordance with the Finish Schedule.
 - .5 WP5: In accordance with the Finish Schedule.
 - .6 WP6: In accordance with the Finish Schedule.
- .2 Panel fixing method:
 - .1 As recommended by panel manufacturer.
- .3 Double sided tape: #A915 Double Sided Tape.
- .4 Welding rod: as recommended by panel manufacturer.
- .5 Sealant: as recommended by panel manufacturer.
- .6 Panel cleaning materials: as recommended by panel manufacturer.
- .7 Top and side trim at exposed edges:
 - .1 Acceptable Product: Schluter 'Schiene E30, Stainless Steel'.
 - .2 Substitutions in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Examine surfaces to receive wall panel system. Report unsatisfactory conditions immediately to *Consultant*. The work of this section shall not proceed until unsatisfactory conditions have been corrected.
- .2 Substrate surface shall be straight to tolerance of ± 3 mm (± 0.12 ") over 3000 mm (118").
- .3 Ensure that environmental conditions have been provided as requested and specified.
- .4 Defective *Work* resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the *Work* of this section.

3.2 Installation - General

- .1 Install in accordance with wall panel manufacturer's written recommendations.

3.3 Installation - Adhesive Method Application

- .1 Cut and fit sheet as required. Clean back of panel using safe solvent cleaner. Avoid the use of ketones, acetones or any solvents that may cause damage to panel.
- .2 Apply double sided adhesive tape to top and bottom of sheet.
- .3 Apply adhesive tape to window and door openings where sheet has a tendency to pull away from substrate prior to adhesive cure.

Hygienic Wall Panel System

- .4 Prime wall on area directly corresponding to tape position using a non-flammable contact adhesive.
- .5 Apply adhesive to back of sheet using trowel as recommended by panel manufacturer.
- .6 Apply sheet to wall and line up any reference marks before pressing into place.
- .7 Use a white rubber mallet for initial contact with adhesive tape.
- .8 Ensure adequate adhesive transfer by thoroughly rolling entire panel surface using a wall roller.
- .9 Allow 3 mm (1/8") gap at ceiling, door and window frames, pipes, and projections to accommodate panel expansion. Seal gaps with sealant.
- .10 Seal transition strip to flash-coved sheet vinyl with silicone sealant. Allow required gap between top of flash-coved flooring and panels to accommodate expansion.
- .11 Maintain at least 80% coverage of direct transfer of adhesive between panels and wall substrate.
- .12 Install metal top and edge trim in accordance with manufacturer's recommendations, in locations as indicated or scheduled.

3.4 Sheet to Sheet Jointing

- .1 Heat welding:
 - .1 Apply double-sided adhesive tape flush to panel edges.
 - .2 Remove burrs from panel edges.
 - .3 Place each successive panel allowing for a 1.5 mm (1/16") gap between each panel.
 - .4 Clean both the seam area and the weld rod with safe solvent cleaner - one that will not attach the vinyl or leave a film.
 - .5 Test weld on a scrap piece of panelling before proceeding.
 - .6 Proceed only when temperature and speed have been satisfied.
 - .7 The weld may be trimmed flush when semi-cooled using the round part of the trimming spatula.

3.5 Jointing Sheet to Coved Vinyl Flooring

- .1 Overlapping:
 - .1 Extend the panel down a minimum of 25 mm (1") past the top of the flooring material.
 - .2 Use extra adhesive to fill the gap.
 - .3 Apply a bead of recommended sealant along the bottom edge of the panel.

3.6 Field Quality Control

- .1 Manufacturer's field review to be in accordance with Section 01 45 00.

3.7 Adjusting and Cleaning

- .1 Remove the protective film from the panels, clean panels with an anti-static solution.

Hygienic Wall Panel System

- .2 Wash with water or a diluted neutral soap/detergent solution. Do not use materials containing abrasives or solvents.

3.8 Protection

- .1 After materials have set, and until completion, co-ordinate *Work* to ensure that panels are not damaged by traffic or adjacent work.
- .2 At completion of panel installation, install protection in areas where finishing *Work*, repairs and installation of equipment will occur.

END OF SECTION

Painting

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Painting of interior paintable surfaces.
 - .2 Repainting of interior surfaces.
 - .3 Painting of exterior paintable surfaces.
- .2 Paintable and non-paintable surfaces:
 - .1 Paint and finish paintable surfaces included in the *Work*, except where excluded by the *Contract Documents*.
 - .2 The following surfaces are considered non-paintable, except as otherwise indicated or scheduled:
 - .1 Material and equipment furnished prime and finish painted.
 - .2 Internal surfaces of steel tanks and stacks.
 - .3 Sprayed fire-resistive materials.
 - .4 Stainless steel, weathering steel, copper, bronze, chromium plate, nickel, anodized or lacquered or mill finished aluminum, Monel metal.
 - .5 Insulation, glass, plastic, brick, stone.
 - .6 Metallic and mastic insulation finishes.
 - .7 Abrasive material finishes on floors, stair treads, stair nosing and landings.
 - .8 Insulated electric cables.
 - .9 Machined parts of machinery and equipment.
 - .10 Concealed surfaces.
 - .11 Manufactured finish materials.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets and list of *Products* proposed for use in the work of this section as identified in 'Approved Product List' section of the MPI (Master Painters Institute) Architectural Painting Specification Manual and the MPI Maintenance Repainting Specification Manual (MPI Repainting Manual), as applicable. Correlate *Products* to Schedule furnished by *Consultant*.
- .3 Samples:
 - .1 Samples for initial paint colour and finish selection:

Painting

- .1 Submit manufacturer's colour charts showing full range of colours available, including light and deep dark tones, for each type of finish material indicated for colour selection by *Consultant*.
- .2 *Consultant* shall have complete freedom in choice of colours in compiling colour schedule and will not necessarily select colours from standard colour charts of manufacturer of *Products* specified.
- .3 Submit 3 drawdowns of each selected colour for review by *Consultant* and resubmit to *Consultant* as required to obtain approval. Drawdown to be of specified colour, sheen, and paint formula for applicable surface.
- .2 Samples for verification:
 - .1 Submit 3 samples on 200 mm x 305 mm (8"x 12") material of same type as that on which coating is to be applied, for *Consultant's* approval, at least 30 days before materials are required.
 - .2 Identify each sample as to *Project*, finish, formula, colour name, number, gloss name and number, date and name of *Contractor* and painting *Subcontractor*.
 - .3 Resubmit as required until colours and gloss value are approved.
- .4 MPI (Master Painters Institute) Manual:
 - .1 Provide and maintain 1 copy of MPI Manual, latest edition, at site office for reference.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Provide 2 sealed containers, each of 4 litres (1 gallon) capacity of each paint product in each colour used in the *Work* for *Owner's* maintenance use. Containers shall be new, clearly labelled with manufacturer's name, type of paint, colour and colour number. Store at *Place of the Work* where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications
 - .1 Manufacturers:
 - .1 Paint manufacturers and *Products* used shall be as listed under the Approved Product List section of the MPI Painting Manual.
 - .2 Installers / applicators / erectors:
 - .1 Applicators: Shall have minimum 5 years proven satisfactory painting experience of projects of similar size and class subject to *Consultant's* approval.

Painting

- .2 Only qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices shall work under the direct supervision of a qualified journeyman in accordance with trade regulations.

1.6 Delivery, Storage, and Handling

- .1 Deliver painting materials in sealed, original labelled containers bearing manufacturer's name, brand name, type of paint or coating and colour designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.
- .2 Store paint *Products* and materials in original labelled containers in secure (lockable), dry, heated and well ventilated single designated area meeting minimum requirements of both paint manufacturer and authorities having jurisdiction, and at a minimum ambient temperature of 7°C.
- .3 Protect floor and wall surfaces of storage area. Protect floors with sheets or clean plywood or metal pans where mixing is being carried out.

1.7 Field Conditions

- .1 Ambient conditions:
 - .1 Comply with environmental requirements of MPI Manual.
 - .2 Perform no painting work when ambient air and substrate temperatures are below 10°C for both interior and exterior work, unless suitable weatherproof covering and sufficient heating and ventilation facilities are in place in accordance with MPI Manual.
 - .3 Perform no painting work when relative humidity is above 85% or when dew point is less than 3°C (5°F) variance between air/surface temperature.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 Performance/Design Requirements

- .1 Except where more stringent requirements are specified, the following reference standard shall govern the work of this section:
 - .1 Master Painters Institute (MPI) Architectural Painting Specification Manual (MPI Manual) and the MPI Maintenance Repainting Specification Manual (MPI Repainting Manual), as applicable, including Identifiers, Evaluation, Systems, Preparation and Approved Product List, latest edition, and referenced herein as the MPI Manual, as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
 - .2 Materials, preparation and workmanship shall conform to requirements of latest edition of Architectural Painting Specification Manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
 - .3 Painting systems:

Painting

- .1 Shall remain free from failure due to causes including: material failure; surface preparation less than that specified; and paint film thickness less than that specified, or when not specified, less than that coverage recommended by manufacturer.
- .2 Presence of any of following shall constitute failure: visible corrosion; film peeling, blistering, checking, scaling, embrittling or general film disintegration; and poor adhesion as determined by tape "peel-off" test procedures.

2.2 Materials

- .1 *Products* listed in MPI Manual shall be used in the *Work*, unless specified otherwise.
- .2 Paint and materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, and the like) shall be in accordance with the MPI Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .3 Other paint materials, such as linseed oil, shellac, and the like, shall be highest quality *Products* of an approved manufacturer listed in the MPI Manual and shall be compatible with other coating materials as required.
- .4 Paint materials shall have good flowing and brushing properties and shall dry or cure free of blemishes or sags.
- .5 Where required, paints and coatings shall meet flame spread and smoke developed ratings designated by building code requirements and/or authorities having jurisdiction.

2.3 Equipment

- .1 Painting and coating equipment in accordance with written requirements of MPI Manual.

2.4 Mixing and Tinting

- .1 Unless otherwise specified, paints shall be ready-mixed. Re-mix prior to application to ensure colour and gloss uniformity.
- .2 Paste, powder or catalysed paint mixes shall be mixed in accordance with manufacturer's written requirements.
- .3 Perform colour tinting operations prior to delivery of paint to *Place of the Work*.
- .4 Where thinner is used, addition shall not exceed paint manufacturer's recommendations.

2.5 Colours and Gloss Levels

- .1 Paint colours and gloss levels shall be as selected by the *Consultant*. Locations as indicated or scheduled.
- .2 Colour and gloss schedule: in accordance with the Finish Schedule.
- .3 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 maximum
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35

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G4	Satin finish	20 to 35	35 minimum
G5	Semi-gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	> 85	

.4 Sheen levels:

.1 Sheen for various locations shall be as follows:

- .1 Ceilings: G1.
- .2 Walls: G3.
- .3 Doors/frames: G5.

PART 3 - EXECUTION

3.1 Examination

- .1 Prior to commencement of work of this section, examine surfaces scheduled to be painted.
 - .1 For surfaces to be repainted, the degree of surface deterioration (DSD) shall be assessed using assessment criteria in accordance with the MPI Repainting Manual.
- .2 Check moisture content and alkalinity of surfaces to be painted in accordance with paragraph above titled Field Conditions.
- .3 Inspect surfaces to be coated for gouges, marks, nibs, and other defects and properly prepare patching, filling, smoothing or other surface preparation necessary to ensure satisfactory finish.
- .4 Report in writing any condition adversely affecting work of this section.
- .5 Proceed with work only when surfaces and conditions are satisfactory. Remove dust, grease, rust, scale and extraneous matter, tool and machine marks and insects from surfaces which could be detrimental to a satisfactory and acceptable finish.

3.2 Preparation

- .1 Comply with manufacturer's written requirements and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- .2 Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - .1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- .3 Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, mildew, grease, and incompatible paints, encapsulants, and other deleterious materials.
- .4 Paint surfaces when moisture content or alkalinity of surfaces to be painted comply with Field Quality Control paragraphs in Section 09 91 00.
- .5 Masonry substrates: Remove efflorescence and chalk.

Painting

- .6 Shop-primed steel substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- .7 ZF75 and ZF120 galvanized-metal substrates: Remove grease and oil residue from galvanized sheet metal by methods to produce clean surfaces that promote adhesion of subsequently applied paints.
- .8 Aluminum substrates: Remove loose surface oxidation.
- .9 Substrates to be repainted:
 - .1 Prepare surfaces for repainting in accordance with MPI Repainting Manual requirements.

3.3 Installation

- .1 Do not paint unless substrates are acceptable and/or until Field Conditions (heating, ventilation, lighting and completion of work of other sections) are acceptable for applications of *Products*.
- .2 Apply primer, paint or stain in accordance with MPI Manual finish requirements based on Grade specified below in Section 09 91 00.
- .3 Schedule application of paints and coatings after cleaning to prevent field conditions causing flash-rusting, rusting, weathering or water damage to substrate, or other contamination of the substrate. Comply with MPI manual, MPI Repainting Manual, and manufacturer's written requirements, the most stringent of which shall govern.
- .4 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.
- .5 Tint each coat of paint progressively lighter to enable confirmation of number of coats.
- .6 Unless otherwise approved by *Consultant*, apply a minimum of 4 coats of paint where deep or bright colours are used to achieve satisfactory results.
- .7 Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1000 mm (39").
- .8 Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.
- .9 Prime coat of stain or varnish finishes may be reduced in accordance with manufacturer's directions.
- .10 Paint finish shall continue through behind wall-mounted items (i.e. chalk and tack boards) and exposed/ visible in complete work including interiors of cupboards and closets, tops of doors, trim, and the like, whether in sight line or not, including behind surface mounted fixtures and heating units.
- .11 *Consultant* shall have right to make changes in colour tone of finishes prior to final coat to obtain desired results without additional cost to *Owner*.
- .12 Access doors, prime coated butts and other prime painted hardware, registers, radiators and covers, exposed piping and electrical panels shall be painted to match adjacent surfaces in terms of colour, texture and sheen, unless otherwise indicated.

Painting

3.4 Mechanical and Electrical Items

- .1 Finish paint primed mechanical and electrical items with 2 coats of paint. Include for the following list unless otherwise indicated:
 - .1 Conduit.
 - .2 Convector.
 - .3 Exposed Conduit.
 - .4 Exposed Ductwork.
 - .5 Grilles.
 - .6 Fire hose cabinets.
 - .7 Fire extinguisher cabinets.
 - .8 Louvres.
 - .9 Vents.
- .2 Prime and paint exposed insulated and bare pipes. Prime and paint exposed conduits and electrical raceways, fittings, outlet boxes, junction boxes, pull boxes and similar items. Use heat resistant epoxy paint on pipes and surfaces where operating surface temperature exceeds 65°C.
- .3 Coordinate the painting of pipes, and coverings with mechanical contractor applying colour banding, flow arrows and pipe identification after the painting of pipes and coverings.
- .4 Paint work to match adjacent walls and ceilings unless directed otherwise.
- .5 Paint interior surfaces of air ducts and pipe trenches including heating pipes and elements that are visible through grilles and louvres with one coat of flat metal paint to limit of sight-line. Paint to be black or white as directed by *Consultant*.
- .6 Gas pipes, whether concealed or exposed, shall be painted in accordance with gas code.
- .7 Paint and finish wall surfaces behind convectors. Walls to be finished prior to installation of convector covers. Touch up walls after covers are installed as necessary to make good installation damage.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Field tests and inspections:
 - .1 Paint and Coating Quality Assurance Inspections:
 - .1 Field quality control shall be in accordance with Section 01 45 00.
 - .2 Moisture and alkalinity testing:
 - .1 Check moisture content of surfaces to be painted using properly calibrated electronic moisture meter approved by paint manufacturer and *Consultant*, or other approved method. Maximum moisture contents shall be in accordance with manufacturer's recommendations and as follows:
 - .1 Concrete and concrete masonry (clay and concrete brick/block): Maximum 12%.
 - .2 Gypsum board and plaster: Maximum 12%.

Painting

- .3 Wood: Maximum 15%.
- .2 Conduct moisture tests on concrete floors using cover patch test method.
- .3 Test concrete, masonry and plaster surfaces for alkalinity.
- .3 Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the *Consultant*:
 - .1 Brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - .3 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .4 Damage due to application on moist surfaces or caused by inadequate protection from weather.
 - .5 Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).
- .4 Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces to the *Consultant*:
 - .1 Visible defects are evident on vertical and horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm (39").
 - .2 Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
 - .3 When final coat on any surface exhibits a lack of uniformity of colour, sheen, texture, and hiding across full surface area.
- .5 Painted surfaces rejected by the *Consultant* shall be made good at the expense of the *Subcontractor*. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.
- .6 Painting *Subcontractor* shall obtain from *Contractor* written confirmation of specific surface preparation procedures and primers used for fabricated steel items from the fabricator/*Supplier* to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.

3.6 Adjusting and Cleaning

- .1 Promptly as work proceeds and on completion of *Work*, remove paint where spilled, splashed or spattered during the progress of the *Work*. Keep the premises free from unnecessary accumulation of tools, equipment, surplus materials and debris; at the conclusion of the work leave the premises clean.

3.7 Exterior Paint Systems

- .1 System references listed are based on MPI Manual and are Premium Grade, Low VOC, unless otherwise indicated:

Painting

- .1 Masonry units: (smooth and split face block and brick)
 - .1 EXT 4.2A Latex finish (over block filler); gloss level: G1.
- .2 Structural steel and metal fabrications:
 - .1 EXT 5.1B Water based light industrial coating (over inorganic zinc); gloss level: G6.
 - .2 EXT 5.1C Water based light industrial coating (over alkyd metal primer); gloss level: G6.
 - .3 EXT 5.1D Alkyd (over alkyd primer); gloss level: G1.
- .3 Galvanized metal (not chromate passivated): (for high contact / high traffic area doors, frames, railings, misc. steel, pipes, etc.; for low contact / low traffic area overhead decking, ducts, gutters, flashing, etc.)
- .4 EXT 5.3N Alkyd (over water based galvanized primer); gloss level: G1.

3.8 Interior Paint Systems

- .1 System references listed are based on MPI Manual and are Premium Grade, Low VOC, unless otherwise indicated:
 - .1 Concrete masonry unit assemblies:
 - .1 INT 4.2P High performance architectural latex finish (over alkali resistant primer); gloss level G3.
 - .2 Ferrous metal fabrications: Prepared and primed in accordance with Section 05 50 00.
 - .1 INT 5.1Q Latex finish (over alkyd primer); gloss level G5.
 - .3 Galvanized metal: (doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.)
 - .1 INT 5.3M High performance architectural latex (over water based galvanized primer); gloss level G5.
 - .4 Plaster and gypsum board: (gypsum wallboard, drywall and textured finishes)
 - .1 INT 9.2B High performance architectural latex finish (over latex primer/sealer):
 - .1 Gloss level:
 - .1 Walls, except as otherwise indicated: G3.
 - .2 Ceilings, except as otherwise indicated: G1.

3.9 Interior Repaint Systems

- .1 System references listed are based on MPI Repainting Manual and are Premium Grade, Low VOC (Green Seal GS-11), unless otherwise indicated:
 - .1 Concrete masonry unit assemblies (smooth and split face block and brick):
 - .1 RIN 4.2K High performance architectural latex finish.
 - .2 Structural steel and metal fabrications (columns, beams, joists, etc.)
 - .1 RIN 5.1RR High performance architectural latex.

Painting

- .3 Galvanized metal: (doors, frames, etc.)
 - .1 RIN 5.3J High performance architectural latex (do not use flat finish on doors and door frames), gloss level G5.
- .4 Plaster and gypsum board: (gypsum wallboard, drywall and textured finishes)
 - .1 RIN 9.2B High performance architectural latex finish:
 - .2 Gloss level:
 - .1 Walls, except as otherwise indicated: G3.
 - .2 Ceilings, except as otherwise indicated: G1.

END OF SECTION

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Corner guards (CG1) (CG2) (CG3).
 - .2 Hand rail (HR1).
 - .3 Bumper rail (HR2) (HR3).

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 Samples:
 - .1 Submit 3 samples, 300 mm (12") long or 300 x 300 mm (12 x 12") in size as applicable, for each *Product* in specified finish.
- .4 Shop drawings:
 - .1 Include plans, elevations, hardware, and installation details.
 - .2 Show seam locations.
- .5 Templates:
 - .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of hardware.

1.3 Delivery, Storage, and Handling

- .1 Package or crate, and brace *Products* to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.
- .2 Deliver *Products* to location at the *Place of the Work* designated by *Contractor*.

1.4 Field Conditions

- .1 Install materials of this section only when surfaces and air temperatures have been maintained between 18°C and 24°C for 48 hours preceding installation, and will be so maintained during installation and for 48 hours thereafter. Maintain a minimum temperature of 13°C after above period. Relative humidity shall be 50 +/- 10%.
- .2 Ensure that adequate ventilation is provided during installation and curing of materials of this section.
 - .1 Do not expose wall protection to direct sunlight during or after installation.

1.5 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 General

- .1 Incorporate reinforcing, fastenings and anchorage required for building-in of *Products*.
- .2 Heights of corner guards are to be full wall heights.

2.2 Corner Guard Protection (CG1)

- .1 Stainless steel corner guard (CG-1):
 - .1 Material: Stainless steel.
 - .2 Finish: #4 satin finish.
 - .3 Angle: 90 degrees.
 - .4 Leg length: 51 mm (2").
 - .5 Acceptable *Products*:
 - .1 In accordance with Finish Schedule.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .2 Corner guard (CG-2) (CG3):
 - .1 Material: Vinyl.
 - .2 Colours/finish: to later selection by *Consultant* from manufacturer's full range.
 - .1 Two colours will be selected.
 - .3 Angle: End wall (90 degree).
 - .4 Leg length: 50.8 mm (2").
 - .5 Mounting method: vinyl cover and top and bottom cap over mechanically fastened metal retainer.
 - .1 Fasteners: in accordance with corner guard manufacturer's written requirements.
 - .6 Acceptable *Products*:
 - .1 In accordance with Finish Schedule.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.3 Hand Rails (HR1)

- .1 Type (HR1):
 - .1 Colour: to later selection by *Consultant* from manufacturer's full range.
 - .2 Acceptable *Products*:
 - .1 In accordance with Finish Schedule.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .3 Sealants: in accordance with Section 07 92 00.

Corner Guards, Handrails and Bumper Rails

2.4 Bumper Rail (HR2) (HR3)

- .1 Type (HR2) (HR3):
 - .1 Colours: In accordance with Finish Schedule.
 - .2 Acceptable *Product*:
 - .1 In accordance with Finish Schedule..
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .3 Sealants: in accordance with Section 07 92 00.

PART 3- EXECUTION

3.1 Installation

- .1 Install work to meet manufacturer's written requirements, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .2 Clean substrates to remove dirt, debris and loose particles prior to installation.
- .3 Fit joints and junction between components tightly and in true planes.
- .4 Install units on solid backing as indicated, and erect with materials and components straight, tight and in alignment.
- .5 Installation for bumper rails, hand rails:
 - .1 Mechanically fasten with top surface parallel to finished floor line to height indicated.
 - .2 Install straight and level to a tolerance of plus or minus 3 mm (1/8") over 3000 mm (10') straight edge, non-cumulative.
- .6 Corner guards:
 - .1 Corner guard edges shall be smooth.
 - .2 Stainless steel:
 - .1 Adhere stainless steel corner guards with continuous adhesive beads in accordance with manufacturer's written requirements.
 - .3 Vinyl:
 - .1 Mechanically fasten vinyl corner guard retainer, clip top and bottom cap and vinyl cover to retainer in accordance with guard manufacturer's written requirements. Fasteners shall be aligned and equally spaced.
 - .4 Visible fasteners are not permitted.
 - .5 Install corner guard shall be tightly fitted without gaps.

END OF SECTION

Washroom Accessories

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Washroom accessories.
 - .2 Coordination and installation of washroom accessories as supplied by *Owner*.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Supply manufacturer's handling instructions, anchorage information, roughing-in dimensions, templates, and service requirements for installation of the work of this section, and assist or supervise, or both, the setting of anchorage devices and construction of other work incorporated with *Products* specified in this section in order that they function as intended.

1.3 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 Samples:
 - .1 Submit 3 samples of each finish specified.
- .4 Shop drawings:
 - .1 Include plans, elevations, hardware, and installation details.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.5 Delivery, Storage, and Handling

- .1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.
- .2 Deliver products to location at the *Place of the Work* designated by *Contractor*.

PART 2 - PRODUCTS

2.1 Accessories

- .1 Incorporate reinforcing, fastenings and anchorage required for building-in of *Products*.
- .2 Washroom accessories; locations as indicated or scheduled.

Washroom Accessories

- .1 Waste receptacle (WR-1):
 - .1 *Acceptable Product:*
 - .1 Bobrick 'B-277'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .2 Sanitary napkin waste receptacle; surface mounted (WR-2):
 - .1 *Acceptable Product:*
 - .1 Bobrick 'Contura Series Surface-Mounted Sanitary Napkin Disposal B-270'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .3 Clothes/robe hook (CH-1) (CH-2):
 - .1 *Acceptable Product:*
 - .1 Frost 'Safety Coat Hook #1150'..
 - .2 Substitutions: in accordance with Section 01 25 00.
- .4 Grab bars:
 - .1 *Acceptable Products:*
 - .1 GB-1; 610 mm, peened surface: Bobrick 'B-5806.99x24 (610 mm).
 - .2 GB-2; 762 mm x 762 mm, peened surface: Bobrick 'B-6898.99 (762 mm x 762 mm long legs).
 - .3 GB-3; 1065 mm, peened surface: Bobrick 'B-5806.99x42 (1065 mm).
 - .4 Substitutions: in accordance with Section 01 25 00.
- .5 Tilt mirrors (MIR-1):
 - .1 *Acceptable Product:*
 - .1 Bobrick 'B-293 1830.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .6 Toilet back rest (BR-1):
 - .1 *Acceptable Product:*
 - .1 Frost '1028'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .3 Washroom accessories supplied by *Owner*; locations as indicated or scheduled:
 - .1 Toilet tissue Dispenser (TPD-1).
 - .2 Soap dispenser (SD-1).
 - .3 Hand sanitizer (HS-1).
 - .4 Paper towel dispenser (PTD-1).
 - .5 Sharps bins (SC-1) (SC-2).
 - .6 Glove dispenser (GD-1).
 - .7 Disinfectant wipes dispenser (DW-1).

Washroom Accessories

- .8 Pamphlet rack (PR-1).

2.2 Fabrication

- .1 Fabricate *Products* with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that washroom accessories 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 Verify that rough-in dimensions and blocking or back-up has been provided to comply with product manufacturer's written requirements.

3.2 Installation of Washroom Accessories

- .1 Comply with product manufacturers written requirements.
- .2 Install and secure fixtures rigidly in place using expansion shields in solid masonry or concrete, toggle bolts in hollow masonry or sheet metal screws at metal studs.
- .3 Insulate surfaces to prevent electrolytic action due to contact with dissimilar metals, or concrete or masonry as applicable. Use bituminous paint or other approved means.
- .4 Install on built-in concealed solid backing materials. Grab bar installation shall be able to withstand 250 kg downward force.
- .5 Verify locations and mounting heights with *Consultant* before roughing-in.

3.3 Barrier Free Installation Heights

- .1 Install accessories to permit operable parts and controls to be accessed in accordance with authorities having jurisdiction.

3.4 Installation Tolerances

- .1 Install accessories plumb, level, straight, tight and secured, centred between joints on masonry and tile walls to the following maximum tolerances:
 - .1 Plumb and level: 3 mm (1/8").
 - .2 Variation from indicated position: 3 mm (1/8").

3.5 Adjusting and Cleaning

- .1 Verify under work of this section that installed *Products* function properly and adjust them accordingly to ensure satisfactory operation. Test mechanisms, hinges, locks, and latches and adjust and lubricate to ensure washroom accessories are in perfect working order.
- .2 Do not remove protective coatings until final cleaning, or earlier if directed by *Consultant*.
- .3 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at *Place of the Work* only if approved.

END OF SECTION

Prefinished Metal Lockers

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Prefinished metal lockers.

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 Indicate thicknesses of metal, fabricating methods, assembled banks of lockers, bases, trim, numbering, filler panels, end panels, and tops.
- .4 Samples:
 - .1 Submit sample of colour and finish on actual base metal.

PART 2 - PRODUCTS

2.1 Materials

- .1 Lockers: to CAN/CGSB 44.40-2001 AMEND.
 - .1 Type:
 - .1 2-tier locker.
 - .2 Size (width x depth x height):
 - .1 305 mm x 450 mm x 1830 mm (12" x 18" x 72").
 - .3 Locking system: suitable for padlocks.
 - .4 Metal materials: to ASTM A1008/A1008M-13, free of imperfections.
 - .5 Frame: 1.6 mm (0.0625") thick (16 gauge).
 - .6 Door:
 - .1 Minimum 1.0 mm (0.0375") 20 gauge outer panel and 24 gauge liner, hollow core or honeycomb.
 - .7 Hooks: three single prong coat hooks.
 - .8 Body: minimum 0.6 mm (0.025") thick (24 gauge).
 - .9 Sloped top: minimum 20 gauge, mitred at corners.
 - .10 Filler and end panels: minimum 1.0 mm (0.0375") 20 gauge.
 - .11 Ventilation: Airflow shall be achieved through louvers or perforates in the vertical frame members or door.
 - .12 Base:

Prefinished Metal Lockers

- .1 Locker manufacturer's standard minimum minimum 1.0 mm (0.0375") thick (20 gauge metal base. Height shall be 100 mm.
- .13 Number plates: Each door shall have a number plate riveted onto body or door pull, numbered sequentially starting at "1" for each locker Type as directed by the *Consultant*.
- .14 Locker finish; exposed and semi-exposed surfaces: baked on polymer powder or alkyd enamel, standard colour to later selection by the *Consultant*. Frame colour shall match door colour unless otherwise indicated.
- .15 Acceptable manufacturers/*Products*:
 - .1 Hadrian 'Emperor'.
 - .2 Substitutions in accordance with Section 01 25 00.

PART 3- EXECUTION

3.1 Installation

- .1 Assemble and install lockers complete with metal base in accordance with manufacturer's written installation requirements.
- .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.
- .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

Solid Phenolic Lockers

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Solid phenolic lockers for staff areas and public areas.

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 Indicate thicknesses of panels, fabricating methods, assembled banks of lockers, bases, trim, numbering, filler panels, end panels, sloped tops and manufacturer's installation instructions.
- .4 Samples:
 - .1 Submit sample of colour and finish.

1.3 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 20 years.

PART 2 - PRODUCTS

2.1 Materials

- .1 Lockers:
 - .1 Type:
 - .1 2-tier locker.
 - .2 4-tier locker.
 - .3 Locations as indicated or scheduled.
 - .2 Size:
 - .1 305 mm wide x 380 mm deep x 1830 mm high (12" x 15" x 72").
 - .3 Solid Phenolic:
 - .1 Solidly fused plastic laminate with matte-finish melamine surfaces, coloured face sheets, and black phenolic-resin core that is integrally bonded with exposed black edges milled and polished
 - .2 Thicknesses; solid phenolic panels:

Solid Phenolic Lockers

- .1 Doors and frames: 12.7 mm (1/2").
- .2 Tops, bottoms, and shelves: 12.7 mm (1/2").
- .3 Backs: 6 mm (1/4").
- .4 Sides: 10 mm (3/8").
- .5 Filler and end panels: 12.7 mm (1/2").
- .6 Sloped top: 6 mm (1/4"), mitred at corners.
 - .1 Locations as indicated or scheduled.
- .3 Finish: rough matte finish.
- .4 Colours:
 - .1 To later selection by *Consultant*. from manufacturer's standard range.
- .4 Locking system:
 - .1 Staff area lockers: Hasp latch suitable for padlocks.
 - .2 Public area lockers: Built-in, programmable combination locks, with master key control.
- .5 Hinges: constructed of stainless steel Type 304, provide 2 per door for multi-tier units and 3 for full height doors.
 - .1 Through-bolted hinges.
 - .2 Hinges tapped into door.
- .6 Coat hooks: zinc plated forged steel, ball ends, mounted to top of locker, 1 per locker.
- .7 Base:
 - .1 150 mm (6") high.
 - .2 Construction as detailed or scheduled.
- .8 Acceptable *Products*:
 - .1 ASI 'Phenolic Traditional Plus'.
 - .1 Locking as indicated above.
 - .2 Substitutions in accordance with Section 01 25 00.

PART 3- EXECUTION

3.1 Installation

- .1 Assemble and install lockers in accordance with manufacturer's written installation requirements.
- .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.
- .4 Install finished end panels to exposed ends of locker banks.

Solid Phenolic Lockers

3.2 Installation Tolerances

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

END OF SECTION

Healthcare Equipment

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Healthcare equipment supplied and installed by *Contractor*:
 - .1 Horizontal headwall; recessed-mounted.
 - .2 Patient assist track & ladder system; ceiling-mounted.
 - .2 Healthcare equipment supplied by *Owner* for installation by *Contractor*.
- .2 Related sections:
 - .1 Wood blocking - under Section 06 10 53.
 - .2 Metal support systems - under Section 09 22 16.
 - .3 Mechanical – under Divisions 21, 22, and 23.
 - .4 Electrical - under Divisions 26, 27, and 28.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 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.
 - .2 Submit equipment manufacturer's handling and installation instructions, anchorage information, roughing-in dimensions, service requirements for installation of the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings for the following:
 - .1 Patient lift and track systems, and track support framing assemblies, including anchoring and connections for work of this section.
 - .2 Headwall systems, including anchoring and connections for the work of this section.
 - .3 Seismic design, connections and restraint.
 - .2 Clearly indicate, materials, finishes, fabrication details, dimensions, thicknesses, plans, elevations, hardware, fastenings, service connections and installation details.
 - .3 Indicate termination/connection points of services for headwalls.
 - .4 Indicate proposed site connections, fasteners and methods.
- .4 Samples:
 - .1 Submit duplicate samples of each finish specified.

Healthcare Equipment

.5 Templates:

- .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of equipment.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in the application of the *Products*, systems, and assemblies specified and with approval and training of *Product* manufacturers.
 - .2 Manufacturer:
 - .1 Shall have 10 years of continued experience, minimum, having successfully completed other projects of similar or greater magnitude.

1.6 Delivery, Storage, and Handling

- .1 Package or crate, and brace *Products* to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.
- .2 Deliver products to location at the *Place of the Work* designated by *Contractor*.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 Horizontal Headwall (Recessed-Mounted)

- .1 Basis-of-design:
 - .1 Materials and construction:
 - .1 Enclosure shall be constructed of extruded, anodized aluminum alloy sections to provide a modular surface mounted unit with integrated accessory rails for equipment management.
 - .2 Integrated accessory rails: Provide system with 2 accessory channels integrated into aluminum extrusion assembly, clear etched anodized finish.
 - .3 Laminated fascia: Aluminum strips with high pressure laminate, colour and pattern as selected by *Consultant*.
 - .4 Covers and end caps: Top and bottom cover panels fabricated from powder coated extruded aluminum, with injection moulded ABS fire retardant plastic end caps.

Healthcare Equipment

- .5 Headwall length: as indicated on drawings.
- .2 Components:
 - .1 Backbox: 16 gauge satin coat steel backbox, complete with compartments for mounting of electrical, medical gas and communication devices.
 - .2 Compartments: Eight compartments of 16 gauge formed satin coat steel complete with pre-drilled and tapped mounts for standard medical gas, electrical and communication devices. Compartments to include 19 mm (3/4") knock-outs for factory installed conduit.
 - .3 Decorative trim panel:
 - .1 1-piece plastic laminate panel, shape and size as indicated, complete with standard powder coat finish.
 - .4 Accessory mounts: 2 full-length universal profile medical equipment mounting channels of extruded aluminum, complete with custom powder coat finish.
 - .5 Except where noted otherwise, units shall have devices pre-wired and pre-piped. Wiring shall be terminated in junction boxes or terminal strips.
 - .6 Channels or barriers shall be provided to separate normal and emergency power, as well as communications systems.
 - .7 Medical gas piping:
 - .1 Extend 150 mm (6") above finished unit.
 - .2 Fitted with plastic caps to prevent dirt from entering piping.
- .3 Electrical components:
 - .1 Receptacles and switches shall be in accordance with Divisions 26, 27, and 28 wiring devices.
 - .2 Duplex receptacles: Hubbell Brand 15A Nema 5-15R 8200 Series Hospital Grade type, white colour for normal power, red colour if connected to emergency power.
 - .3 Electrical devices shall be factory pre-wired in designated raceways to a terminal strip located in 1 of 2 snap-fit, easy access compartments.
 - .4 Compartments shall be complete with labelled terminal strips, steel barriers to separate electrical services, and an aluminum ground bus complete with wiring terminals.
 - .5 Wiring to each device to include 1-black and 1-white #12 RW90 or THHN stranded copper wire and 1-green #10 RW90 or THHN stranded copper ground wire.
 - .6 Nurse call system and communication devices and wiring.
 - .1 Nurse call and code devices shall be supplied, installed, wired and tested on-site by work of Divisions 26, 27, and 28.
 - .7 Communications outlets for telephone, data, monitoring systems shall be supplied, installed, wired, and tested on-site by Divisions 26, 27, and 28.
- .4 Medical gas outlets:

Healthcare Equipment

- .1 Factory supplied, installed and manifolded for single point connection by headwall manufacturer.
 - .2 Degreased, Type L hard copper pipe to extend from each terminal unit to a common access point for on-site connection by medical gas *Subcontractor*.
 - .3 Piping shall be labelled per CSA Z7396.1-17 and capped for cleanliness.
 - .4 Medical gas outlets shall be serviceable without removal of nameplate or gas specific components, complete with CSA Z7396.1-17 certification.
 - .5 Medical gas outlets shall be Class 1 Inc., 'XM57 Series DISS' medical gas terminal units.
- .2 *Acceptable Products:*
- .1 Amico Corporation 'Majestic Series Single Tier Recessed Headwall'.
 - .2 Substitutions in accordance with Section 01 25 00.

2.2 Patient Assist Track & Ladder System (Ceiling-Mounted)

- .1 Basis-of-design:
- .1 Patient Assist Track and Ladder System:
 - .1 Ceiling track, extruded aluminum, white powder coat finish:
 - .1 *Acceptable Product:* Tollos 'G1.5 Profile'.
 - .2 Ladder:
 - .1 4 rungs.
 - .2 Standard spring loaded trolley.
 - .3 Length: 1829 mm (72").
 - .4 *Acceptable Product:*
 - .1 Tollos 'LR-72-R01-W08-N4'.
 - .2 Substitutions in accordance with Section 01 25 00.
 - .3 Track guide:
 - .1 Standard rail; Extruded aluminum, white powder coat finish:
 - .1 *Acceptable Product:*
 - .1 Tollos 'T1.5 Standard Rail'.
 - .2 Substitutions in accordance with Section 01 25 00.

2.3 Halcyon Laser Equipment

- .1 *Acceptable Product;* client specified equipment to be supplied and installed by Contractor:
Refer to attached data sheets.

PART 3 - EXECUTION

3.1 Installation - Healthcare Equipment

- .1 Install equipment in accordance with equipment manufacturer's written requirements and in accordance with reviewed shop drawings.

Healthcare Equipment

- .2 Submit manufacturer's information and templates required for installation of work of this section. Assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with *Products* specified in work of this section in order that they function as intended.
- .3 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .4 Verify locations and mounting heights with *Consultant* before roughing-in.
- .5 Electrical *Subcontractor* shall be responsible for final electrical hook-up at service connection locations, as well as interconnection wiring on multi-sectional units. Coordinate work of this section with work of Divisions 26, 27, and 28.
- .6 Mechanical *Subcontractor* shall be responsible for final mechanical service connections. Coordinate work of this section with work of Divisions 21, 22, and 23.

3.2 Installation - Headwall

- .1 Install equipment in accordance with equipment manufacturer's written requirements and in accordance with reviewed shop drawings.
- .2 Submit manufacturer's information and templates required for installation of work of this section. Assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with *Products* specified in work of this section in order that they function as intended.
- .3 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .4 Verify locations and mounting heights with *Consultant* before roughing-in.
- .5 Electrical *Subcontractor* shall be responsible for final electrical hook-up at service connection locations, as well as interconnection wiring on multi-sectional units and testing, in accordance with authorities having jurisdiction and with requirements of Divisions 26, 27, and 28. Coordinate work of this section with work of Divisions 26, 27, and 28.
- .6 Mechanical *Subcontractor* shall be responsible for final mechanical service connections and testing, in accordance with authorities having jurisdiction and with requirements of Divisions 21, 22, and 23. Coordinate work of this section with work of Divisions 21, 22, and 23.

3.3 Patient Assist Track & Ladder System

- .1 Install equipment in accordance with equipment manufacturer's written requirements and in accordance with reviewed shop drawings.
- .2 Submit manufacturer's information and templates required for installation of work of this section. Assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with *Products* specified in work of this section in order that they function as intended.
- .3 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .4 Verify locations and mounting heights with *Consultant* before roughing-in.

Healthcare Equipment

3.4 Halcyon Laser Equipment

- .1 Install equipment in accordance with equipment manufacturer's written requirements and in accordance with reviewed shop drawings.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

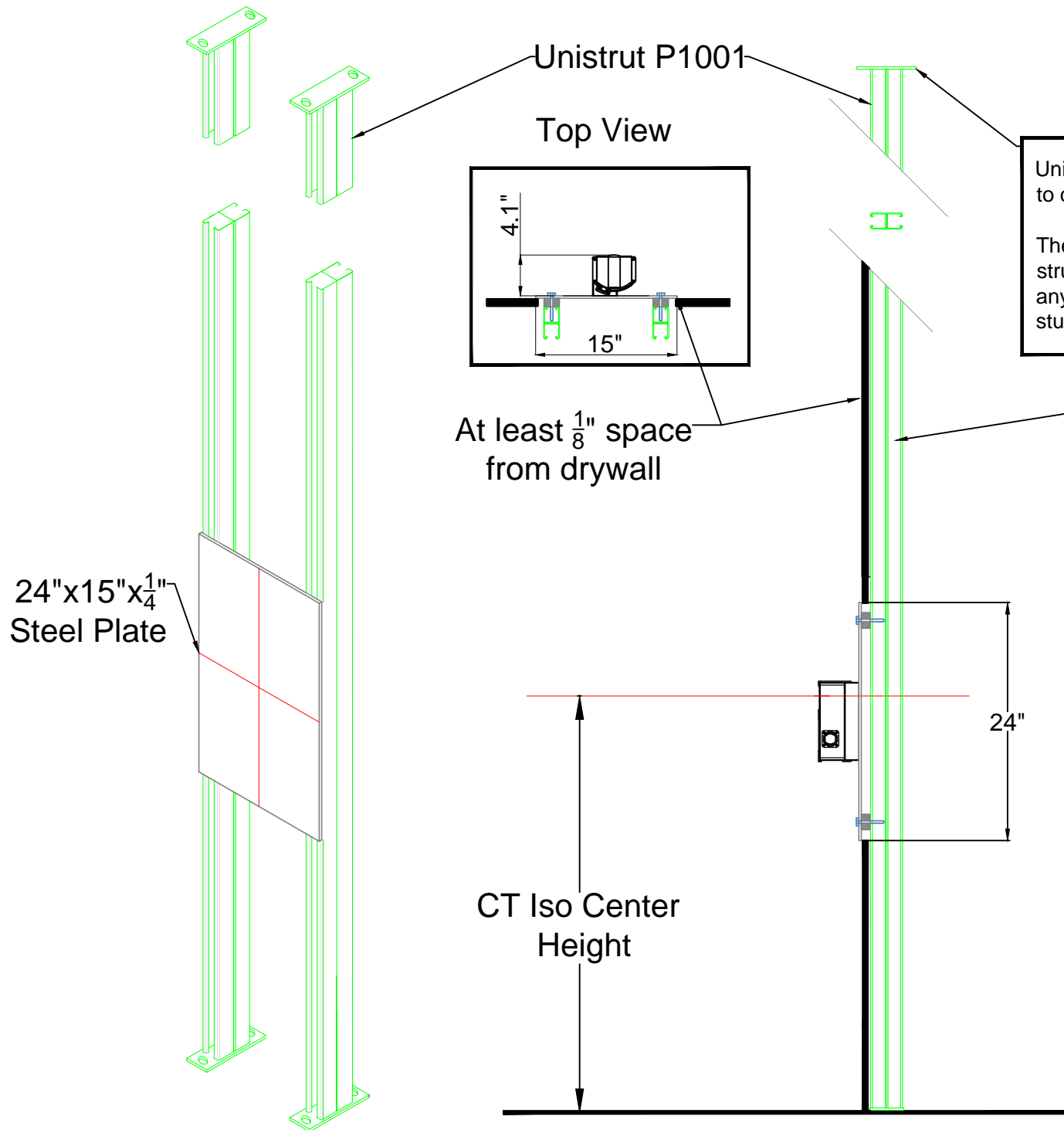
3.6 Adjusting and Cleaning

- .1 Upon completion of installation, inspect finishes and materials for damage and faulty installation. Make good or replace damaged finishes and materials as directed by *Consultant* at no cost to *Owner*.
- .2 Verify under work of this section that installed *Products* function properly, and adjust accordingly to ensure satisfactory operation.
- .3 Do not remove protective coatings until final cleaning in accordance with Section 01 77 00, or earlier if directed by *Consultant*.

3.7 Closeout Activities

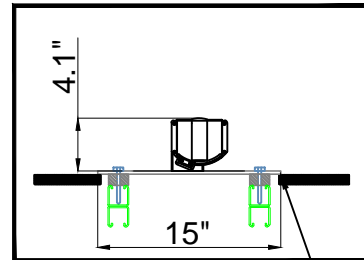
- .1 Testing:
 - .1 Test and commission equipment in accordance with equipment manufacturer's written requirements.
- .2 Demonstration:
 - .1 Before acceptance of system, arrange for demonstration of equipment with authorized representatives of *Owner*, to be performed by competent representative of equipment manufacturer to assure proper function, operation and explanation. Give *Owner's* representative a minimum of 48 hours advance notice in writing of demonstration date.
 - .2 Conduct comprehensive demonstration for *Owner's* staff on operation and care of equipment.

END OF SECTION



Unistrut P1001

Top View



At least $\frac{1}{8}$ " space from drywall

Unistrut bolts from concrete floor to concrete ceiling.

The unistrut and all of our structure needs to avoid any contact to drywall and wall studs.

Bolt with Metal spacer to keep plate off drywall



24"x15"x $\frac{1}{4}$ "
Steel Plate

24"

CT Iso Center
Height

OF AMERICA L.L.C.

161 Commerce Rd Boynton Beach, FL 33426
Phone: (561) 416-9250 Fax: (561) 416-9263



Drawn By: Keith McDonnell

Date: 8/21/2013

AID - 014 REV 1

APOLLO/ASTOR WALL



Data Sheet

APOLLO

Remotely adjustable fixed laser system for patient positioning at LINAC

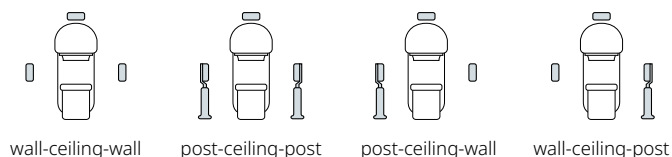
Features

- Precise laser line due to a max. width of 0.5 mm, a line straightness of ± 0.1 mm and distortion-free glass with anti-reflective coating.
- Stable thanks to a high-quality aluminum housing which reliably protects the fine mechanics and optical components inside from vibration, damage and radiation exposure.
- Flexible for your room situation: Install your lasers safely, practically and aesthetically with the optional accessories.
- Comfortable laser adjustment via remote control: All lasers can be easily selected and adjusted in all degrees of freedom.

Configurations

- Color (each laser): red, green or blue
- Line shape (each laser): line, tilted line 90° or crosshair
- Preconfigured sets with 3 or 4 lasers available

Mounting options



Laser

Dimensions (L × W × H)	110 × 100 × 221 mm 4.3 × 3.9 × 8.7 "
Weight	2.6 kg
Power supply	100–240 V AC, 50–60 Hz
Power supply (internal)	24 V DC
Laser color	red (638 nm), green (520 nm), blue (450 nm)
Focusable range	1–4 m
Line length at 3 m distance	>3 m
Line width up to 4 m distance	<0.5 mm (blue), <1 mm (red, green)
Swivel angle	45°
Ambient conditions	35–80 % rel. humidity, non-condensing
Operating temperature	15–30 °C
International protection rating	IP 20
Approved	A CE conformity assessment according to the European Medical Device Regulation MDR – EU 745/2017 was carried out successfully. The device is listed in the FDA Medical Devices Database and legally marketed in the USA.
Laser class	2
Laser power	<1 mW

Remote control

Dimensions (L × W × H)	163 × 63 × 21 mm 6.4 × 2.5 × 0.8 "
Weight	130 g
Power supply	6 V DC (2 batteries type AAA/ LR 03/Micro, 1.5 V)
International protection rating	IP 40

Scope of delivery

Laser system as configured, adjustable tilting brackets, plug-in power supply, 12 months standard warranty, installation and commissioning not included

Accessories

Optional accessories available, please refer to accessory overview:



LAP GmbH Laser Applikationen
Zeppelinstr. 23
21337 Lüneburg
Germany

P +49 4131 95 11-95

E info@lap-laser.com



**made
in
Germany**





Operation manual

APOLLO

Laser system for patient alignment

Read the instructions prior to performing any task!

Keep this manual for future reference.

Translation of the original

MAN-1357 Rev. 5-en_GB, 2021-12, 0013415-0065

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Subject to technical changes.



This product meets the relevant requirements of all applicable European Union legislation.

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1 General information

Dear Customer,

This document is designed to help you put your new product to the best possible use. By observing the information in this document you can avoid potential dangers and extend your product's service life.

This product has been developed using state-of-the-art technology. It may be used only as intended.

This document is a component of the product. Keep the document in a designated location close to the product for easy reference. If the equipment is moved to a different operating location make sure the document is transferred as well.



All persons working on or with this product must have read and understood the relevant sections of the document, and in particular the chapter "Safety instructions". The instructions must be observed.

This document cannot substitute for instruction provided by service personnel or product specialists trained by LAP.

This document describes an LAP laser system. This document contains information on the following subjects, among others:

- Structure and function
- Operation
- Adjustment
- Maintenance
- Troubleshooting
- Contact addresses (local LAP agent) for further questions about using the product [🔗 For contact information see p. 41](#)

The most important terms used in this document are explained in the glossary in the annex.



Other applicable documents:

- Installation manual for the LAP laser system (includes information on transport and storage, installation, commissioning, removal and disposal)

We aim to continuously improve the quality of our documentation. If you have any questions or requirements with regard to this document, please contact us at techdoc@lap-laser.com.

You may request additional copies of this document from LAP.

This document is a translation from the German original.

1.1 Validity

This document is valid for:

Model	Product number	Revision
APOLLO red cross-hair	0014621-0001	4.2.1
APOLLO red line	0014621-0002	4.2.1
APOLLO red line 90°	0014621-0003	4.2.1
APOLLO green cross-hair	0014621-0004	4.2.1
APOLLO green line	0014621-0005	4.2.1
APOLLO green line 90°	0014621-0006	4.2.1
APOLLO blue cross-hair	0014621-0007	4.2.1
APOLLO blue line	0014621-0008	4.2.1
APOLLO blue line 90°	0014621-0009	4.2.1



It is also valid for later, higher versions of the products, unless this document has been replaced by a newer version.

1.2 Styles and conventions

Safety instructions

We use a multi-level system where necessary in this document to point the reader to different danger levels.



DANGER

Cause of the danger

Signals that **death or severe physical harm will** result if the specified precautions are not observed.



WARNING

Cause of the danger

Signals that **death or severe physical harm may** result if the specified precautions are not observed.



CAUTION

Cause of the danger

Signals that **minor physical injury may** result if the specified precautions are not observed.





NOTICE

Cause of the danger

Signals that **property damage may** result if the specified precautions are not observed.




Danger symbols

We use a symbols system where necessary in this manual to refer to specific dangers.

Warning signs	Type of danger
	Warning – laser radiation.
	Warning – danger zone.

Information symbols

The following symbols provide quick information where necessary:

Symbol	Meaning
	The document must be read.
	Manufacturer
	Indicates important information on handling the product or important sections of the document.

Markups

The following markups are used in our documents as required:

Markup	Usage
1. ▶	Operating steps which need to be performed in the order listed.
⇒	Result of a work or operating step.
<Enter>	Designation of equipment and keys.
↗	Cross-reference to another position of the document.

2 Safety

2.1 Intended use/intended purpose

Medical purpose	The LAP APOLLO laser system is used to align the patient during radiotherapy. The aim is to support treatment by making it possible to position the patient reproducibly for treatment planning and for radiotherapy.
Patient	The system is intended for use with patients for whom radiotherapy is planned.
Intended users	Only expert radiotherapy staff who have received appropriate instruction on the laser system and medical training may use the system. These users have the technical knowledge required to operate sophisticated medical systems. Basic English knowledge is a prerequisite.
Usage	The laser system is used with devices for treatment planning (CT, PET) and with therapeutic devices for radiotherapy (LINAC, proton therapy, cobalt devices). Within the scope of this intended purpose, no other applications are envisaged. The laser system projects a fixed coordinate system, which enables the user to mark and reproducibly position the patient. The laser system must always be used according to the current clinical standard and the state of the art.

2.2 Improper use

The use of the APOLLO system in the vicinity of a magnet resonance imaging (MRI) system is not permitted.

The laser system must not be used in an oxygen-enriched environment.

Intended use also includes adhering to LAP instructions regarding installation, removal, commissioning, operation, maintenance and disposal of the system.

As a rule, any modification of the product must be approved in advance in writing by LAP.

Use only accessories approved by LAP. The use of accessories which do not meet the safety requirements may reduce the safety of the overall system.

Any use beyond or other than the intended use is regarded as improper use of the product.

Improper use of the product will terminate all warranty claims. The owner will be solely responsible for the risk and any damage or injury.

2.3 Safety instructions

The following section describes residual risks which may be involved in the operation of the LAP product, even if it is used as intended.

Safety-relevant changes to the product must be reported immediately to the persons responsible.

Observe the safety instructions in other documents supplied with the product.



2.3.1 General dangers

Danger to the patient due to incorrect radiation exposure as a result of incorrect marking

If the laser system is not correctly adjusted, the radiation treatment may be administered incorrectly to patients during radiotherapy.

- Check the beam path every day and also following a collision with a system component.
- Make sure the system has been adjusted before use.
- Do not use the system if the pane in the laser housing is defective

Risk of injury due to illegible symbols

As time passes, stickers and labels may become soiled or unrecognisable for other reasons with the result that the user will not be aware of potential dangers and will not be able follow the necessary instructions for operation. This poses a risk of injury.

- Make sure all safety instructions, warnings and operating instructions are clearly legible.
- Replace damaged labels or stickers immediately.

You can obtain replacements from Technical Service [↗ For contact information see p. 41.](#)

Danger of damaging the device

In the event of malfunctions, the device is to be switched off immediately and the owner or his/her representative is to be informed.

2.3.2 Safety instructions for lasers

Potential danger of exposure to radiation

Use of operating or adjusting equipment or performance of procedures other than those specified herein may result in eye damage.

- Never deviate from the procedures described in this document.
- Follow the safety instructions in this document.

If you cannot guarantee that the safety instructions will be complied with, do not carry out the work described in this document. In this event please contact LAP [↗ For contact information see p. 41.](#)

Safety

According to IEC 60825-1, lasers are classified into classes 1, 1M, 2, 2M, 3R, 3B and 4.

Laser class of product

- 2

The laser class is shown on the laser warning label of the devices.

Safety instructions for class 2 lasers



Fig. 1: Class 2 laser warning label (example)

These lasers can be considered harmless up to a radiation time of 0.25 s, including for the eye. The emitted laser radiation is in the visible portion of the spectral range.

- Never look directly into the laser beam.
- Close your eyes immediately and turn away if the beam strikes your eye.
- Prevent specular reflections.
- Never point the laser beam at people's faces.

National requirements

In addition to the requirements of IEC 60825-1, the respective national occupational safety and health requirements for lasers must be reviewed and implemented.

2.3.3 Information on electromagnetic compatibility (EMC)

Our product complies with the legal limits for electromagnetic radiation and immunity.

The LAP system does not provide “essential performance” as defined in IEC 60601-1-2 which can be affected by external electromagnetic interference.

- Make sure that all devices in the operating environment comply with the legal limits.
- Portable HF communication devices (radio equipment) (including accessories such as external antennas and cables) should not be used closer than 30 cm (12 inch) to the parts and cables of the LAP system identified by the manufacturer. Non-compliance may result in decreased performance of the device.
- Make sure that only accessories approved by LAP are used for the product, since third-party accessories may negatively affect the EMC behaviour.
- If the product does not behave as described in this document, switch it off immediately and notify the owner or his/her representative. Never attempt to repair the fault yourself. Never modify the product.

For detailed information on electromagnetic radiation and immunity, refer to the laser system’s installation manual.

2.4 Obligations of the owner

The owner is the person or legal entity which operates a product for commercial or economic purposes or allows it to be operated by a third party/entity and is legally responsible for the product during its operation for the purpose of protecting the user, personnel or third parties.

The owner of the LAP product is subject to the local statutory obligations regarding occupational safety. The owner must be familiar with and implement all relevant occupational safety regulations. The owner must mark the work space in which the laser is installed in accordance with legal requirements.

The owner ensures that any person working on and with the LAP product has read and understood the operation manual of the LAP product. The owner also informs his/her staff about potential dangers. The owner trains his/her staff at regular intervals.

The owner prepares operating instructions for the validation and use of the system. The owner ensures that the system is validated before use and after every modification of components involved in the clinical workflow.

If the owner connects additional devices to the LAP product, the owner is the system configurator. The system configurator is responsible for meeting the standard requirements for the system. All system configurations must comply with the standard requirements for medical systems (IEC 60601-1 clause 16 or IEC 60601-1-1). Furthermore, all additional devices connected to the LAP product must be proven to satisfy their respective IEC or ISO standards.

The owner assigns clear responsibilities for the operation, troubleshooting and maintenance of the system.

The owner ensures that the maintenance intervals specified in the operation manual are observed.

All serious incidents which occurred in connection with the product must be reported to the manufacturer and the relevant authority of the member state in which the user and/or the patient is located.

2.5 Staff requirements

Required qualifications are specified in the relevant sections of the document.

Clinical user

The clinical user operates the LAP system and marks or positions the patient:

He/she prepares the patient for the procedure/workflow.

He/she performs the safety measures to protect the patient.

He/she positions the patient accurately and reproducibly – using suitable positioning aids, if need be – to ensure the patient is aligned correctly for the radiotherapy.

He/she answers the patient's questions regarding the workflow.

The clinical user typically has qualifications equivalent to those of a radiologic technologist (RT) or radiotherapist.

Maintenance personnel

Maintenance personnel are those persons who have been authorised by the owner to perform work in the course of maintenance and troubleshooting. The maintenance personnel have been instructed by the owner and know the residual risks of the system.

Based on their vocational training, knowledge and experience as well as knowledge of the relevant conditions, the maintenance personnel are capable of performing their assigned work and identifying and avoiding potential dangers.

Physical-technical users

Physical-technical users are qualified to perform the following tasks:

They are responsible for quality assurance of the owner's radiation treatment planning.

They are responsible for administration of the LAP system, e.g. for the software configuration.

They are the primary contacts for the manufacturer.

Physical-technical users typically have a qualification equivalent to that of a medical physicist.

2.6 Safety devices

Master switch for the laser system

The electrical connections for the laser system are installed by the owner.

This involves the installation of a master switch with which the laser system can be disconnected from the power supply at all poles.

3 Overview



Fig. 2: Laser system in use with a treatment device (example)

The LAP APOLLO laser system is used to align the patient during radiotherapy. It is used with devices for treatment planning (CT, PET) and with therapeutic devices for radiotherapy (LINAC, proton therapy, cobalt devices).

The number of lasers integrated into a system, and how the laser devices are arranged and installed in the room, depends on the intended use of the system and on the room conditions at the installation location.

Functional principle

The laser system projects a fixed coordinate system, which enables the user to mark and reproducibly position the patient.

The lasers project laser planes in space which appear as laser lines on the patient. The projected points of intersection of the laser lines mark the isocentre of a treatment device, for example, or the virtual isocentre of an imaging system.

The laser planes/lines projected by the laser system are called sagittal, coronal or transverse planes/lines, depending on their position relative to the patient.



The coordinate system in accordance with the IEC 61217 standard serves as the reference system for the laser system.

4 Technical description

4.1 Scope of delivery/components

Single laser device:	<ul style="list-style-type: none">• 1 cross-hair laser or line laser with swivel mount• 1 plug-in power pack• 1 IR remote control
Set of three lasers for use with a treatment device:	<ul style="list-style-type: none">• 2 cross-hair lasers with swivel mount• 1 line laser with swivel mount• 3 plug-in power packs• 1 IR remote control
Set of four lasers for use with a treatment device:	<ul style="list-style-type: none">• 3 cross-hair lasers with swivel mount• 1 line laser with swivel mount• 4 plug-in power packs• 1 IR remote control
Set of three lasers for use with a diagnostic device:	<ul style="list-style-type: none">• 3 cross-hair lasers with swivel mount• 3 plug-in power packs• 1 IR remote control
Optional system components	<p>System components that can be used for adjustment of the laser system:</p> <ul style="list-style-type: none">• Wilke phantom (diagnostic device only)



Optional system components are components which are not included in the standard delivery scope of a system.

4.2 View and structure

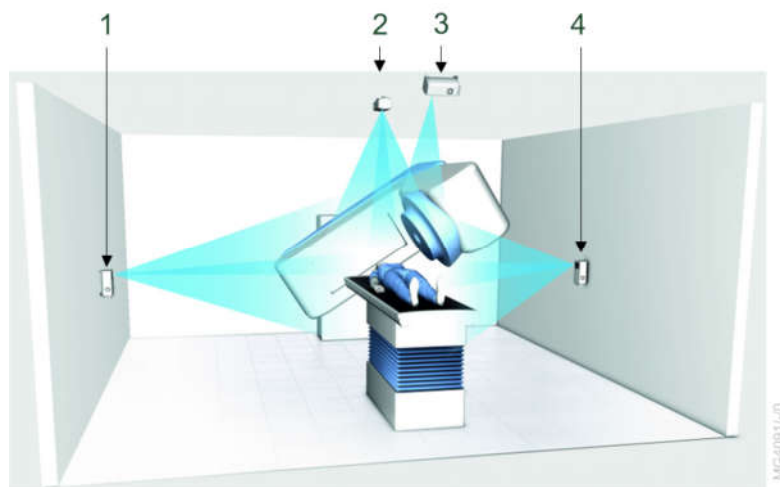


Fig. 3: Four laser devices with the treatment device (example)

- | | |
|---|--|
| 1 | Device for projection of the transverse and coronal lines |
| 2 | Device for projection of the transverse and sagittal lines |
| 3 | Device for projection of the sagittal line |
| 4 | Device for projection of the transverse and coronal lines |

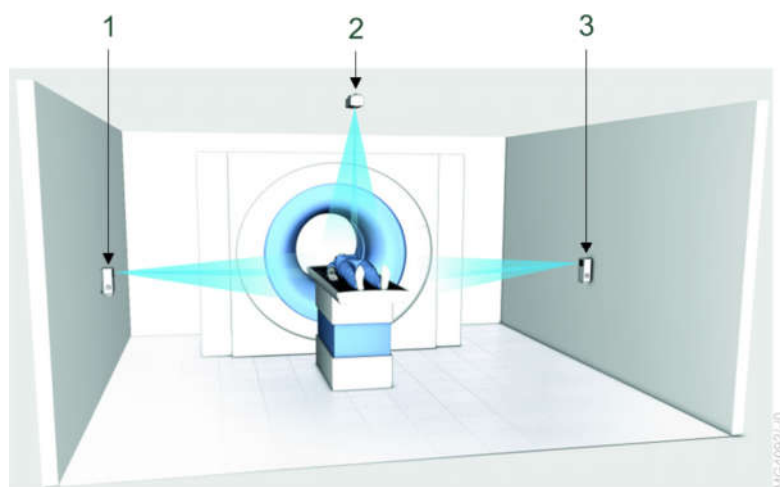


Fig. 4: Three laser devices with the diagnostic device (example)

- | | |
|---|--|
| 1 | Device for projection of the transverse and coronal lines |
| 2 | Device for projection of the transverse and sagittal lines |
| 3 | Device for projection of the transverse and coronal lines |

Laser system used with treatment device (example)

In the basic configuration, two cross-hair lasers and one line laser are used. The laterally mounted cross-hair lasers generate the coronal and transverse lines. The line laser mounted at the foot end generates the sagittal line. An additional option involves the mounting of a cross-hair laser over the isocentre.

Laser system used with diagnostic device

With a diagnostic device, three cross-hair lasers are mounted in one plane to project the virtual isocentre together. The lateral cross-hair lasers generate the coronal and transverse lines. The ceiling-mounted cross-hair laser generates the sagittal and transverse lines.

4.3 Control elements and displays

Master switch for the laser system

The electrical connections for the laser system are installed by the owner.

This involves the installation of a master switch with which the laser system can be disconnected from the power supply at all poles.

LEDs

On each laser there is a green LED which indicates the operating states.

If the lasers are supplied with power when the master switch is turned on, their LEDs flash. The rate at which the LED flashes depends on the digit which is defined on the IR remote control for communication with the laser (example: digit 1 = flash once). Then the LED is dimly lit.

If a laser is activated via the IR remote control in order to make an adjustment, its LED lights up much more brightly.

If signals are transmitted from the IR remote control to an activated laser, the green LEDs of all the lasers supplied with power flicker. This signals that the IR remote control is functioning correctly. If the LEDs do not flicker, this may indicate that the IR remote control batteries are discharged.

The lasers also have a yellow LED which is generally off. It flashes briefly once when the master switch is switched on.

Description of the LEDs

Green LED	Yellow LED	Operating status
On (dimly lit)	Off	Normal operating conditions
On (brightly lit)	Off	Adjustment mode of the laser is active
Flashes quickly	Off	Laser is currently being adjusted
Flashes slowly (when the laser is switched on)	Off	Signalling of the laser address
Off	Flashes slowly (1 Hz)	Memory error
Flashes quickly	Lights up when a remote control key is pressed	The corresponding motor is in its end position

IR remote control

View and control elements of the IR remote control: [🔗 Description on p. 28](#)

4.4 Laser devices

Different versions (model variants) of the laser devices are available. The type plate on each device includes information about the model variant [Chapter 10.2 View of labels on page 39](#).

The models differ in the following respects:

- Laser colour (red, green, blue)
- Beam type (line or cross-hair)
- Beam alignment for line laser

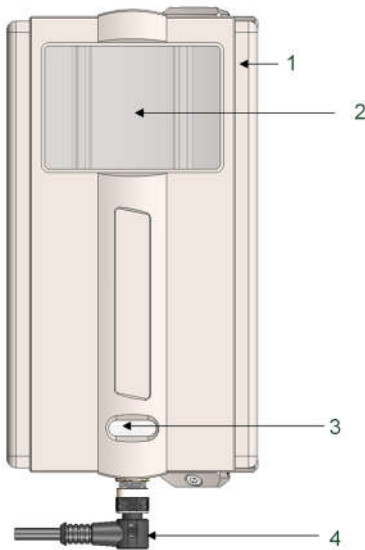


Fig. 5: Device: front

- | | |
|---|--------------------------------------|
| 1 | Housing cover |
| 2 | Optical window |
| 3 | LED window |
| 4 | Angled connector of the power supply |

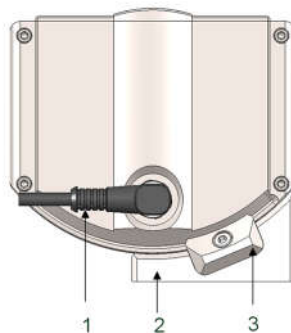


Fig. 6: Device: bottom

- | | |
|---|--------------------------------------|
| 1 | Connection for the operating voltage |
| 2 | Swivel mount |
| 3 | Clamp of swivel mount |



Fig. 7: Device with floor mount

4.5 IR remote control

The scope of delivery of a laser system includes an IR remote control which can control up to six lasers. The IR remote control is used to adjust the lasers; it requires a direct line of sight to the laser's IR receiver for this purpose.

Control elements of the IR remote control: [🔗 Description on p. 28.](#)

4.6 Wilke phantom

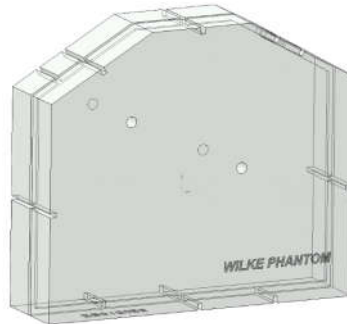


Fig. 8: Wilke phantom

The Wilke phantom is a quality assurance tool which is used to align the laser beams for patient alignment at the diagnostic device. The phantom is used to check the alignment of the laser planes on the isocentre.

5 Operation and control

5.1 Safety instructions

**WARNING****Danger to patients in the case of restricted eyelid closure reflex**

If a patient's eyelid closure reflex is restricted or if his/her head is immobilised, the patient's eyes may be damaged if the laser is directed at them.

- Make sure that the operating and adjusting equipment as well as the specified methods are used as described.
- Inform the patients about the lasers and instruct them to keep their eyes closed during the positioning process.
- Make sure that restricted patients keep their eyes closed during the positioning process.

**WARNING****Risk of injury due to exposure to the laser beam of class 2 lasers**

These lasers can be considered harmless up to a radiation time of 0.25 s, including for the eye. The emitted laser radiation is in the visible portion of the spectral range.

- Never look directly into the laser beam.
- Close your eyes immediately and turn away if the beam strikes your eye.
- Prevent specular reflections.
- Never point the laser beam at people's faces.

**WARNING****Danger to the patient due to incorrect radiation exposure as a result of incorrect marking**

If an adjustment is not carried out or is carried out incorrectly, the patient will be marked incorrectly.

- Check the path of the laser beam every day and as the specific need arises (especially if the devices collide with other objects).
- If faults are discovered, carry out an adjustment of the lasers.

5.2 Prerequisites for use of the laser system in clinical settings

- The transverse laser planes are vertical and run coplanar to each other.
- The coronal laser planes are aligned horizontally and run coplanar to each other.
- The sagittal laser plane is vertical and aligned orthogonally to the transverse laser planes.
- All laser planes intersect at the virtual isocentre (with a diagnostic device) or the actual isocentre (with a treatment device).
- The laser lines are focussed in the isocentre.

5.3 Switching the laser system on and off

- Personnel:
- Clinical user
 - Physical-technical users

Switching on

- ▶ Turn on the master switch.

Switching off

- ▶ Turn off the master switch.

5.4 Checking the beam path of the lasers

- Personnel:
- Physical-technical users

The laser system must be switched on for the following checks.

Performing the paper test

- ▶ Hold a sheet of paper in the beam path of the laser planes at different positions in the room.
- ⇒ The coronal laser planes must appear as a single line at every position. The transverse laser planes must appear as a single line at every position.

Checking the vertical alignment

- ▶ The vertical alignment of the sagittal and transverse laser planes is checked using a plumb line or a self-levelling laser.

Checking the horizontal alignment

- ▶ The horizontal alignment of the coronal laser plane is checked using a spirit level or a self-levelling laser.

Checking the orthogonal path

- ▶ The orthogonal path of the sagittal laser plane relative to the transverse laser plane is checked using an angle iron or a self-levelling laser.

At the diagnostic device: Scanning the phantom

- ▶ The scanning of the phantom helps ensure that all laser planes intersect the virtual isocentre and that the transverse laser planes run parallel to the scanning plane of the diagnostic device [↪ For procedure see p. 23.](#)

At the treatment device: Performing a starshot or Winston-Lutz test

- ▶ Check whether all laser planes intersect the isocentre.

If the check reveals that the laser beams are not aligned correctly, the lasers must be adjusted [↪ For procedure see p. 27.](#)

5.4.1 Performing a scan with a phantom

The check ensures the following:

- The parallelism of the machine's scanning planes to the transverse laser plane
- The alignment of the laser beams on the virtual isocentre of the machine



The test with the phantom can also indicate whether the gantry has rotated or whether the patient couch is twisted or sagging.

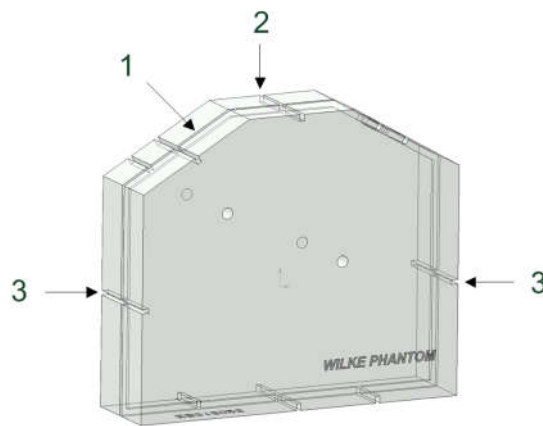


Fig. 9: Wilke phantom

- 1 Circumferential groove for the transverse line
- 2 Groove for the sagittal line
- 3 Groove for the coronal line

Checking the adjustment of the laser for a diagnostic device

Prerequisite: The laser system is switched on. The patient couch has been moved out of the CT scanner.

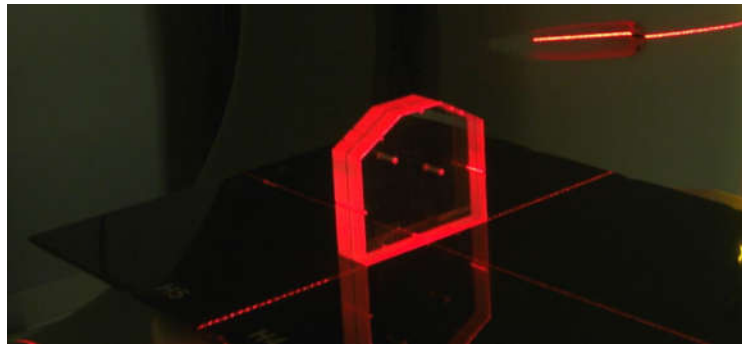


Fig. 10: Phantom in laser light (transverse line not in groove) – shown in the example with red laser light

1. ▶ Position phantom vertically on the patient couch, at right angles to the longitudinal axis of the couch.
2. ▶ Check the verticality with the spirit level and vertically align phantom if required using appropriate aids.
3. ▶ Move the phantom on the couch until the sagittal line passes through the upper groove and the transversal line through the circumferential groove.
4. ▶ Adjust the height of the couch until the coronal lines run through the two lateral grooves.
5. ▶ Set the home position of the CT scanner to the current couch position.
6. ▶ Move the couch by the defined Y-offset into the CT scanner.
7. ▶ Perform the scan with the minimum slice thickness (< 1 mm; scanned area approx. ± 5 mm around the value of the Y-offset).

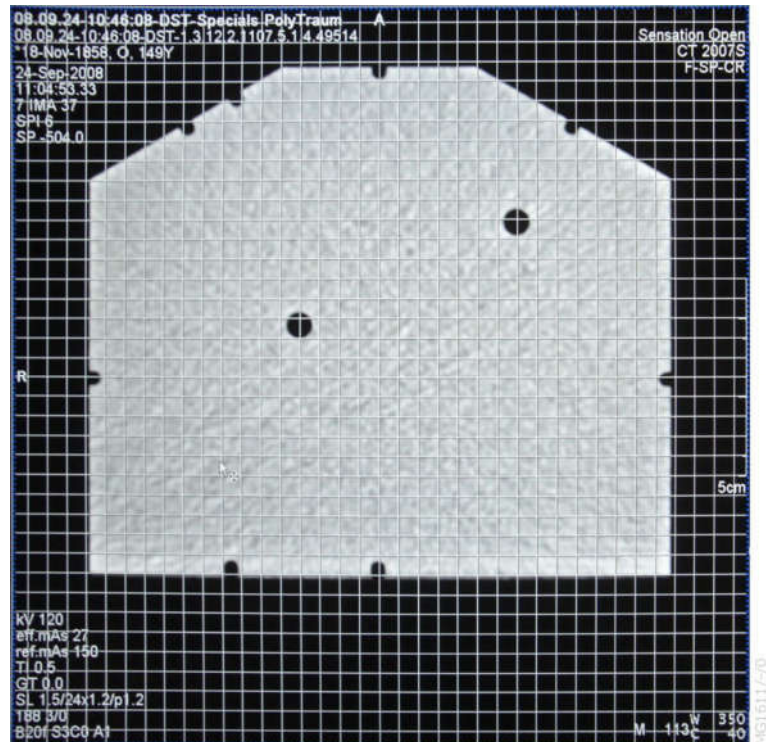


Fig. 11: Phantom in initial CT image (outside of the circumferential groove)

8. ▶ Check the initial CT image using the grid.

- ⇒ If the result is optimal, the horizontal zero reference plane of the CT scanner will pass exactly through the centre of the lateral grooves (shown). The sagittal zero reference line will pass exactly through the centre of the upper and lower grooves (shown).

If the result is not optimal, move the patient couch out of the CT scanner and perform the following checks, making corresponding adjustments if required: alignment of phantom, path of couch movement, adjustment of laser. Once you have done this repeat the scan.

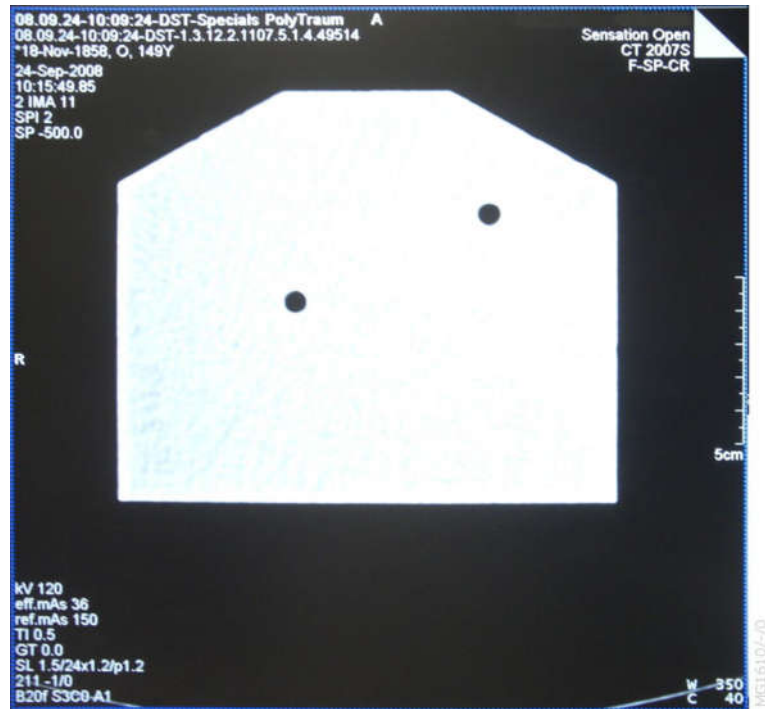


Fig. 12: Phantom in centre CT image (within the circumferential groove)

9. ▶ Check the CT images from the centre of the phantom scan (e.g. with 11 slices, the sixth slice).
 - ⇒ If the result is perfect, the CT image will be sharp and no grooves will be identifiable. The scan has been performed in the circumferential groove of the phantom. The couch position specified at the time of scanning the centre CT image is precisely the value of the Y-offset.
- If the result is not optimal, move the patient couch out of the CT scanner and perform the following checks, making corresponding adjustments if required: alignment of phantom, path of couch movement, couch inclination, adjustment of laser, compliance with defined Y-offset when moving the couch into the CT scanner. Once you have done this repeat the scan.

6 Adjustment

Adjustment steps

Personnel: • Physical-technical users

Prerequisite: Before a laser is adjusted it must first be activated using the remote control.

1. ▶ Focus the laser beams.
2. ▶ Align the laser planes.
3. ▶ Check the adjustment.

6.1 Safety instructions



WARNING

Risk of injury due to exposure to the laser beam of class 2 lasers

These lasers can be considered harmless up to a radiation time of 0.25 s, including for the eye. The emitted laser radiation is in the visible portion of the spectral range.

- Never look directly into the laser beam.
- Close your eyes immediately and turn away if the beam strikes your eye.
- Prevent specular reflections.
- Never point the laser beam at people's faces.



WARNING

Danger to the patient due to incorrect radiation exposure as a result of incorrect marking

If an adjustment is not carried out or is carried out incorrectly, the patient will be marked incorrectly.

- Perform the adjustment carefully then check the beam path of the laser.



IR radiation of external devices may interfere with the signals of the remote control. Switch external devices off during the adjustment.

6.2 Control elements of the IR remote control

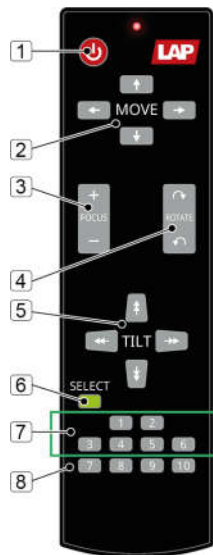


Fig. 13: IR remote control key assignment

- | | |
|---|--|
| 1 | : Switching the laser on and off |
| 2 | <MOVE> : Parallel moving of the laser beam |
| 3 | <FOCUS> : Focusing of the laser beam |
| 4 | <ROTATE> : Rotation of the laser beam |
| 5 | <TILT> : Tilting of the laser beam |
| 6 | <SELECT> : Selection of the laser to be adjusted in conjunction with one of the <1> to <6> keys |
| 7 | <1> to <6> : Selection of the laser to be adjusted in conjunction with the <SELECT> key |
| 8 | <F7> to <F10> : No function |

6.3 Activating a laser

Before a laser can be focussed or aligned, it must first be activated using the IR remote control.

Prerequisite: The master switch of the laser system has been switched on.

1. ▶ Briefly press the **<SELECT>** key on the IR remote control twice. Then press the key assigned to the laser (digits 1 - 6).
⇒ The green LED becomes brighter, signalling successful activation.
2. ▶ Start the adjustment within 60 s; otherwise the adjustment mode will be deactivated automatically.



As long as an activated device is receiving signals from the remote control, the green LED on the device flashes.

If the LED of an activated device stops flashing, no signal is being received. This can be caused by insufficient power in the batteries of the remote control.

6.4 Focusing the laser beams

If the projection of a laser beam does not appear perfectly in focus on the surface, the laser must be focussed. The **<FOCUS>** keys on the IR remote control are used to focus the laser.

1. ▶ Activate the laser.
2. ▶ Press and hold the **<FOCUS>** keys until the focus has been adjusted on the target plane in the isocentre area and the line appears perfectly sharp and in focus.

6.5 Aligning the laser planes

Alignment of the laser planes is an iterative process whose steps must be repeated as often as necessary until the alignment is optimised. The alignment of the individual laser planes relative to each other must be repeatedly checked [↗ For procedure see p. 22](#).

Prerequisite: The IR remote control is ready for operation.



WARNING

Danger to the patient due to incorrect radiation exposure as a result of incorrect marking

If the couch position is changed during an adjustment, the patient will be marked incorrectly.

- Make sure that the couch remains in the same position at all times when adjustments are in progress.

1. ▶ Align the transverse planes.
2. ▶ Align the coronal planes.
3. ▶ Align the sagittal plane.

Alignment of the individual planes is described below. For a cross-hair laser the coronal plane (wall unit) and the sagittal plane (ceiling unit) are aligned when the transverse plane is aligned. The plane must nevertheless be adjusted to the isocentre.

Aligning the transverse plane at the ceiling unit

1. ▶ Use the **<TILT>** keys to adjust the laser plane so that it runs vertically.
2. ▶ Use the **<ROTATE>** keys to adjust the laser plane so that it runs parallel relative to the scanning plane.
3. ▶ Use the **<MOVE>** keys to adjust the laser plane to the position of the isocentre.

Aligning the transverse plane with a wall unit

1. ▶ Use the **<ROTATE>** keys to adjust the laser plane so that it runs vertically.
2. ▶ Use the **<TILT>** keys to adjust the laser plane so that it is aligned parallel relative to the scanning plane.
3. ▶ Use the **<MOVE>** keys to adjust the laser plane to the position of the isocentre.

Aligning the coronal plane

1. ▶ Use the **<ROTATE>** keys to adjust the laser line until the line projected forward runs horizontally.
2. ▶ Use the **<TILT>** keys to adjust the laser plane so that it is horizontal.
3. ▶ Use the **<MOVE>** keys to adjust the laser plane to the position of the isocentre.

Aligning the sagittal plane

1. ▶ Use the **<ROTATE>** keys to adjust the laser plane so that it runs vertically.
2. ▶ Use the **<TILT>** keys to adjust the laser plane so that it runs orthogonal relative to the scanning plane.
3. ▶ Use the **<MOVE>** keys to adjust the laser plane to the position of the isocentre.

6.6 Checking the adjustment

For information on checking the adjustment see the chapter on checking the beam path of the laser [↪ For procedure see p. 22.](#)

7 Maintenance

This chapter provides you with all product-related care and maintenance information.

To ensure the product works perfectly, make sure that the work described is carried out regularly by trained specialist personnel. The frequency depends on the on-site conditions. Adapt the intervals specified in the maintenance table accordingly as needed.

7.1 Table of maintenance tasks

Interval	Maintenance work	Personnel
Daily	☞ Chapter 5.4 Checking the beam path of the lasers on page 22	Physical-technical users
Quarterly	☞ Chapter 7.2 Cleaning the optical window on page 31	Maintenance personnel
	☞ Chapter 7.3 Cleaning the devices on page 31	Maintenance personnel

7.2 Cleaning the optical window

The laser can work perfectly only if the optical window is clean. Contamination by dust, water, oil, etc., may cause the device to malfunction.

1. ▶ Disconnect the system from the mains power supply.
2. ▶ Carefully remove all solid foreign substances from the window using a lint-free cloth to avoid scratching it.



NOTICE

Danger of damaging the device

Liquids can damage the device

- Ensure that no liquid gets into the device while working on it.

3. ▶ Now clean the window with a new lint-free cloth and customary window cleaning agent. Apply a small amount of window cleaning agent to the cloth so that it is slightly damp.

7.3 Cleaning the devices

Keep the devices clean in accordance with the regulations at your clinic.

**WARNING****Electric shock hazard**

If too much liquid is used during cleaning, it can penetrate into the device/power supply unit. This can pose an electric shock hazard for persons.

- Disconnect the device from the power supply.
- Use a small amount of liquid for cleaning.
- Ensure that no liquid gets into the device/power supply unit.

1. ▶ Disconnect the device from the power supply.
2. ▶ Clean the device/power supply unit with a lint-free cloth. If dry cleaning is insufficient, use water, ethyl alcohol or isopropanol as needed. Apply a small amount of the liquid to the cloth so that it is slightly damp.

7.4 Maintenance by LAP

The post-manufacturing processes for LAP products include rigorous functional tests to meet the highest quality standards. The laser safety, electrical safety and mechanical safety are all reviewed against the current standards and state of the art.

In order to prolong laser life and to offer the highest level of product performance, LAP recommends you check the product's performance parameters annually and perform any necessary calibration or adjustments.

For more information, please contact Technical Service at LAP

🔗 [For contact information see p. 41.](#)

8 Troubleshooting

If you cannot rectify an error by performing the measures listed in this chapter, please consult your local dealer or LAP [↗ For contact information see p. 41.](#)

8.1 Safety instructions



WARNING

Risk of injury due to exposure to the laser beam of class 2 lasers

These lasers can be considered harmless up to a radiation time of 0.25 s, including for the eye. The emitted laser radiation is in the visible portion of the spectral range.

- Never look directly into the laser beam.
- Close your eyes immediately and turn away if the beam strikes your eye.
- Prevent specular reflections.
- Never point the laser beam at people's faces.



NOTICE

Danger of damaging the device

The device contains highly sensitive components that could be damaged if handled incorrectly.

- Do not repair the device yourself!
- If repairs are necessary: Notify your local dealer or LAP [↗ For contact information see p. 41.](#)
- After repair work is performed on the devices, have qualified staff ensure their operational safety.

8.2 Troubleshooting table

Fault description	Cause	Remedy
Laser system does not work.	Master switch is turned off.	Turn on the master switch.
	Plug-in power pack is not plugged in correctly.	Plug in the plug-in power pack. For information on the electrical connections, please refer to the installation instructions for the laser system.
The laser projection is out of focus.	Optical window is dirty.	↗ Chapter 7.2 Cleaning the optical window on page 31
	Focus is not adjusted correctly.	↗ Chapter 6.4 Focusing the laser beams on page 29
Laser projection is not in required position.	Laser beam is not correctly aligned.	↗ Chapter 6.5 Aligning the laser planes on page 29

Fault description	Cause	Remedy
The green LED does not flash when the device is controlled using the remote control.	Insufficient power in the batteries of the remote control.	🔗 Chapter 8.3 Replacing the batteries in the IR remote control on page 34
The yellow LED flashes slowly.	Saving of the IR address has failed.	Save the IR address again. For information on saving the IR address, please refer to the installation instructions for the laser system.
Laser projection is fading.	The laser module is old.	Consult your LAP service partner 🔗 For contact information see p. 41.

8.3 Replacing the batteries in the IR remote control

If the batteries are discharged, the laser devices can no longer be adjusted correctly. Then all batteries must be replaced [🔗 Battery information on p. 36.](#)

1. ▶ Open the cover plate. The cover plate is located on the rear side of the remote control.
2. ▶ Take all batteries out of the battery compartment.
3. ▶ Insert new batteries.
4. ▶ Put the cover plate back on to close the battery compartment.
5. ▶ Dispose of used batteries in an environmentally friendly manner.

9 Technical data

Information on ambient conditions applies during operation.

The storage data is provided in the installation manual.

The lasers are suitable for short-term intermittent operation as well as 24-hour continuous operation without restriction.

Electrical data of the APOLLO device

Parameter	Value
Input voltage	24 V DC
Max. power consumption	100 mA

Mechanical data of the APOLLO device

Parameter	Value
International protection rating	IP 20
Dimensions (H x W x D) of device	221 x 110 x 100 mm
Swivel angle of the swivel mount	45°
Weight incl. swivel mount	Approx. 2 kg
Max. weight incl. floor mount	Approx. 15 kg
Dimensions (H x W x D) of floor mount (standard)	1,512 x 225 x 167 mm
Dimensions (H x W x D) of floor mount (XL)	1,712 x 225 x 167 mm
Possible position (height) of the laser module (exit line/cross-hair) for installation with a floor mount (standard)	900 ... 1,400 mm
Possible position (height) of the laser module (exit line/cross-hair) for installation with a floor mount (XL)	1,100 ... 1,600 mm

Ambient conditions during operation

Parameter	Value
Humidity (rel. humidity, non-condensing)	35 ... 80%
Air pressure	800 ... 1,100 hPa
Temperature	15 ... 30 °C
Max. operating height	2,000 m

Optical properties

Parameter	Value for red lasers	Value for green lasers	Value for blue lasers
Laser class	2	2	2
P _{AEL}	< 1 mW	< 1 mW	< 1 mW
Type of laser source	Diode	Diode	Diode
Typical wavelength	638 nm	520 nm	450 nm
Min. line length at a distance of 3 m	3 m	3 m	3 m
Focus range	1 ... 4 m	1 ... 4 m	1 ... 4 m
Max. line width in the focus range (FWHM)	< 1 mm	< 1 mm	< 0.5 mm

Technical data for adjustment of the lasers

Parameter	Value
Moving range	± 15 mm
Rotational range	± 2°
Tilt angle, horizontal	± 2°
Tilt angle, vertical	± 2.5°

The specified values apply to zero-point adjustment of the lasers (at the factory).

IR remote control

Parameter	Value
International protection rating	IP 20
Input voltage	3 V DC
Max. power consumption	1.4 VA
Dimensions (L x W x H)	180 x 50 x 25 mm
Weight incl. batteries	106 g
Batteries	2 x AAA/LR03/Micro

Plug-in power pack

Parameter	Value
Input voltage	100 ... 240 V AC
Frequency	50 ... 60 Hz
Max. input current	500 mA
Protection class	II
Cable length	1.8 m

10 Labelling

10.1 Location of labels

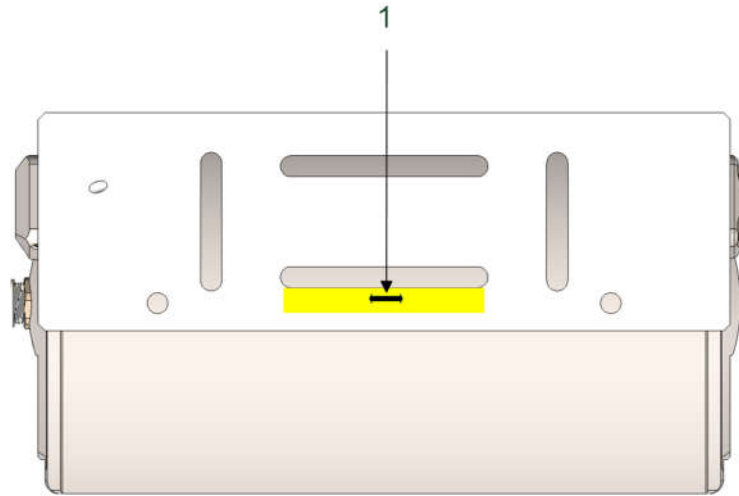


Fig. 14: Location of stickers on rear

1	Isocentre
---	-----------

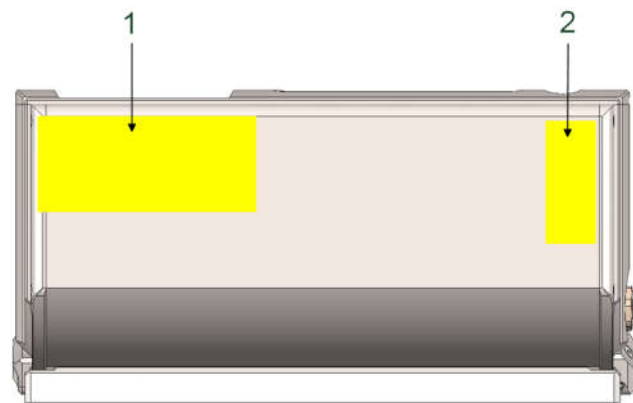


Fig. 15: Location of stickers on left side

1	Type plate
2	Laser warning label

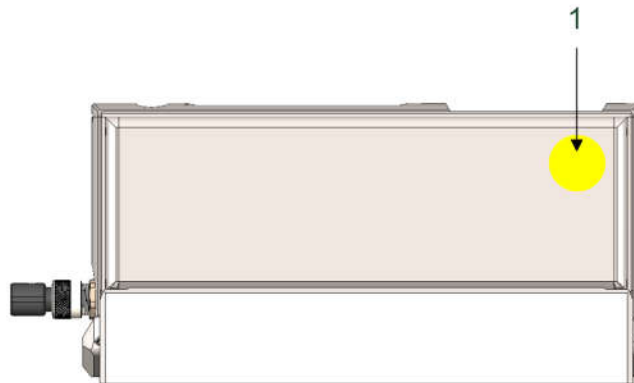


Fig. 16: Location of stickers on right side

- | | |
|---|----------------------------------|
| 1 | Sticker: "Read operation manual" |
|---|----------------------------------|

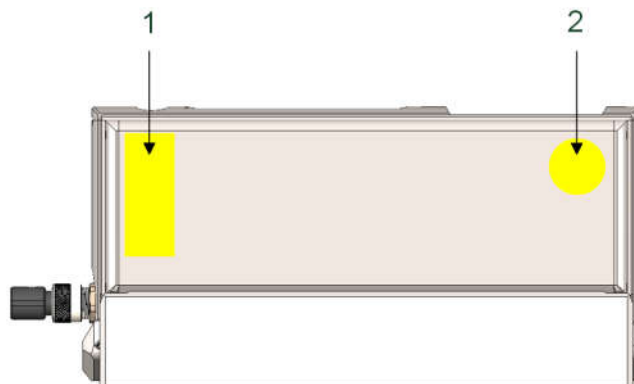


Fig. 17: Location of stickers on right side (special rule for USA and Canada)

- | | |
|---|---|
| 1 | Laser warning label in second language (USA and Canada) |
| 2 | Sticker: "Read operation manual" |

10.2 View of labels

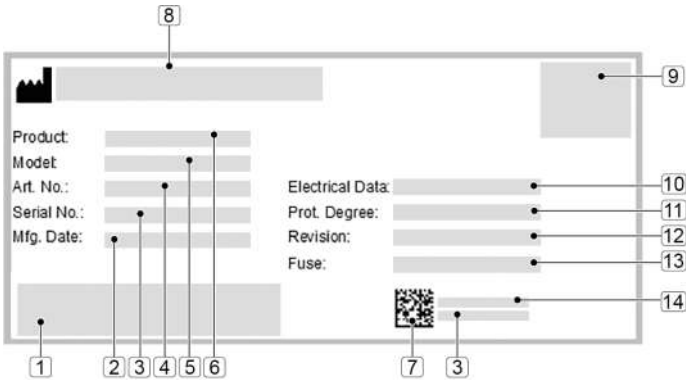


Fig. 18: Type plate (example)

- | | |
|----|---------------------------------|
| 1 | Symbols: approvals and logos |
| 2 | Manufacturing date |
| 3 | Serial number |
| 4 | Product number |
| 5 | Model designation |
| 6 | Product designation |
| 7 | GS1 DataMatrix (UDI) bar code |
| 8 | Company address |
| 9 | Company logo |
| 10 | Electrical data |
| 11 | International protection rating |
| 12 | Revision |
| 13 | Electrical fuse data |
| 14 | Device identification number |

Selected symbols from the approvals and logos area



	CE labelling
	Medical device



Fig. 19: Laser warning label (example)



Fig. 20: Test certificate: NRTL (Nationally Recognized Testing Laboratory) (example)



Fig. 21: Sticker: Read operation manual

11 Addresses

**Germany LAP Office, Company
Head Office and Technical
Service:**



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Germany
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Fax Service Healthcare: +49 (0)4131 9511-396
E-Mail Service Healthcare: service.healthcare@lap-laser.com
Website: <http://www.lap-laser.com>

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12 Glossary

EMC	Abbreviation for "electromagnetic compatibility". EMC tests are performed to ensure that the electromagnetic waves emitted by different devices do not cause them to interfere with one another. To this end, both the stray radiation transmitted by a device and the device's own susceptibility to foreign stray radiation are minimised.
Focussing	Focussing refers to the process of adjusting the sharpness of a beam, projection or image.
International protection rating	Classification of devices as defined in the IEC 60529 standard which states the protection rating against the ingress of solid objects and water. The "IPxx" classification indicates the protection with two digits. The first digit states the degree of protection against solid objects, the second states the degree of protection against water. The higher the number, the higher the protection rating.
IR	Abbreviation for infrared, i.e. light invisible to the human eye which has a larger wavelength than visible red.
Machine	The product is intended for use with a medical device. This medical device is referred to as a "machine" in this document.
Owner	The owner is any natural or legal person who uses the product either himself/herself or on whose behalf the product is used. The owner can authorise a representative to exercise his/her rights and responsibilities.
P_{AEL}	P _{AEL} indicates the accessible emission limit and describes the performance characteristics for classification of the laser safety.
Protection class	The classification of devices defined in IEC 61140. The protection class defines how the user is protected from electric shock. There are four classes: class 0 (no protection), class I (protective earthing), class II (protective insulation) and class III (use of safety extra-low voltage).
Self-levelling laser	Laser device which can be used to project laser lines, laser cross-hairs or laser dots. The projected lines are automatically levelled horizontally and vertically.
UDI	Abbreviation for unique device identification. UDI is a global system for uniform product labelling of medical devices.
Virtual isocentre	Laser-aided alignment and marking take place outside the machine. To this end, a virtual isocentre is defined that is located at a certain distance from the isocentre; this distance depends on the external geometry of the machine. After alignment, the patient couch is moved to the machine's isocentre by this amount (also referred to as Y-offset).
X-ray marker	Stickers with X-ray absorbing material. X-ray markers are used in the medical sector with patients or measuring equipment for marking purposes.

Y-offset

Distance between the isocentre plane (scanning plane of the diagnostic device) and the virtual isocentre plane (laser) [mm].

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Instructions for installation preparation

APOLLO

Laser system for patient alignment

Read the instructions prior to performing any task!

Keep this manual for future reference.

Translation of the original

MAN-1359 Rev. 4-en_GB, 2019-11, 0013417-0008

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Subject to technical changes.

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1 General information

Dear Customer,

This document is designed to help you plan your new product optimally and prepare the installation. The ideal positioning and functional linking of the components of a laser-based patient alignment system largely depend on the room conditions.

This document provides information on the installation preparations, which must be carried out by the customer before the APOLLO laser system is installed.

We aim to continuously improve the quality of our documentation. If you have any questions or requirements with regard to this document, please contact us at techdoc@lap-laser.com.

You may request additional copies of this document from LAP.

This document is a translation from the German original.

1.1 Validity

This document is valid for:

Model	Product number	Revision
APOLLO red cross-hair	0014621-0001	4.2.1
APOLLO red line	0014621-0002	4.2.1
APOLLO red line 90°	0014621-0003	4.2.1
APOLLO green cross-hair	0014621-0004	4.2.1
APOLLO green line	0014621-0005	4.2.1
APOLLO green line 90°	0014621-0006	4.2.1
APOLLO blue cross-hair	0014621-0007	4.2.1
APOLLO blue line	0014621-0008	4.2.1
APOLLO blue line 90°	0014621-0009	4.2.1



It is also valid for later, higher versions of the products, unless this document has been replaced by a newer version.

2 Overview



Fig. 1: Laser system in use with a treatment device (example)

The LAP APOLLO laser system is used to align the patient during radiotherapy. It is used with devices for treatment planning (CT, PET) and with therapeutic devices for radiotherapy (LINAC, proton therapy, cobalt devices).

The number of lasers integrated into a system, and how the laser devices are arranged and installed in the room, depends on the intended use of the system and on the room conditions at the installation location.

The laser planes/lines projected by the laser system are called sagittal, coronal or transverse planes/lines, depending on their position relative to the patient.



The coordinate system in accordance with the IEC 61217 standard serves as the reference system for the laser system.

3 Schematic design and scope of delivery

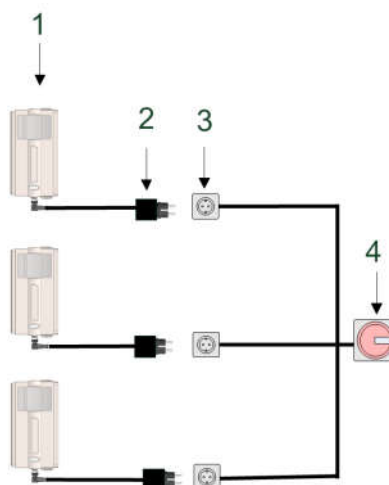


Fig. 2: APOLLO connection using a plug-in power pack

- | | |
|---|--------------------|
| 1 | APOLLO device |
| 2 | Plug-in power pack |
| 3 | Socket |
| 4 | Master switch |

Laser system used with treatment device (example)

In the basic configuration, two cross-hair lasers and one line laser are used. The laterally mounted cross-hair lasers generate the coronal and transverse lines. The line laser mounted at the foot end generates the sagittal line. An additional option involves the mounting of a cross-hair laser over the isocentre.

Laser system used with diagnostic device

With a diagnostic device, three cross-hair lasers are mounted in one plane to project the virtual isocentre together. The lateral cross-hair lasers generate the coronal and transverse lines. The ceiling-mounted cross-hair laser generates the sagittal and transverse lines.

3.1 Scope of delivery/components

Single laser device:

- 1 cross-hair laser or line laser with swivel mount
- 1 plug-in power pack
- 1 IR remote control

Set of three lasers for use with a treatment device:

- 2 cross-hair lasers with swivel mount
- 1 line laser with swivel mount
- 3 plug-in power packs
- 1 IR remote control

Set of four lasers for use with a treatment device:

- 3 cross-hair lasers with swivel mount
- 1 line laser with swivel mount

APOLLO

Schematic design and scope of delivery

- | | |
|--|---|
| | <ul style="list-style-type: none">• 4 plug-in power packs• 1 IR remote control |
| Set of three lasers for use with a diagnostic device: | <ul style="list-style-type: none">• 3 cross-hair lasers with swivel mount• 3 plug-in power packs• 1 IR remote control |
| Optional system components | <p>System components which are necessary to adapt to special room conditions or special requirements:</p> <ul style="list-style-type: none">• Ceiling installation system for suspended ceilings with a depth of up to 1,000 mm• Floor mount• Steel plinth <p>System components that can be used for adjustment of the laser system:</p> <ul style="list-style-type: none">• WILKE phantom (diagnostic device only) |



Optional system components are components which are not included in the standard delivery scope of a system.

4 Process from system planning to installation

During the planning phase, LAP or the businesses authorised by LAP and the customer exchange drawings and information. Once planning is complete, the planned system is approved and a schedule is set. The customer creates the conditions on site for installing the system and sends confirmation to LAP or the business authorised by LAP when all work is complete. The service personnel perform the installation and commissioning on site.

4.1 Providing information for developing the system configuration

To be able to develop an appropriate system configuration for your situation and determine the installation locations of the devices, LAP or the business authorised by LAP requires corresponding information from you.

Please provide LAP or the business authorised by LAP with the following information and drawings:

- Contact information (of the owner, of the project manager for planning and the delivery address)
- Information and documents regarding the treatment/diagnostic device (device type, data sheets)
- All true-to-scale drawings for the installation location (view from above, side views, ceiling view and layout of the rooms) in one of the following formats:
 - DXF
 - DWG (AC1014, AUTOCAD R14 or later)

The true-to-scale drawings show the following positions:

- Exact position of the treatment or diagnostic device in the room
- Exact position of the isocentre/virtual isocentre in the room
- Exact position of doors, windows and changing cubicles in the room
- Exact position of all built-in components on, in and behind the walls, such as cupboards, washbasins and cable, air-conditioning and sanitary ducts in the ceiling and floor, as well as radiators, pipes, supply lines, earthed wall sockets, etc.
- Exact position of lights in the room
- Exact height of room

Information regarding the ceiling/walls/floor:

- Type of raw ceiling, e.g. hollow chamber ceiling, precast concrete ceiling, vaulted/brick ceiling, concrete ceiling
- If the ceiling is a suspended ceiling: type of ceiling, e.g. closed plasterboard ceiling, grid ceiling, x-ray ceiling, walk-on ceiling; distance between raw ceiling and underside of suspended ceiling
- Type of wall: masonry (brick, lime sandstone, etc.), concrete wall (with or without lining), etc.
- Type and construction of floor: e.g. concrete floor, false floor

- Thickness of screed and/or insulating layers
- Underfloor heating system installed: yes/no
- If a false floor is installed: information on height

LAP or the business authorised by LAP normally sends the proposed system configuration to you as electronic data (e.g. DWG format).



LAP or the business authorised by LAP cannot start specific planning until the required information has been received.

4.2 Approving the planning

Once the planning is complete and you are satisfied with the result, the planning documents, including drawings, must be approved by all project managers. The approval is a prerequisite for delivery of the system according to the planning.

The planning approval includes the following points:

- Schedule confirmed by both parties
- Confirmation of the order by **LAP or the business authorised by LAP**

Without approval, installation may be delayed.



Once the planning is approved, no amendments can be made, for instance to the location or orientation of the treatment/diagnostic device, as this invalidates the planning. Furthermore, no built-in components which could interfere with the configuration and function of the laser devices may be installed in the room.

Following approval, you may begin carrying out the preparations for installation.

5 Planning and carrying out preparation for installation

Prerequisite

- The system configuration has been completely planned.
- The planned system configuration has been approved by LAP or a business authorised by LAP and the customer.

5.1 Installation requirements for the laser devices

In general, mechanical ambient conditions of class 3M1 (IEC 60721-3-3) must be met for proper operation.



The effects of the drilled holes on the radiation protection may need to be evaluated.

Wall installation

A prerequisite for wall installation is a solid, non-vibrating wall. Direct installation on lightweight walls is not permitted, since the projection accuracy cannot be guaranteed. For walls other than concrete (e.g. solid brick or building brick) a second lock nut is screwed on between the mounting plate and the wall. No supply lines or ducts may be located in the wall in the immediate vicinity of the installation surface (approx. 200 mm around the centre axis of the device).



Alternatives for lightweight walls

- Install the laser device with floor mount.
- If there is a solid wall behind the lightweight wall: build a wall niche (niches must be suitably dimensioned).

Ceiling installation

A prerequisite for ceiling installation is a solid, non-vibrating ceiling. Direct installation on suspended ceilings is not permitted, since otherwise the projection accuracy cannot be guaranteed. No supply lines or ducts may be located in the ceiling in the immediate vicinity of the installation surface (approx. 200 mm around the centre axis of the device).



Alternatives for suspended ceiling

- Mount a ceiling installation system on the solid raw ceiling.
- Install niches (must be suitably dimensioned).
- Install two line lasers on the wall instead of a cross-hair laser on the ceiling, or install a line laser on the wall instead of a line laser on the ceiling.
- Make structural changes (must be planned in consultation with LAP). The structural changes must provide sufficient stability and load-bearing capacity and must not be subject to vibrations.

Floor installation

A prerequisite for floor installation is a horizontal, smooth concrete floor. Direct installation on screed or false floors is not permitted, since the projection accuracy cannot be guaranteed. No supply lines or ducts may be located in the floor in the immediate vicinity of the installation surface (approx. 200 mm around the centre axis of the device).



Procedure for existing screed floor

- Remove the screed and insulation at the attachment location and fill in with concrete.



Alternatives for false floor

- Install the steel plinth.
- Make structural changes (must be planned in consultation with LAP).



Alternatives if supply lines or cable ducts run under the installation surface

- Install a steel plate with a minimum thickness of 12 mm on top of the installation surface.

Installation in niches

Laser devices can be installed in niches in walls or ceilings. The niches must be created in accordance with the transverse axis. The laser beam exits at an angle (angle of radiation). Select the niche dimensions so that the laser beam is not blocked.

The required size of the niche depends on the size of the laser device, the installation angle and the depth of the niche. The deeper the niche, the more space which is required.

Examples:  [Dimensioned drawings starting on p. 16](#)



Observe that when a laser device is swivelled, the niches must not be arranged symmetrically relative to the transversals!

5.2 Preparing the power supply

In order to be able to establish the electrical connection with the devices at the time of installation, you must ensure that the required connections are available.



The installation of the electrical system is not part of the delivery scope and cannot be carried out by the LAP installation personnel.

A (centrally-switched) socket must be installed near the specified installation locations of the laser devices. Whenever possible, sockets should be installed below the anticipated installation point, taking the length of the cable on the plug-in power pack into account [↪ Technical data on p. 14](#).

The following criteria must be met for installation on-site:

- At least one power supply of class > 15 in accordance with IEC 60364-7-710 for medical locations is available.
- A separate socket per device with the required operating voltage (see technical data) has been installed in the room.
 - The sockets can be switched on/off via a common master switch meeting the requirements of IEC 60447. In addition the master switch must comply with the creepage distances and clearances specified in IEC 61058-1 for a peak nominal voltage of 4 kV.
 - The cable to the master switch and the cables between the master switch and the sockets have been permanently installed.

6 Prerequisites for carrying out the installation

The prerequisites that must be met at the time of installation are:

- The installation location is accessible and has been prepared for the installation as specified in the planning documents.
- A structural analysis of the ceiling, wall, floor and substructure has been carried out to verify their load-bearing capacity and confirmation of this is available. The building structures are suitable for the planned types of installation.
- Holes may be drilled at the installation locations specified in the installation drawing. There are no cables or pipes in the immediate vicinity of these installation locations. The effects of the drilled holes on the radiation protection have been evaluated.
- The power supply for all laser devices has been installed, including a master switch.
- The treatment/diagnostic device is installed and has been put into operation.
- The attachment materials and installation aids to be provided as per the agreement are available.
- The treatment/diagnostic room will be fully available during the installation period. The temperature of the room is within the range prescribed for operation of the laser devices ↪ *"Ambient conditions during operation" on page 14.*
- No vibrations should occur during precision adjustment of the laser devices.

Persons who must be present, or available at short notice, during installation and commissioning:

- Contact person or stand-in.
- Person who can operate the treatment device/diagnostic device.
- Personnel to be trained, if required

7 Technical data

Information on ambient conditions applies during operation.

The storage data is provided in the installation manual.

The lasers are suitable for short-term intermittent operation as well as 24-hour continuous operation without restriction.

Electrical data of the APOLLO device

Parameter	Value
Input voltage	24 V DC
Max. power consumption	100 mA

Mechanical data of the APOLLO device

Parameter	Value
International protection rating	IP 20
Dimensions (H x W x D) of device	221 x 110 x 100 mm
Swivel angle of the swivel mount	45°
Weight incl. swivel mount	Approx. 2 kg
Max. weight incl. floor mount	Approx. 15 kg
Dimensions (H x W x D) of floor mount (standard)	1,512 x 225 x 167 mm
Dimensions (H x W x D) of floor mount (XL)	1,712 x 225 x 167 mm
Possible position (height) of the laser module (exit line/ cross-hair) for installation with a floor mount (standard)	900 ... 1,400 mm
Possible position (height) of the laser module (exit line/ cross-hair) for installation with a floor mount (XL)	1,100 ... 1,600 mm

Ambient conditions during operation

Parameter	Value
Humidity (rel. humidity, non-condensing)	35 ... 80%
Air pressure	800 ... 1,100 hPa
Temperature	15 ... 30 °C
Max. operating height	2,000 m

APOLLO

Technical data

Optical properties

Parameter	Value for red lasers	Value for green lasers	Value for blue lasers
Laser class	2	2	2
P _{AEL}	< 1 mW	< 1 mW	< 1 mW
Type of laser source	Diode	Diode	Diode
Typical wave length	638 nm	520 nm	450 nm
Min. line length at a distance of 3 m	3 m	3 m	3 m
Focus range	1 ... 4 m	1 ... 4 m	1 ... 4 m
Max. line width in the focus range (FWHM)	< 1 mm	< 1 mm	< 0.5 mm

Technical data for adjustment of the lasers

Parameter	Value
Moving range	± 15 mm
Rotational range	± 2°
Tilt angle, horizontal	± 2°
Tilt angle, vertical	± 2.5°

The specified values apply to zero-point adjustment of the lasers (at the factory).

IR remote control

Parameter	Value
International protection rating	IP 20
Input voltage	3 V DC
Max. power consumption	1.4 VA
Dimensions (L x W x H)	180 x 50 x 25 mm
Weight incl. batteries	106 g
Batteries	2 x AAA/LR03/Micro

Plug-in power pack

Parameter	Value
Input voltage	100 ... 240 V AC
Frequency	50 ... 60 Hz
Max. input current	500 mA
Protection class	II
Cable length	1.8 m

8 Technical drawings

APOLLO device

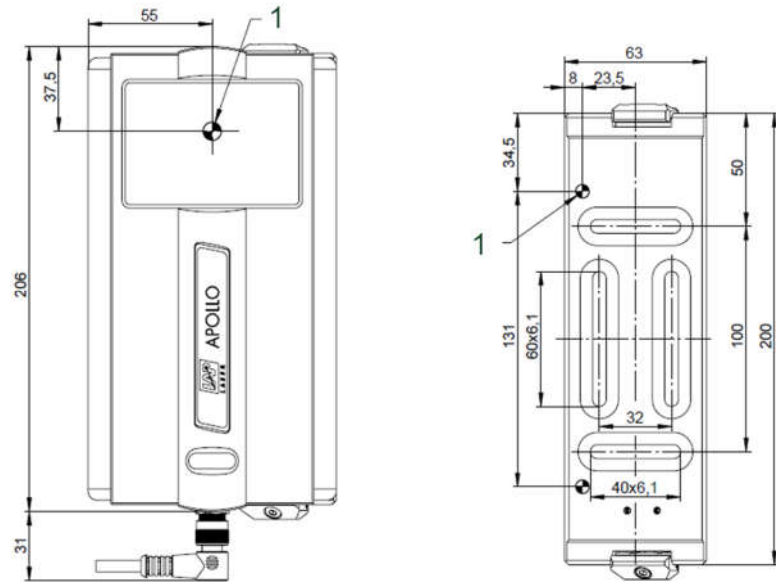


Fig. 3: Laser device and swivel mount – view from front (dimensions in mm)

1 Isocentre

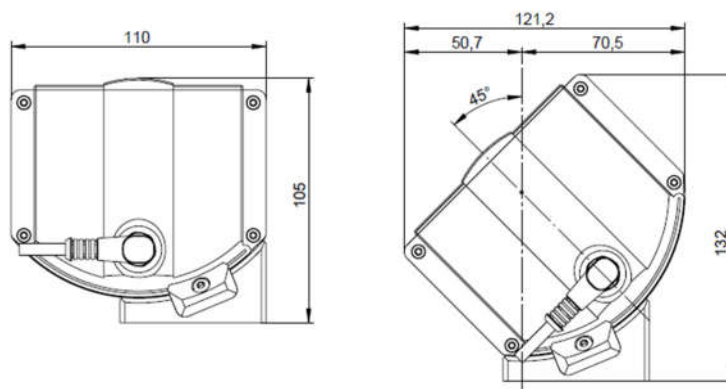


Fig. 4: Laser device with swivel mount – top view (dimensions in mm)

Double swivel mount

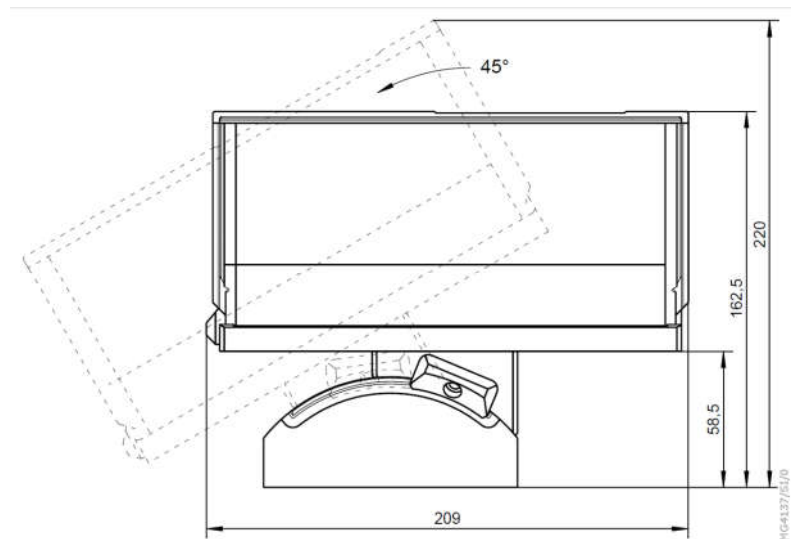


Fig. 5: Double swivel mount with laser device (dimensions in mm)

Ceiling installation system

LAP offers a ceiling installation system which is used to bridge the distance between the solid raw ceiling and the suspended ceiling. It is installed directly on the raw ceiling. The height can be adjusted during installation.

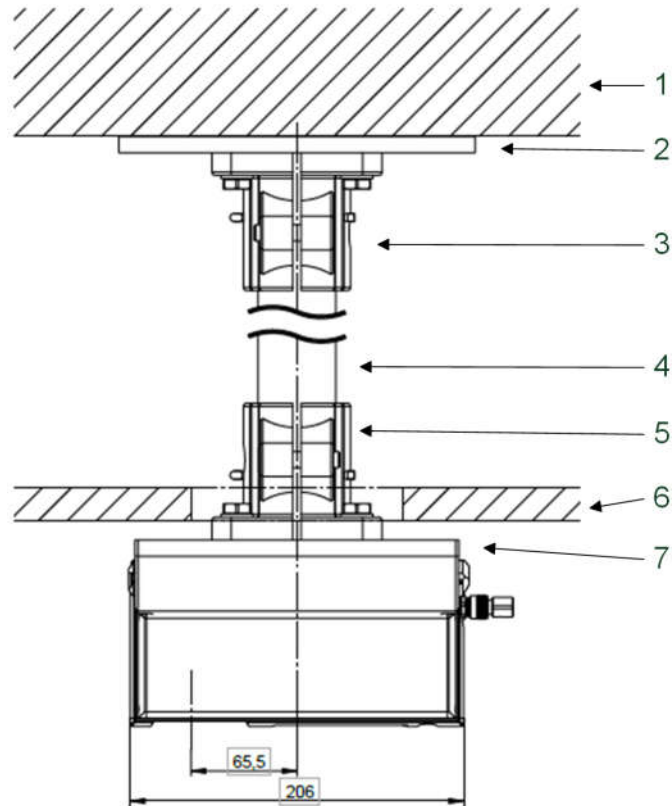


Fig. 6: Ceiling installation system – layout

- 1 Solid ceiling
- 2 Flanged plate
- 3 Base clamping piece
- 4 Steel tube
- 5 Base clamping piece
- 6 Suspended ceiling
- 7 Adapter plate

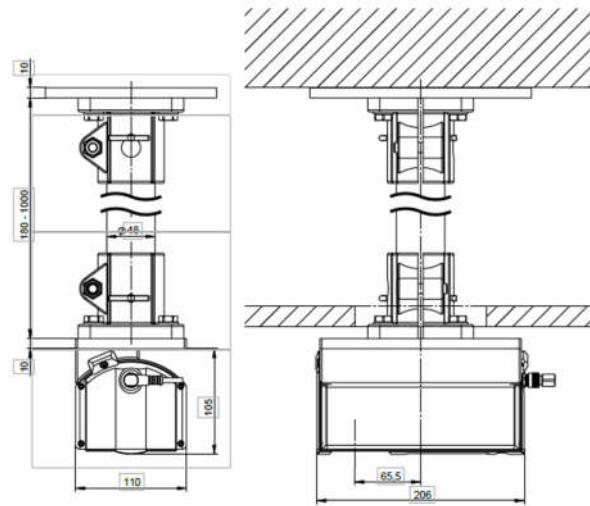


Fig. 7: Ceiling installation system with laser device (dimensions in mm)

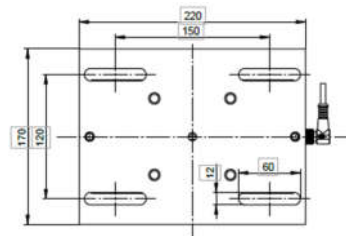


Fig. 8: Ceiling installation system – flanged plate (dimensions in mm)

APOLLO on the floor mount

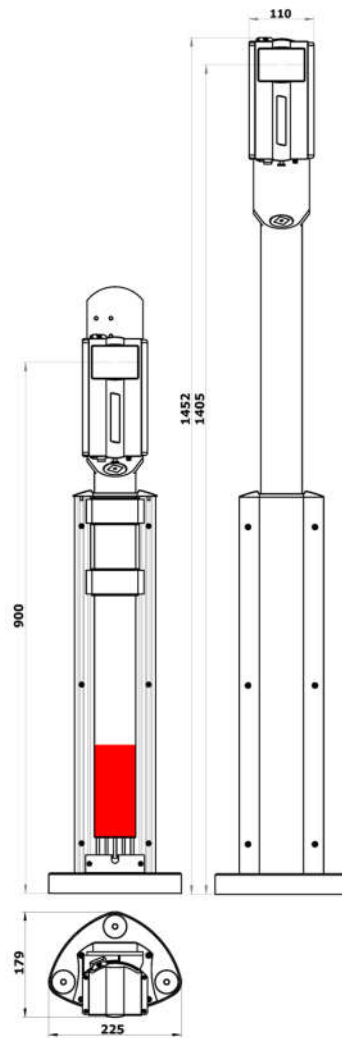


Fig. 9: APOLLO device with swivel mount on the floor mount (standard)
(dimensions in mm)

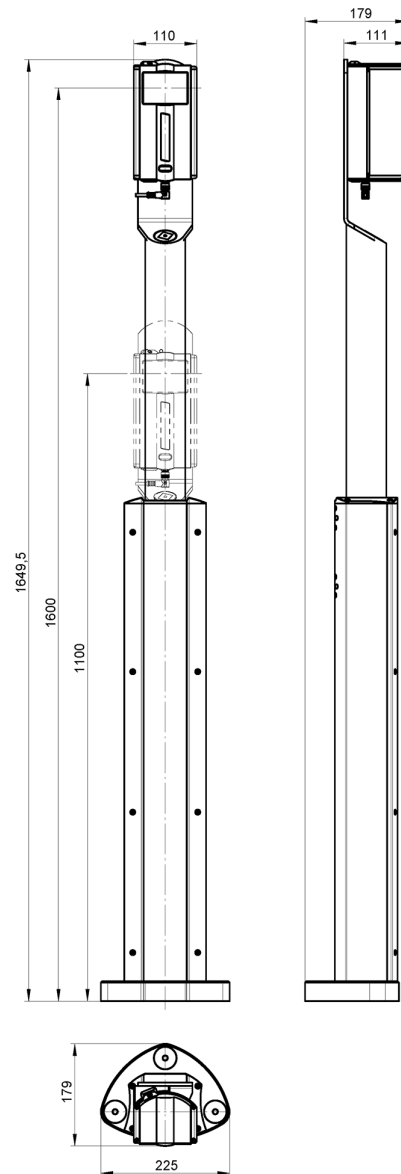


Fig. 10: APOLLO device with swivel mount on the floor mount (XL) (dimensions in mm)

Base plate

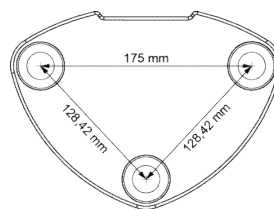


Fig. 11: Base plate (dimensions in mm)

Example of minimum niche dimensions for APOLLO devices

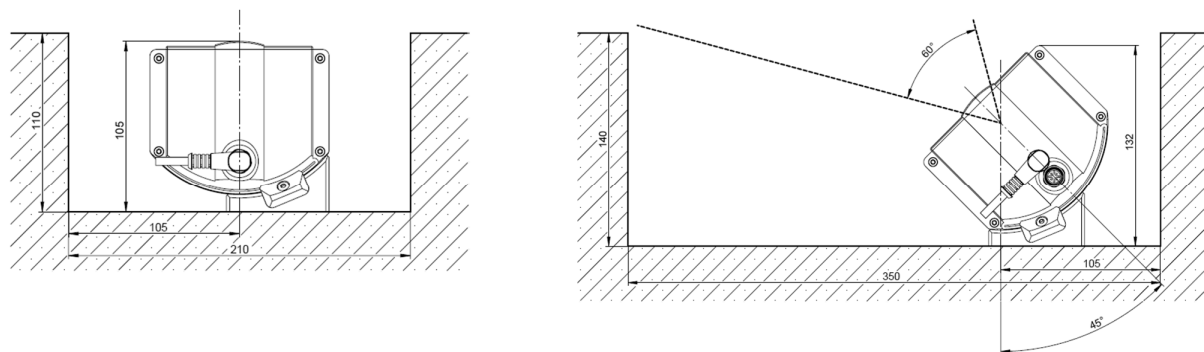


Fig. 12: Width and depth of a wall niche (dimensions in mm)

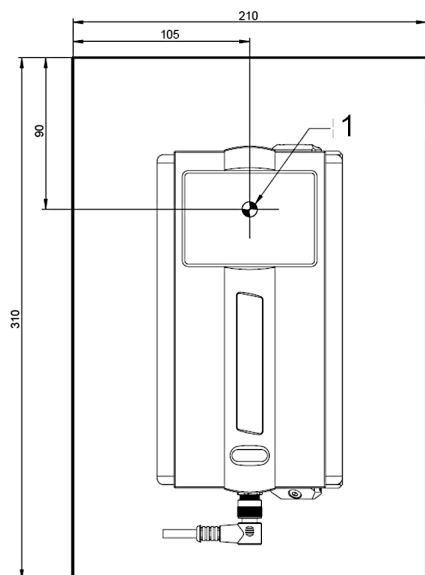


Fig. 13: Height and width of a wall niche (dimensions in mm)

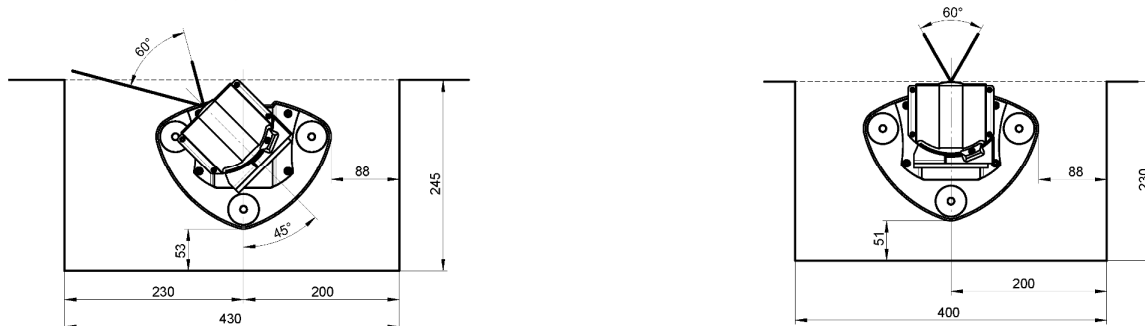


Fig. 14: Width and depth of a wall niche - installation with a floor mount (dimensions in mm)

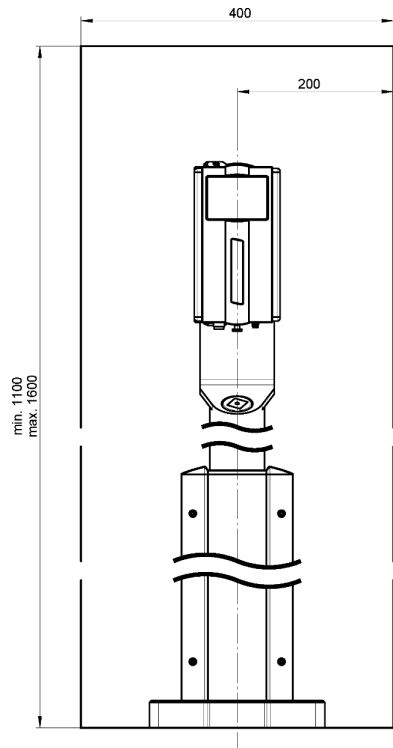


Fig. 15: Height and width of a wall niche – installation with floor mount (standard) (dimensions in mm)

Steel plinth for floor installation

LAP offers a steel plinth which comes in different heights for floor installation with false floors. The steel plinth is mounted directly on the concrete floor. It can be manufactured with a height of 100 ... 500 mm.

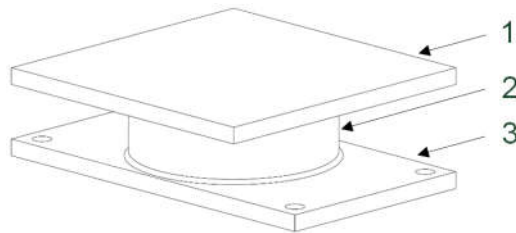


Fig. 16: Steel plinth

- | | |
|---|----------------|
| 1 | Flange plate A |
| 2 | Tube |
| 3 | Flange plate B |

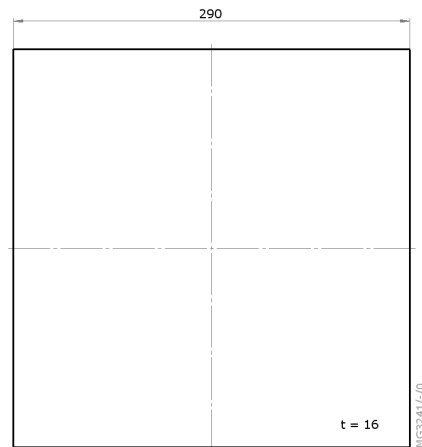


Fig. 17: Steel plinth - flange plate A (square): top view (dimensions in mm)

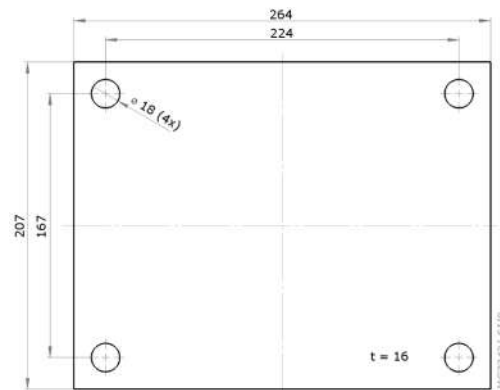


Fig. 18: Steel plinth - flange plate B: top view (dimensions in mm)

9 Addresses

Germany LAP Office, Company Head Office and Technical Service:



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21337 Lüneburg
Germany
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Fax: +49 (0)4131 9511-96
E-Mail: info@lap-laser.com
Fax Service Healthcare: +49 (0)4131 9511-396
E-Mail Service Healthcare: service.healthcare@lap-laser.com
Website: <http://www.lap-laser.com>

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161 Commerce Rd Unit #3
Boynton Beach, FL 33426
USA
Tel.: +1 (561) 416 9250
Fax: +1 (561) 416 9263
E-Mail: america@lap-laser.com

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LAP Laser Applications Asia Pacific Pte Ltd.
750A Chai Chee Road
#07-07 Viva Business Park
Singapore 469001
Tel.: +65 6536 9990
Fax: +65 6533 6697
E-Mail: info-asia@lap-laser.com

China LAP Office:

LAP Laser Applications China Co. Ltd.

镭尔谱激光应用技术（上海）有限公司

East Unit, 4F Building # 10

LujiaZui Software Park

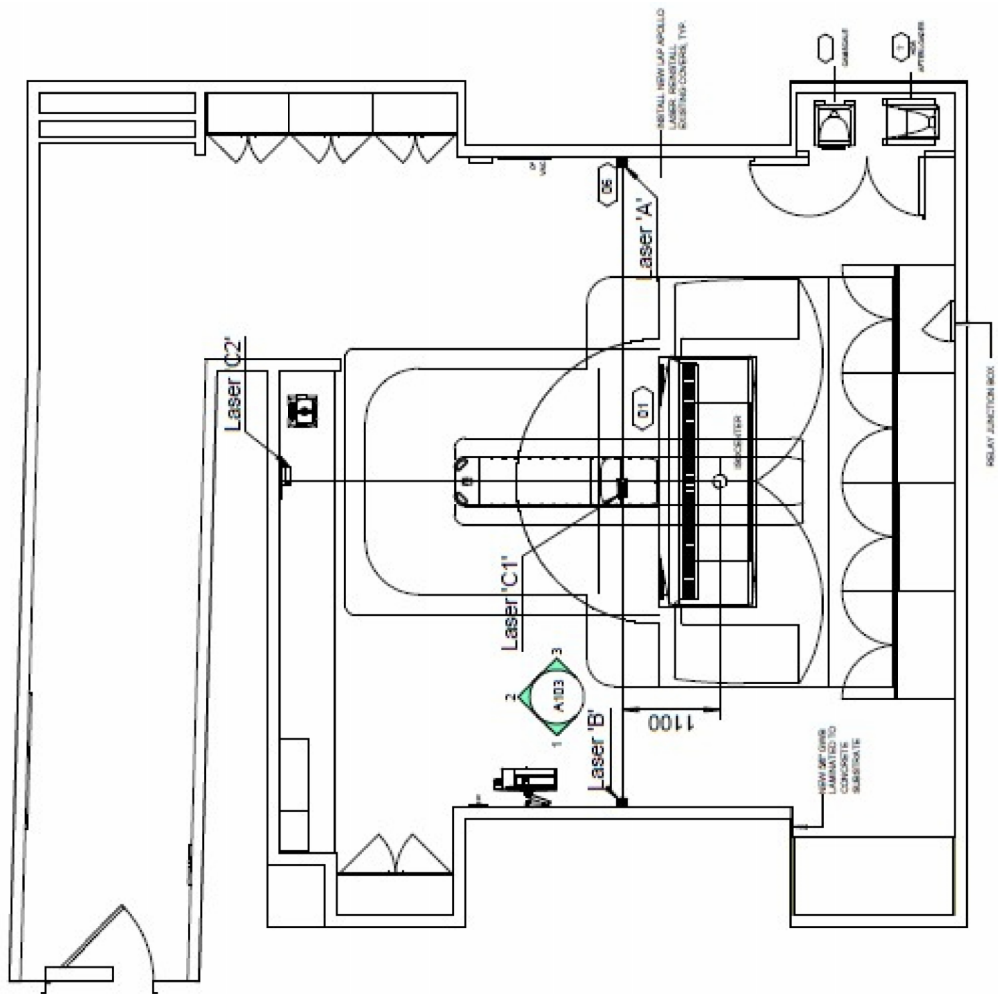
No. 61 Lane 91 EShan Road

Shanghai 200127, P. R. China

Tel.: +86 21 5047 8881

Fax: +86 21 5047 8887

E-Mail: info-cn@lap-laser.com



SECTION 13 49 00
MODULAR RADIATION SHIELDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Radiation protection products including the following:
 - 1. VeriShield® interlocking high density cementitious modular shielding.

1.02 RELATED SECTIONS

- A. Section 05 12 00 - Structural Steel
- B. Section 05 12 10 - Structural Steel Erection
- C. Section 05 50 00 - Miscellaneous Metals
- D. Section 13 50 00 - Radiation Shielded SmartDoor® Entry Systems and Frames.
- E. Section 13 51 00 - Lead Sheets and Lead Plates.

1.03 REFERENCES

- A. Federal Specifications:
 - 1. QQL-171 Grade C.
 - 2. QQL-201 F Grade C.
- B. National Council on Radiation Protection (NCRP):
 - 1. NCRP Report No. 51, "Radiation Protection for Particle Accelerator Facilities".
 - 2. NCRP Report No. 79, "Neutron Contamination from Medical Electron Accelerators".
 - 3. NCRP Report No. 91, "Recommendations on Limits or Exposure to Ionizing Radiation.
 - 4. Structural Shielding Design and Evaluation for Megavoltage X and Gama Ray Radiotherapy Facilities.
- C. Canadian Nuclear Safety Commission (CNSC) Regulatory Guide G-129, Rev.1: All projects in Canada are shielded using the standards from the CNSC Regulatory Guide.

1.04 DEFINITIONS

- A. **Pre-Engineered:** The advance design of shielding elements and room components to maximize performance and compatibility with the overall project parameters.
- B. **Modular/Modules:** Radiation shielding components shall be individual elements or VeriShield modules that are combined to form a composite structure to create the required radiation attenuating environment. The VeriShield modular system shall retain the ability to be deconstructed and reused. The individual modules shall not exceed 45 lb. maximum safe handling limit and shall provide a 100% sine-wave interlocking mechanism with no straight-line joints or seams between modules.
- C. **Interlocking:** All photon, neutron and electron shielding VeriShield modules shall feature a design that presents a full 100% Sine-wave, interlocking mechanism. Lapping or alternating of seams which result in straight line paths and allow radiation streaming will not be permitted. VeriShield modules shall interlock together to form a solid and stable structure comprised primarily of dry stacked module system. Horizontal and vertical structurally reinforced bond beams may be incorporated into module system to create the necessary lateral reinforcement and stability of the entire structure.

- D. **Proper Attenuation:** Shielding of all photon, neutron and electron radiation to the levels specified by the governing regulatory agencies as identified in the final physics report.
- E. **Radiation Shielded Environment:** The overall structure providing the radiation shielding along with associated components such as doors and duct shielding, thus forming the full treatment room.

1.05 SYSTEM DESCRIPTION

- A Design Requirements: The design and construction of the required radiation shielded facility shall be based upon the Veritas Medical Solutions systems and methodologies utilizing VeriShield® ultra high density, high neutron attenuating shielding modules. Shielding contractor shall be responsible for the complete radiation shielding design, material manufacturing and installation of the complete VeriShield modular system inclusive of walls, ceiling protection, floor shielding, shielded SmartDoor, duct shielding, and other penetration shielding as may be required. The design phase shall include:
 - 1. Detailed physics analysis, working from physics parameters set forth by the client. The Veritas modular shielding system shall ensure proper attenuation of emitted radiation fields to limits prescribed by the governing regulatory agencies as a minimum. Should the owner appointed Radiological Health Physicist provide additional parameters or recommendations, the shielding design shall conform to the more onerous requirements. Shielding design will follow the approved physics report for the project.
 - 2. Structure analysis for the walls and ceiling system, and architectural installation details for the modular vault assembly. Note: Foundations and floor slab design shall not be included as part of the shielding contractor responsibility. Foundations and floor slabs shall be designed by project architect and structural and civil engineers, handling all other seismic/foundation design for the main works.
- B Provide and install all items of radiation shielding work as required for neutron, photon or electron radiation attenuation, and provide comprehensive physics report to document the effectiveness of the shielding.
- C Shielding materials must have full traceability and be provided by a single manufacturer regularly engaged in the design and manufacturing of radiation shielded materials. Shielding modules shall be newly manufactured and shall be certified by the manufacturer, that it provides the required radiation attenuation characteristics for neutron and photon radiation at the energy levels required by the design. All shielding products provided must be the same design, manufacturing and installation company to ensure traceability, quality assurance and materials manufactured suitable for use with respect to the radiation producing equipment, energy, patient workload and modality influencing the design.
- D Design, furnish and install complete structural support system as necessary to contain and support all items of required radiation shielding. System shall be designed so as to provide all necessary structural steel support and connections for both lateral and column loads.

1.06 SUBMITTALS

- A Refer to Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Performance data and physical properties.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.

- C. Shop Drawings:
 - 1. Indicate dimensions, description of materials and finishes and general construction.
 - 2. Indicate layout of radiation protected areas.
 - 3. Indicate the thickness of the shielding materials.
- D. Closeout and Maintenance Documents:
 - 1. Closeout Conference: Schedule project closeout conference with sufficient time to prepare for requesting Substantial Completion. This conference shall be attended by the Owner, General Contractor, Shielding Subcontractor, Owner's Testing and Inspection Agency, Architect and all other parties as may be appropriate.
 - 2. Manufacturer shall provide operator manuals, maintenance schedules and contact information as necessary.

1.07 QUALITY ASSURANCE

- A. Qualifications: Firm with minimum of 5 years successful experience manufacturing radiation protection products as specified for this project.
- B. Radiation Protection Survey: Employ Medical or Health Physicist, with experience in the testing of specified radiation protective work and to conduct radiation protection survey of facility.
 - 1. After equipment has been installed and placed in operating condition, the radiation shielding will be tested by a Medical or Health Physicist contracted by the owner and certified by a nationally recognized agency. The Shielding Contractor shall be notified ten (10) days in advance of test to permit verification of shielding integrity.
 - 2. Testing will be performed in accordance with the recommendations outlined by NCRP guidelines and as called for by the radiation shielding experts Testing Protocol Manual. Final testing and acceptance is the responsibility of the owner appointed Radiological Medical or Health Physicist. Radiation shielding integrity testing must be completed within 60 days of project completion.
- C. Radiation Protection Work: Comply with National Council of Radiation Protection (NCRP) Report No. 049 - Structural Shielding Design and Evaluation for Medical Use of Gamma Rays of Energies up to 18 MV.
 - 1. Comply with requirements of local regulatory agencies where local standards and criteria exceed requirements for NCRP Report No. 049.
- D. Single Source Responsibility: Obtain radiation protection materials and accessories produced as standard products from single manufacturer regularly engaged in production of X-Ray shielding materials, equipment, and accessories.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instruction for receiving, handling, storing, and protecting materials.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Owner shall provide adequate area for storage and staging of all materials delivered to the site. Reasonable access to the site must be provided.
 - 2. Any required protection of existing floors, carpets, tile, plumbing/electric stub up fixtures, walls, etc. shall be the responsibility of the Owner/Construction Manager shall provide hard surfaced area suitable for delivery and storage of palletized 2-ton packaged materials.

3. Storage area shall be sufficiently large to store 100% of palletized materials as single pallets. Alternatively, storage area requirements can be reduced by providing hard surfaced storage area capable of supporting double stacked pallets or 4 tons.
 4. While greater than double stacked pallets may be possible, such storing shall not be allowed unless receiving the approval of both owner/CM and shielding supplier to ensure adequacy of both hard surface and pallet design being capable of carrying loads. All routes into the building site to be accessible and capable of supporting the loads noted herein.
- C. Store materials in original packaging, protected from exposure to harmful environmental conditions, including static electricity, and at temperature and humidity conditions recommended by manufacturer.
 - D. Exercise care to prevent edge damage to materials.

1.09 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 PRE-INSTALLATION MEETINGS

- A. There shall be a pre-installation conference at the job site at the beginning of the project, or at least two months prior to linear accelerator's installation to review all requirements of construction including shielding placement, protection and inspection. This conference shall be attended by the Owner, General Contractor, Shielding Subcontractor, Owner's Testing and Inspection Agency, Architect and any other parties as may be appropriate.
- B. Conduct the conference to comply with the requirements in Division 01 Section "Project Management and Coordination". Review methods and procedures related to radiation protection.
 1. The shielding subcontractor shall prepare a comprehensive "Linear Accelerator Construction Plan" addressing all procedures associated with supply and placement of the linear accelerator shielding and associated assemblies. Submit plan to Architect and Owner's Testing and Inspection Agency a minimum of seven (7) days prior to Pre-installation Conference. As a minimum, the "Linear Accelerator Plan" shall address the following:
 - a. Shielding design and door system requirements.
 - b. Consistency of materials.
 - c. Staging, scheduling and access.
 - d. Sufficient plant and field manpower.
 - e. Procedures for placement with sufficient backup equipment.
 - f. Coordination with other trades.
 - g. Inspections and acceptances

1.11 WARRANTY

- A. All work shall be guaranteed for one year against defects in parts, material or workmanship.
- B. Shielding shall be guaranteed all shielded materials are installed as per the recommended practices of the manufacturer and of National Council on Radiation Protection as outlines in handbook #151, #51 (#144) and #49.

- C. System must be designed to provide a 100% guarantee against radiation "Streaming" from radiation emanating from the linear accelerator and any bi-product radiation from neutron or photon scattering or photo neutron production within the room. Isocenter shall be assumed average location for the machine head of the linear accelerator as it rotates to deliver treatment.
- D. Completed shielding installation shall be 100% guaranteed to meet the agreed upon shielding requirements applicable at the time of contract. In the event the shielding would require adjustment following radiation shielding integrity testing, the manufacturer shall perform it immediately. Cost for removal of finishes or to provide reasonable access to installation site shall be at the cost of the owner/construction manager. All parties shall cooperate to find the most cost effective and reasonable method for addressing any shielding issues.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Veritas Medical Solutions, LLC
160 Cassell Road
Harleysville, PA 19438 USA
Phone: +1 484.991.8928
www.veritas-medicalsolutions.com
- B. Substitutions: Not Permitted.

2.02 MATERIALS

- A. Veritas Ultra High-Density Shielding:

VeriShield®: Cementitious modular shielding with a sine wave shape that eliminates straight line seams and provides neutron, proton, and particle attenuation at the joints. Fabricate the dry stacked modular shielding of one of the following densities:
 - 1. Size: V220: 10" inches (254mm) by 5" inches (127mm) by 5" inches (127mm).
 - 2. Size: V250: 10" inches (254mm) by 5" inches (127mm) by 5" inches (127mm).
 - 3. Size: V300: 10" inches (254mm) by 5" inches (127mm) by 5" inches (127mm).
 - 4. Size: V250HT: 10" inches (254mm) by 5" inches (127mm) by 2.5" inches (64mm)
- B. Veritas VPAC System:

When the Veritas VeriShield modular shielding is assembled into stackable packs this is referred to as the Veritas VPAC System.

Preassembled shielding packs reduce the time to construct radiation shielded rooms. The system combines individual Veritas VeriShield blocks into a single structural element that interlocks with other VPAC units to form a solid homogeneous shielding structure.

2.03 MATERIAL CHARACTERISTICS

- A. Veritas VeriShield® Information:

Major Compounds

<u>Chemical Name</u>	<u>CAS Registry Number</u>
Portland Cement	*65997-15-1
Gypsum (calcium sulfate)	13397-24-5
*May contain crystalline silica	14808-60-7

B.	Physical/Chemical Characteristics:	
	Boiling Point	N/A
	Vapor Pressure (mm Hg)	N/A
	Melting Point	N/A
	Vapor Density (AIR-1)	N/A
	Evaporation Rate	N/A
	Solubility in Water	N/A
	Appearance & Odor	Grey, no odor
C.	Fire and Explosion Hazard Data:	None
D.	Reactivity Data:	
	Stability:	Stable
E.	Weight per Module:	
	V220	33 lbs – 14.9 kg
	V250	36 lbs – 16.4 kg
	V300	43 lbs – 19.7 kg
F.	Density:	
	V220	220 lbs/cu ft – 3.52 g/cm ³
	V250	250 lbs/cu ft – 4.0 g/cm ³
	V300	300 lbs/cu ft – 5.0 g/cm ³
G.	Compressive Strength:	2,800 psi – 196 kgf/cm ²
	Solubility:	Insoluble
	Reactivity:	Non-Reactive
	Melting Point:	^2,800° F – 1,538° C
	Boiling Point:	N/A

2.04 RADIATION ATTENUATION

Attenuation is based on interpolated data for some energies. The listed TVL's represent the average tenth value thickness of attenuation. First TVT and equilibrium TVL's may be available for thin barrier sections.

A.	V220 Attenuation-Primary Barrier (TVL=)	
	6MV	9.0" – 22.9 cm
	10MV	10.2" – 25.9 cm
	15MV	11.4" – 29.0 cm
	18MV	11.7" – 29.7 cm
B.	V220 Attenuation-Secondary Barrier (TVL=)	
	6MV	7.4" – 18.8 cm
	10MV	8.0" – 20.3 cm
	15MV	8.7" – 22.1 cm
	18MV	8.7" – 22.1 cm

- C. V250 Attenuation-Primary Barrier (TVL=)
- | | |
|-------|-----------------|
| 6MV: | 8.3" – 21.0 cm |
| 10MV: | 9.4" – 23.8 cm |
| 15MV: | 10.4" – 26.5 cm |
| 18MV: | 10.7" – 27.2 cm |
- D. V250 Attenuation -Secondary Barrier (TVL=)
- | | |
|-------|----------------|
| 6MV: | 6.7" – 17.1 cm |
| 10MV: | 7.4" – 18.7 cm |
| 15MV: | 8.0" – 20.2 cm |
| 18MV: | 8.0" – 20.2 cm |
- E. V300 Attenuation-Primary Barrier (TVL=)
- | | |
|-------|----------------|
| 6MV: | 6.5" – 16.5 cm |
| 10MV: | 7.4" – 18.7 cm |
| 15MV: | 8.2" – 20.8 cm |
| 18MV: | 8.4" – 21.4 cm |
- F. V300 Attenuation-Secondary Barrier (TVL=)
- | | |
|-------|----------------|
| 6MV: | 5.3" – 13.4 cm |
| 10MV: | 5.8" – 14.7 cm |
| 15MV: | 6.3" – 15.9 cm |
| 18MV: | 6.3" – 15.9 cm |

2.05 INTERLOCKING MODULAR BLOCK

- A. VeriShield modules shall be placed at a proper thickness and density to attenuate all photon and neutron radiation produced within the rooms to acceptable levels as prescribed by the physicist of record and other Governing Regulator Agencies. Individual blocks shall be of sufficient size and weight to be easily handled by one person without assistance. No special lifting devices or safety machinery shall be required.
- B. Individual VeriShield modules shall have a sine wave curve and the joint radii shall be designed to present a full design thickness to radiation tangent to any point of the seam. Lapping of individual components used for radiation shielding is not permitted unless it can be shown that the 100% design thickness is maintained.
- C. Interlocking VeriShield modules shall be supplied in two thicknesses so as to allow for the interlocking of the various layers of modules. No wall ties shall be required. Block shall stack to provide a stable, structural construction.
- D. Any penetrations through shielded walls or ceilings by HVAC, plumbing, electrical, etc. shall be coordinated with shielding subcontractor to insure shielding integrity.
- E. Built-In Items: Where other built-in items penetrate shielding, manufacturer shall provide grout as required to maintain the continuity of shielding. Install in accordance with manufacturer's instructions.
- F. Where outlet boxes, junction boxes, ducts, conduit and similar items penetrate shield walls or ceilings, the shielding subcontractor shall provide shielded baffles and or overlaps as required to maintain the integrity of design shielding and eliminate any paths for radiation "streaming" or "channeling" effects.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
- B. Prior to installation of VeriShield interlocking modules, installer shall carefully inspect all prior work of other trades that may impact the installation of VeriShield to ensure that conditions are acceptable.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF VERISHIELD MODULAR SHIELDING

- A. Determine isocenter of each room and layout boundaries for all walls.
- B. Layout of Work: Before starting VeriShield interlocking module installation, layout all walls, (if the VPAC installation is used, verify the location of all steel columns); space individual module coursing accurately based upon manufacturer drawings, and layout course lengths to minimize cutting of interlocking modular.
- C. Installation: Lay first course of VeriShield in full bed of mortar, plumb, true to line and with level courses. Before laying individual unit, be sure to remove any debris, flashing, etc. that may be attached to the module.
- D. Lay all interlocking modules in a modified running bond pattern. See manufacturer drawings for specific details.
- E. Adjust interlocking VeriShield® units to final position while grout is soft and plastic.
- F. If units are displaced after grout has stiffened, remove units, clean joints and reset using fresh grout. Grout joints between interlocking block shall be kept to a minimum (approx. 3/8" thick). Insure that all units are pressed tightly together to insure a good interlocking joint.
- G. Every fifth course, offset units using one half thickness unit to fully interlock with previous layer. Lay interlocking module in a leveling bed of 3/8" maximum thickness of grout. Lay all units plumb, level and true to level in modified running bond as noted on drawings. Strike flush all joints.
- H. If necessary to stop a horizontal run of interlocking modules, rack back one-half unit length in each course.
- I. Pack all voids, intersection areas, etc. with VeriShield high-density grout to insure shielding integrity.
- J. Build in all frames, cable raceways, electrical, plumbing, and HVAC penetrations as required. Pack around all penetrations with high-density grout.
- K. Exposed interlocking units shall be laid in best manner possible with no mortar spilled or smeared on the face of the barrier.

3.03 INSTALLATION OF PENETRATING ITEMS

- A. At penetrations, provide shielding to maintain continuity of protection.
- B. Provide sleeves, shields, and other protection in thickness not less than that required in assembly being penetrated.

3.04 INSTALLATION OF DUCT PENETRATIONS

- A. Duct Penetrations will be located either on the front wall of the vault or on the roof.
 - 1. Where the duct penetration occurs Veritas Medical Solutions, LLC will prepare a plan to attenuate the radiation.
 - a. If the duct penetration occurs along the front wall, the duct shielding will be supported from the wall and roof structure.
 - b. If the duct penetration occurs on the roof, the duct shielding will be supported from the roof structure.

3.05 ACCESSORY INSTALLATION

- A. Comply per the recommendation of Veritas Medical Solutions, LLC.
- B. Wherever radiation protection is penetrated, cut, or punctured, assure continuity by the use of Veritas Medical Solutions, LLC high density VeriShield grout.

3.06 FIELD QUALITY CONTROL

- A. Field Inspection: Owner will engage qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. The erection tolerances are as follows:
 - 1. Shielding: Radiation shielding shall be installed as per final shop drawing approval and shall attenuate all radiation fields to "safe levels" as prescribed in the documents herein.
 - 2. Structural Parameters: Maximum ceiling beam deflection shall be limited to the span $l/240$. System shall be entirely "freestanding" and "relocatable". No attachment to existing structures, walls or slabs for purposes of supporting and transmitting loads will be allowed unless coordinated with and approved by the Architect of Record. Wall ties shall not be used between modules.
 - 3. Mortar used between VeriShield shall be freshly mixed and shall be proportioned with 1 part cement, 1 part lime and 6 cu. ft. sand (Type N mix). Mortar shall comply with ASTM C270 for Type N mortar (750 psi compressive strength).
- B. Correct deficiencies by supplement, or remove and replace, radiation protection that inspection reports indicate does not comply with specified requirements.
- C. Testing: After radiology equipment has been installed and placed in operating condition:
 - 1. Radiation shielding will be tested by a Medical or Health Physicist contracted by the Owner and Certified by a National Recognized Agency. The shielding contractor shall be notified ten (10) days in advance of test to permit verification of shield integrity.
 - 2. Testing will be performed in accordance with the recommendations and guidelines outlined by the NCRP and as called for by the radiation shielding experts Testing Protocol Manual, or in accordance with local guidelines such as Canadian Nuclear Safety Commission (CNSC) Regulatory Guide G-129, Rev 1. Final testing and acceptance is the responsibility of the owner appointed Radiological Health Physicist.
- D. Correct deficiencies by supplement, or remove and replace, radiation protection that testing indicates does not comply with specified requirements, including finishes and other work covering defective work.

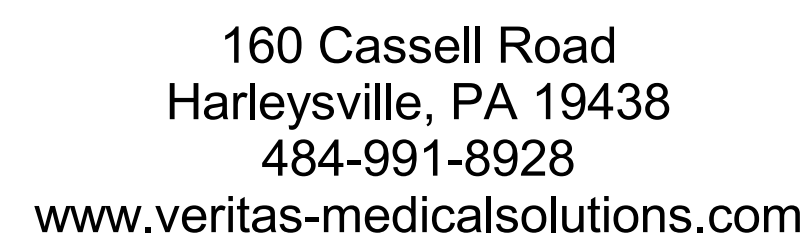
3.07 CLEANING

- A. Remove excess materials from site and leave work areas broom clean.
- B. Leave exposed surfaces ready for site finishing.

3.08 PROTECTION

- A. Limit access to only those persons performing work in radiation protected rooms or as directed by owner.

END OF SECTION 13 49 00



Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada



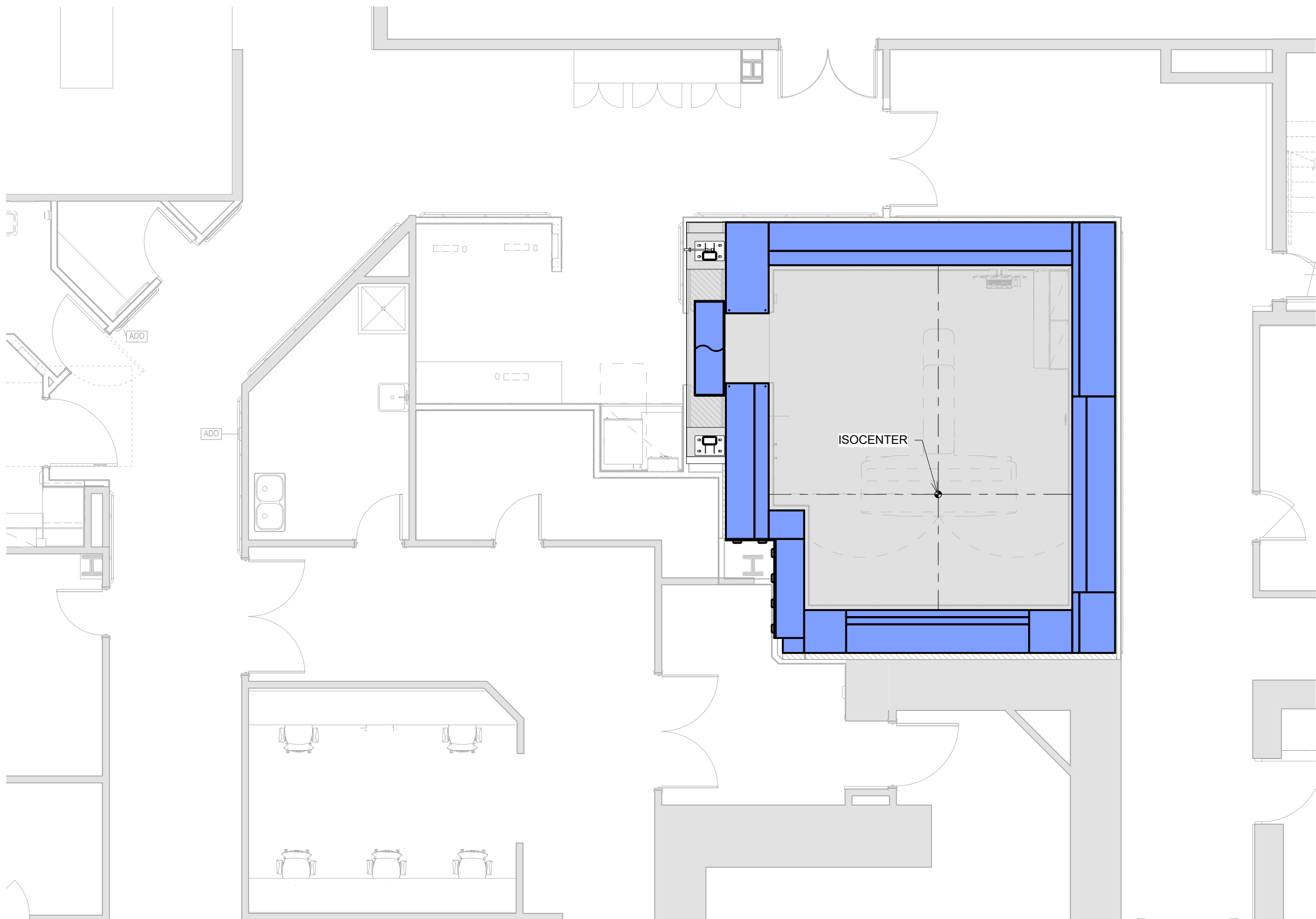
<u>(milestone) SET COORDINATION NOTES:</u>		
<u>COORDINATION ITEM:</u>	<u>PARTY:</u>	<u>COMMENT / ACTION ITEM:</u>
DOSIMETRY (PHYSICS)	(CLIENT/REP)	<u>REVIEW:</u> DOSIMETRY TUBE LOCATION ON (X-110). <u>CONFIRM:</u> IF THE LOCATION IS ACCEPTABLE OR IDENTIFY PREFERRED LOCATION.
DOOR FINISHES	(CLIENT/REP)	<u>REVIEW:</u> DOOR FINISH SELECTION CHART <u>PROVIDED WITH LAYOUT SET.</u> <u>SELECT:</u> PREFERRED FINISH FROM CHART OR PROVIDE ALTERNATE LAMINATE SELECTION *(ALTERNATE SELECTION SUBJECT TO PRICE ADJUSTMENT & POTENTIAL LEAD TIME DELAYS)
DOOR CONTROLS	(CLIENT/REP)	<u>REVIEW:</u> DOOR POWER & CONTROL DIAGRAM <u>PROVIDED WITH LAYOUT SET</u> <u>SK-00x DOOR CONTROL COORDINATION SKETCH.</u> <u>PROVIDED WITH (Milestone) SET</u> DOOR CONTROLS ON <u>SK-00x</u> ARE PLACEHOLDERS
<u>COORDINATE:</u> FINAL DOOR CONTROL LOCATIONS WITH VERITAS		
GENERAL MEP	(CLIENT/REP)	<u>PROVIDE:</u> MIN. REQUIRED UTILITY PENETRATION(S) FOR SERVICES ENTERING/ EXITING SHIELDED TREATMENT ROOM. STANDARD VERITAS PLACEHOLDER PENETRATION OPENING IS 15" HIGH x 50" WIDE. (1) SHIELDED PENETRATION PER VAULT IS ACCOUNTED FOR IN PROPOSAL EXTENT OF SHIELDING AND PENETRATION SHIELD TYPE TO BE COORDINATED .

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VERITAS ESTIMATE # 4614-24
VERITAS PROJECT# 2x-xxx-xxxx

DRAWING TITLE

X000



SCOPE OF WORK - FULL BUILD (VERITAS SHIELDING PACKAGE):

1.

VERITAS SHIELDING SCOPE OF WORK IS LIMITED TO DESIGN, MANUFACTURING, DELIVERING, AND INSTALLING VERISHIELD WALL AND CEILING BARRIERS AND VERITAS SMARTDOOR PRODUCT(S) FOR:
MACHINE VENDOR & MODEL TREATMENT ROOM

PER THE AGREED SCOPE OF WORK SUMMARY DEFINED IN THE PROPOSAL / BUDGET ESTIMATE # **XXXX-XX** , DATED **(mm/dd/yyyy)**
2.

ALL OF VERITAS' SCOPE OF WORK OCCURS ABOVE TREATMENT LEVEL SLAB.
ALL FOOTING, FOUNDATIONS, OR SLAB REINFORCING DESIGN DUE TO APPLIED LOADS FROM SHIELDING OR DOOR PRODUCTS (BY OTHERS).
3.

EXTENT OF INTERIOR FINISHES (BY VERITAS) ARE LIMITED TO:
 - DOOR SHELLS & SHIELD OPENING (EXTENTS VARY PER PROJECT)**
(CLIENT / REP) PLEASE CHOOSE A DOOR FINISH FROM SELECTION CHART. IF A SELECTION CHART HAS NOT BEEN PROVIDED, PLEASE REQUEST ONE FROM THE VERITAS PROJECT MANAGER.
4.

VERITAS' STRUCTURAL CONSULTANTS' SCOPE IS LIMITED TO (ABOVE SLAB) ELEMENTS REQUIRED TO ADEQUATELY SUPPORT VERITAS PROVIDED ITEMS. (VERISHIELD, SUPPLEMENTAL SHIELDING, & SMART DOOR PRODUCTS ONLY).
5.

REFER TO THE STANDARD DOOR PACKAGE(S) FOR:
 - DOOR FINISH SELECTIONS (SUBMITTED SEPARATELY)
 - DOOR POWER & CONTROL INFO (SUBMITTED SEPARATELY)

LOGISTICS & STAGING NOTES:

1.

LOGISTICS FOR PROJECT DELIVERY TO BE COORDINATED WITH VERITAS PROJECT MANAGEMENT TEAM.

PLEASE IDENTIFY:
 - BEST DELIVERY ROUTE (VIA SATELITE IMAGES)
 - UNLOADING LOCATION
 - STAGING / STORAGE AREAS
 - ACCESS PATH FROM STAGING TO INSTALLATION SITE
2.

RESERVE A SECURE PLACE FOR VERITAS STAGING & MATERIAL STORAGE.
3.

PROVIDE CLEAR PATH & FORKLIFT ACCESS FROM STAGING AREA TO TREATMENT ROOM.
4.

KEEP PATH & TREATMENT ROOM AREA CLEAR DURING VERITAS INSTALLATION. DO NOT INSTALL WALLS, FURNITURE, FINISHES, ETC. UNTIL SHIELDING HAS BEEN COMPLETED.
5.

VERITAS TO REVIEW STAGING CONTROL AREA WITH CLIENT AND CONTRACTOR, PRIOR TO THE START OF WORK, TO DETERMINE IF ANY SPECIAL STAGING OR WORKING HOUR RESTRICTIONS APPLY FOR THIS PROJECT (TYP.)

DRAWING REFERENCES:

- PROVIDED BACKGROUNDS:
 - (Source) SHEET/Drawing Name (File Format) - (REC'D mm/dd/201x)**
- SITE PLANNING GUIDE:
 - Vendor/Model (mm/dd/201x)**

GENERAL SCALE NOTE:

THE SCALE OF THE DRAWINGS ARE APPROXIMATE. ALL EXISTING INTERIOR & EXTERIOR WALLS, OPENINGS, ETC. ARE REPRODUCTIONS OF FIELD MEASUREMENTS & OBSERVED EXISTING CONDITIONS PROVIDED BY THE CLIENT / CLIENTS' DESIGN REPRESENTATIVE IN THE FORM OF DIGITAL / ELECTRONIC BACKGROUND DRAWINGS & MODELS OR DATED FIELD VERIFIED NOTES.

EXISTING SITE CONDITIONS NOTE:

ALL EXISTING CONDITIONS TO BE FIELD VERIFIED UPON SITE PREP LAYOUT PRIOR TO COMMENCEMENT OF SHIELDING INSTALLATION.

ANY DISCREPANCIES INCLUDING, BUT NOT LIMITED TO UNIDENTIFIED OBSTRUCTIONS OR CONDITIONS THAT WOULD REQUIRE MODIFICATIONS TO ANY SHIELDING OR SHIELD LOCATION MUST BE IMMEDIATELY BROUGHT TO THE VERITAS TEAMS' ATTENTION PRIOR TO ADVANCING WORK IN THE FIELD.

ISOCENTER NOTE:

ISOCENTER IS THE CONTROL POINT FROM WHICH THE APPROPRIATE SHIELDING DESIGN IS DEVELOPED THROUGH PHYSICS EVALUATION. THIS POINT IS NOT DETERMINED OR LOCATED IN THE FIELD BY VERITAS.

PLEASE ENSURE THAT ISOCENTER IS PROPERLY LOCATED AND IDENTIFIED IN THE FIELD PRIOR TO VERITAS' ARRIVAL FOR SITE LAYOUT ACTIVITIES.

MASONRY GROWTH NOTE:

ALL DIMENSIONS REGARDING VERISHIELD BLOCK & INDIVIDUAL LAYERS OF SHIELDING BARRIERS COMPRISED OF VERISHIELD BLOCK ARE TO BE UNDERSTOOD AS NOMINAL DIMENSIONS ONLY.

EXPECTED GROWTH FACTOR BETWEEN EACH LAYER OF VERISHIELD TO BE APPROXIMATELY 1/8" (3mm) TO ACCOUNT FOR IRREGULARITIES IN SHAPE OF BLOCK & CONSTRUCTION TOLERANCES.

OVERALL SHIELDING BARRIER THICKNESS DIMENSIONS REFLECTED IN VERITAS DRAWINGS TO INCLUDE 1/8" (3mm) SPACE BETWEEN LAYERS TO ACCOUNT FOR THIS ANTICIPATED GROWTH.

SEAL



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Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada

DRAWING ISSUE LOG

#	ISSUE TITLE	Date
1	Sales Set	06/06/2024

VERITAS PROJECT TEAM

SALES REP:

PHYSICIST:

DESIGNER:

PROJECT MANAGER:

VERITAS PROJECT INFORMATION

PROJECT #

PROSPECT #

PHYSICS REPORT:

SHIELDED DOOR(S):

MACHINE:

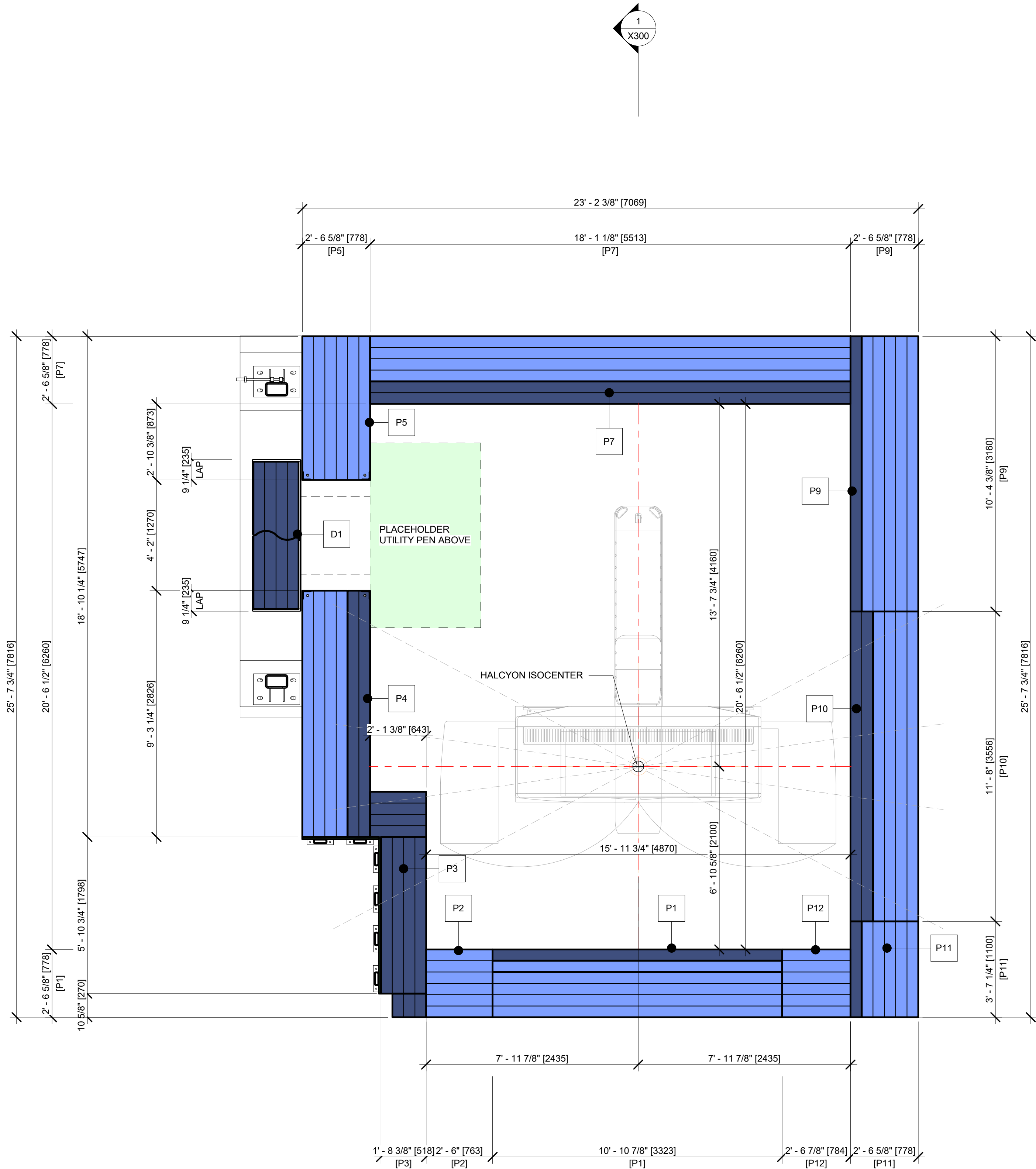
MACHINE ENERGY:

DRAWING TITLE

CONTEXT PLAN

DRAWING NUMBER

X100



1 Wall Shielding Plan
3/8" = 1'-0"

Wall Shield Schedule		
Shielding Region P1 - P12	Type - Layers	Comments
	V220 - 2	
D1	V300 - 4	
P1	V300 - 1	
P1	V250 - 4	
P1	V250 - 1	
P2	V250 - 6 B	
P3	V300 - 3	
P3	V300 - 4	
P3A	1" Pb	
P4	V300 - 2	
P4	V300 - 4 B	
P4	V250 - 4	
P4A	1" Pb	
P5	V250 - 6	
P7	V300 - 2	
P7	V250 - 4	
P9	V300 - 1	
P9	V250 - 5	
P10	V250 - 4	
P10	V300 - 2	
P11	V300 - 1	
P11	V250 - 5	
P12	V250 - 6 B	

SLIDING & BI-PARTING DOOR CAVITY NOTES:

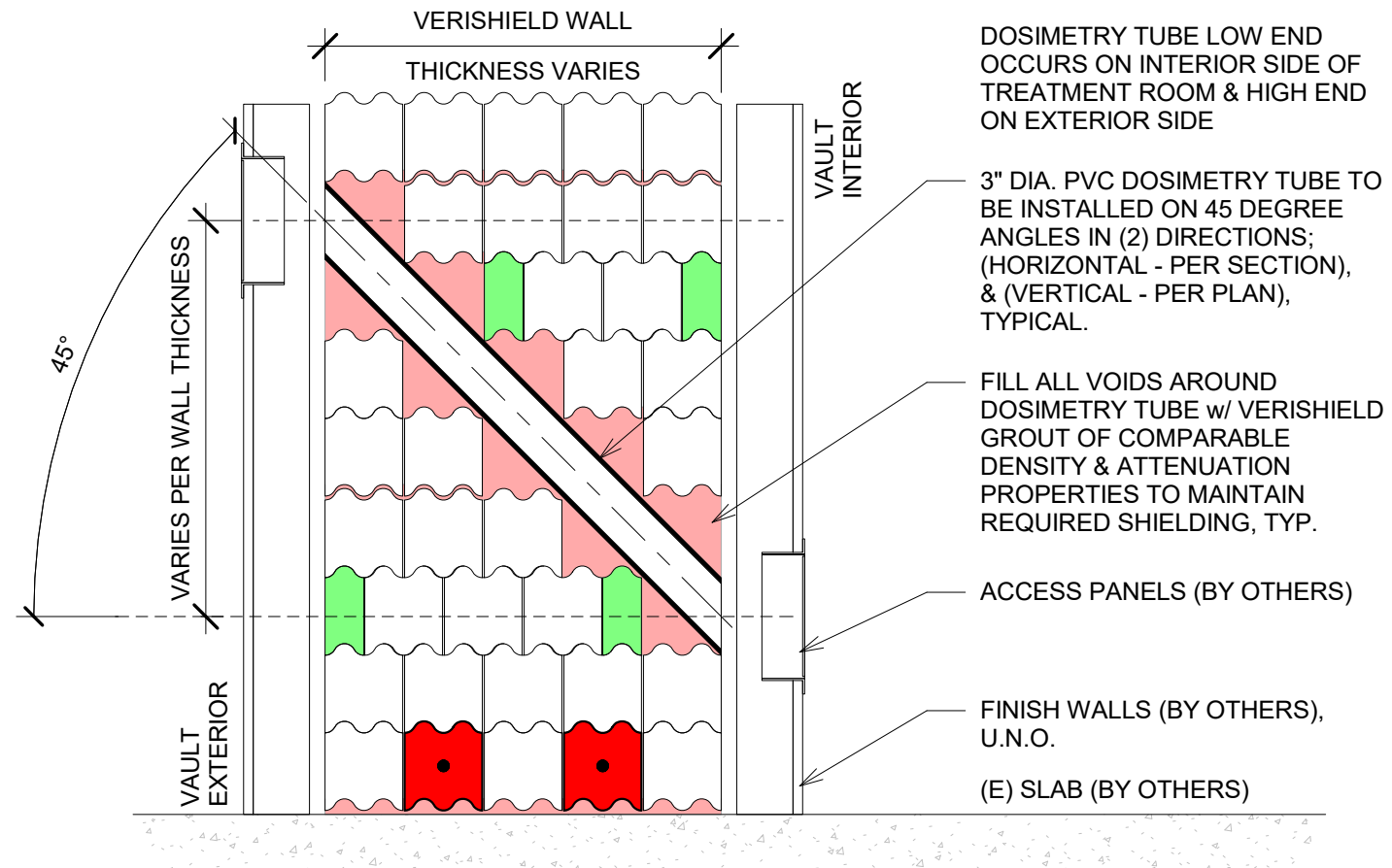
FLOOR SLAB CONDITIONS:

- SLAB REINFORCING / FOUNDATION WORK BY OTHERS
REFER TO SHEET XS-100 FOR DOOR LOAD INFORMATION.
- RECOMMENDED SLAB THICKNESS BELOW DOOR BASE PLATES: 24" (610mm)
REQUIRED MINIMUM SLAB BELOW DOOR BASE PLATES: 18" (457mm)
TYPICAL MIN. DOOR ANCHOR EMBED: 12" (305mm)

* PLEASE COORDINATE LOCATION SLAB REINFORCING OUTSIDE OF BASE PLATE FOOTPRINT TO PREVENT DAMAGE TO REBAR OR DELAYS TO INSTALLATION.
- FINISHED TREATMENT LEVEL FLOOR SLAB CONDITION MUST BE FLAT / LEVEL WITH A TOLERANCE NOT TO EXCEED 1/8" OVERALL WITHIN THE DOOR CAVITY.
- DOOR FINISH CAVITY BY OTHERS.
MINIMUM CAVITY SIZE REQUIREMENTS VARY PER DOOR TYPE & MODEL.
ACCESS IS REQUIRED ON ONE SIDE FOR HAND CRANK & SERVICE.
• RECOMMENDATION: A 2'-6" (762mm) x 7'-0" (2.134m) ACCESS DOOR.
ACCESS IS REQUIRED ABOVE CEILING ALONG THE FRONT OF DOOR SUPPORT BEAM.
• RECOMMENDATION: UTILIZE REMOVABLE CEILING TILES (ACT) OR PROVIDE ACCESS PANELS

STANDARD DOSIMETRY NOTES:

- VERITAS TYPICALLY PROVIDES (1) ONE DOSIMETRY TUBE PER TREATMENT ROOM, U.N.O.
- TYPICAL DOSIMETRY TUBE TO BE NOMINAL 3" (76 mm) MIN. DIAMETER PVC TUBE, U.N.O.
REFER TO PROJECT SPECIFIC PHYSICS REPORT AND DRAWINGS.
- DOSIMETRY TUBES TYPICALLY INSTALLED ON 45 DEGREE ANGLES IN (2) TWO DIRECTIONS (HORIZONTAL PER PLAN & VERTICAL PER SECTION & ELEVATION).
- DOSIMETRY TUBES TO BE ORIENTED IN A MANNER THAT IS PERPENDICULAR TO THE MACHINE ISOCENTER OR SOURCE OF RADIATION.
- DOSIMETRY TUBE TO BE INSTALLED IN A MANNER THAT DOES NOT OBSTRUCT REBAR (VERTICALLY OR HORIZONTALLY) IN BOND BEAMS / WALL REINFORCING CELLS WITHIN VERISHIELD WALLS.
- ALL VOIDS AROUND DOSIMETRY TUBE TO BE FILLED SOLID w/ VERISHIELD GROUT OF COMPARABLE DENSITY & ATTENUATION PROPERTIES OF SURROUNDING BARRIER TO MAINTAIN REQUIRED SHIELDING, TYP. REFER TO PROJECT SPECIFIC PHYSICS REPORT & DRAWINGS.
- DOSIMETRY TUBE TO BE LOCATED IN A SECONDARY SHIELDING BARRIER.
FINAL LOCATION OF DOSIMETRY TUBE TO BE DETERMINED BY CLIENT / CLIENT REPRESENTATIVE.



2 Dosimetry Detail
1" = 1'-0"

SEAL



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DRAWING ISSUE LOG

#	ISSUE TITLE	Date
1	Sales Set	06/06/2024

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PROJECT MANAGER:

VERITAS PROJECT INFORMATION

PROJECT #

PROSPECT #

PHYSICS REPORT:

SHIELDED DOOR(S):

MACHINE:

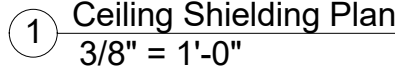
MACHINE ENERGY:

DRAWING TITLE

WALL SHIELDING
PLAN

DRAWING NUMBER

X110



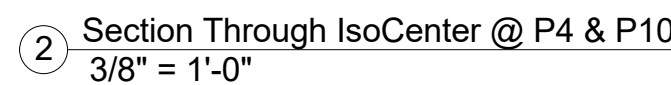
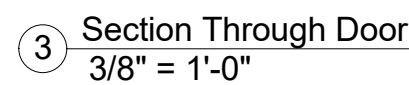
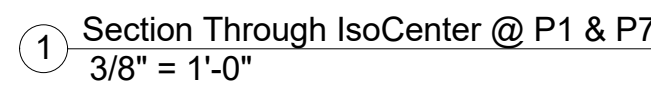
Ceiling Shield Schedule		
Shielding Region C1-3 & L1-2	Type - Thickness	Comments
	V220 - 2	
C1	.5 Fe	
C1	V300 - 2	
C1	6" Pb	
C2	V300 - 3	
C2	.5 Fe	
C2	2.5" Pb	
C3	.5 Fe	
C3	V300 - 3	
C3	1" Pb	

The image shows the Veritas Medical Solutions logo, which consists of the word "veritas" in a bold, blue, sans-serif font, with a stylized orange and blue dot above the 'i'. Below the logo, the text "Medical Solutions" is written in a smaller, blue, sans-serif font. Underneath that, the address "160 CASSELL RD HARLEYSVILLE, PA 19438" is listed, followed by the phone number "(484) 991-8528". At the bottom of the image, the text "CONDITIONS OF USE" is displayed in a bold, black, sans-serif font.

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CEILING SHIELDING PLAN

X130



Wall Shield Schedule		
Shielding Region P1 - P12	Type - Layers	Comments
	V220 - 2	
D1	V300 - 4	
P1	V300 - 1	
P1	V250 - 4	
P1	V250 - 1	
P2	V250 - 6 B	
P3	V300 - 3	
P3	V300 - 4	
P3A	1" Pb	
P4	V300 - 2	
P4	V300 - 4 B	
P4	V250 - 4	
P4A	1" Pb	
P5	V250 - 6	
P7	V300 - 2	
P7	V250 - 4	
P9	V300 - 1	
P9	V250 - 5	
P10	V250 - 4	
P10	V300 - 2	
P11	V300 - 1	
P11	V250 - 5	
P12	V250 - 6 B	
Ceiling Shield Schedule		
Shielding Region C1-3 & L1-2	Type - Thickness	Comments
	V220 - 2	
C1	.5 Fe	
C1	V300 - 2	
C1	6" Pb	
C2	V300 - 3	
C2	.5 Fe	
C2	2.5" Pb	
C3	.5 Fe	
C3	V300 - 3	
C3	1" Pb	

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[illegible]

VERITAS PROJECT TEAM

SALES REP.

PHYSICIST:

DESIGNER:

PROJECT MANAGER: _____

VERITAS PROJECT INFORMATION

PROJECT #

PROSPECT
PHYSICS DE

SHIELDED DOOR(S)

MACHINE:

MACHINE ENERGY:

DRAWING TITLE

100

100

SEC

100

100

100

DRAWING NUMBER

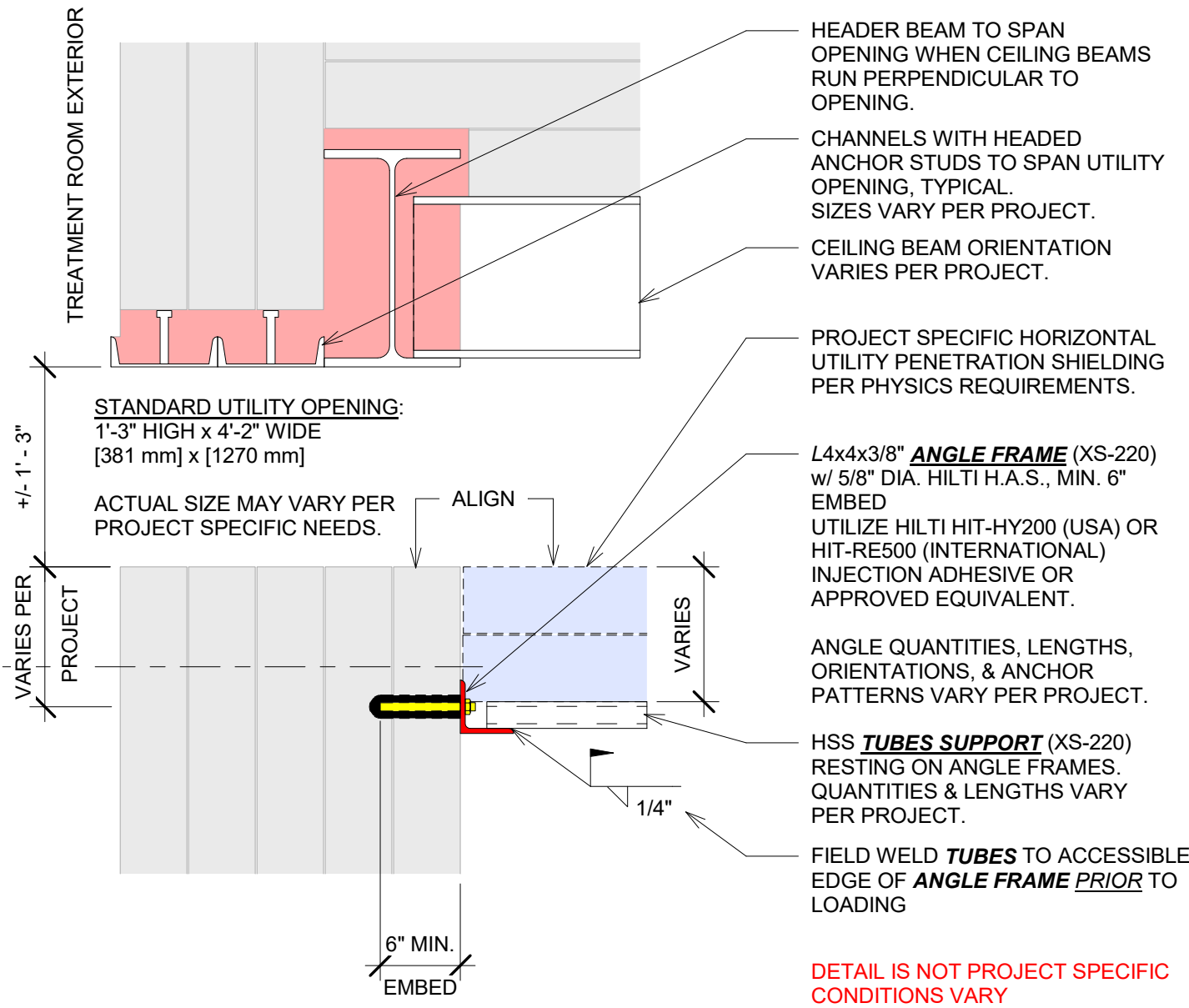
Site with no home

Vr

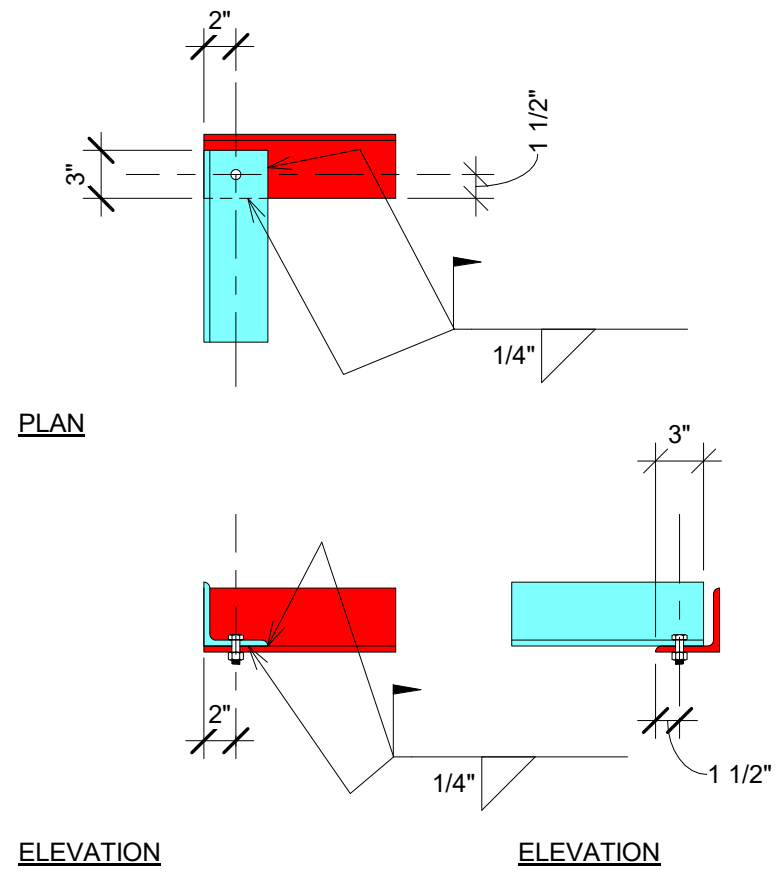
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8 ANGLE FRAME TO WALL DETAIL
1" = 1'-0"



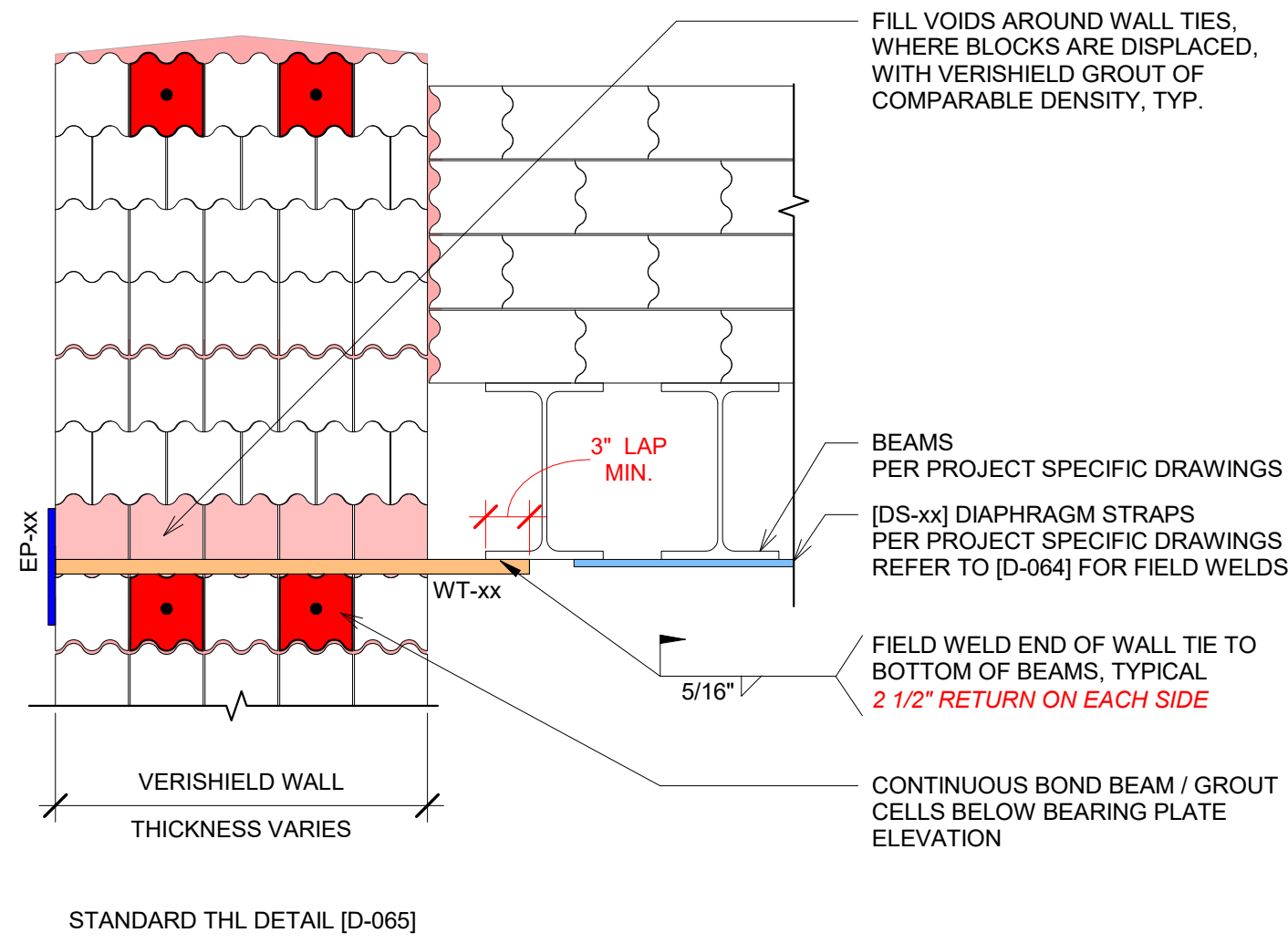
7 ANGLE FRAME BOLTED & FIELD WELDED CONNECTION
1" = 1'-0"

ANCHOR, CONNECTION, & SUPPORT CHART

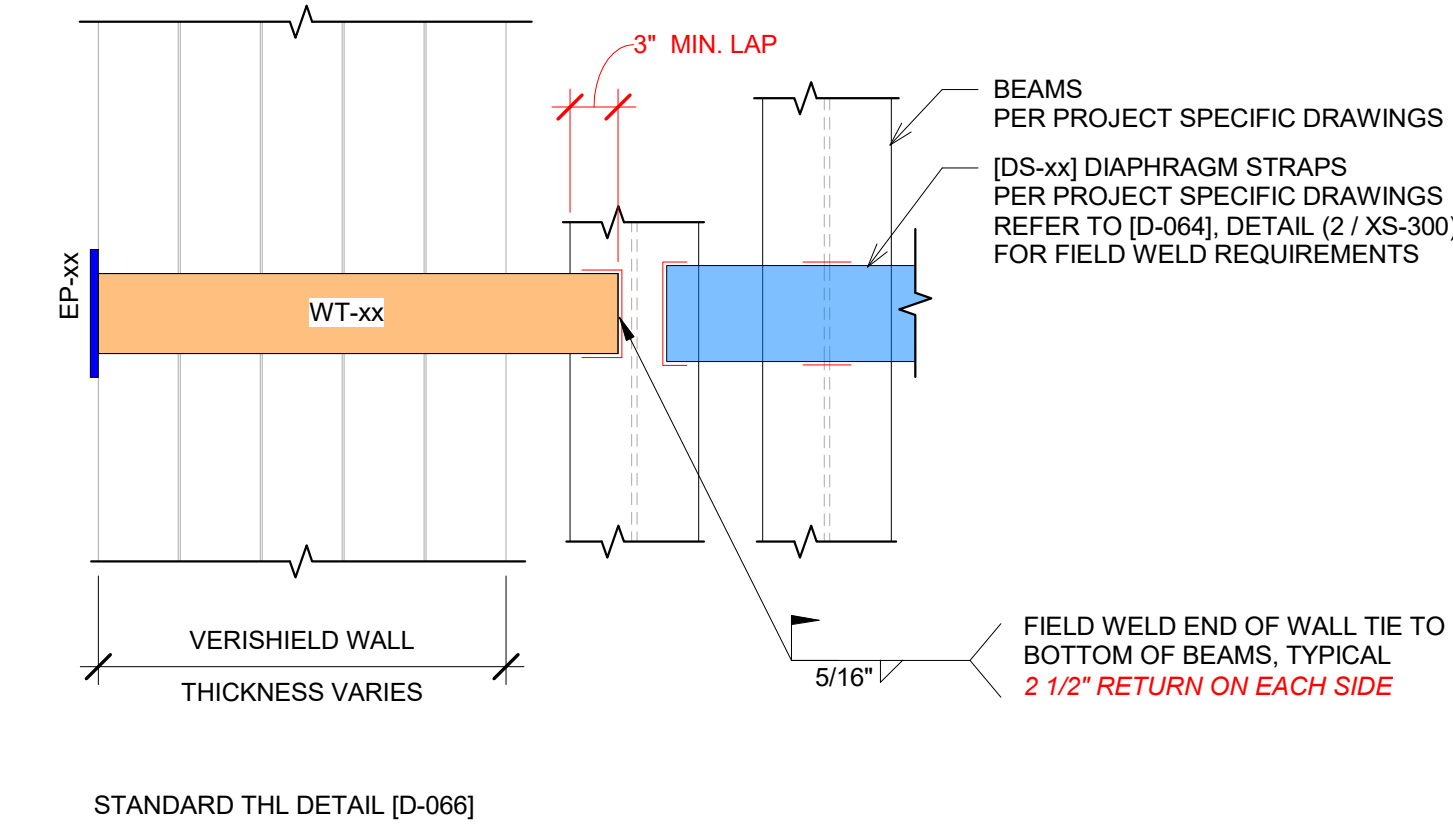
ITEM	DIAMETER	LENGTH	MIN. EMBED	DESCRIPTION (USE / LOCATION)	NOTES
HILTI HAS E-B	1" [25.4 mm]	16" [406.4 mm]	12" [304.8 mm]	<i>BL-PART & SLIDING</i> DOOR FRAME BASE PLATE ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HIT-Z	3/4" [19.05 mm]	9 3/4" [247.65 mm]	6" [152.4 mm]	<i>BL-PART & SLIDING</i> DOOR FRAME WALL TIE-BACK ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HIT-Z	3/4" [19.05 mm]	8 1/2" [215.9 mm]	6" [152.4 mm]	<i>SWING</i> DOOR FRAME & LAP FRAME FLOOR ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HAS -E-55 ROD	5/8" [15.875 mm]	9" [247.65 mm]	6" [152.4 mm]	SHELF ANGLES, PENETRATION ASSEMBLY	UTILIZE APPROVED INJECTION ADHESIVE
A325 - BOLT	5/8" [15.875 mm]	2 3/4" [69.85 mm]	NOT APPLICABLE	PENETRATION ASSEMBLY FRAME	ASSIST BOLTS FOR FRAME ANGLES, FULLY THREADED
A325 - TC BOLTS	3/4" [19.05 mm]	NOT APPLICABLE	NOT APPLICABLE	FRAMING, SET BOLTS FOR OPENINGS	CONNECTION @ FRAMED CEILING OPENINGS
NELSON H4L	5/8" [15.875 mm]	4" [101.6 mm]	NOT APPLICABLE	WELD TO BEARING PLATES & LINTELS	SPACING & QUANTITY PER DETAILS ON XS-50x SHEET(S)
REBAR	VARIES, AS REQ'D	VARIES, AS REQ'D	6" [152.4 mm]	REINFORCING CELLS, 6" MIN. EMBED (SLAB)	SEE XS-110 WALL REINFORCING PLAN FOR REBAR SIZE(S)
HILTI HIT-HY 200(R)	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (USA)	(R = REGULAR), HOUR AND A HALF CURE TIME
HILTI HIT-HY 200(A)	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (USA)	(A = ACCELERATED), 45 MINUTE CURE TIME * DO NOT USE IN REGIONS ASSOCIATED WITH HIGH HEAT or HUMIDITY (i.e.: FLORIDA)
HILTI HIT-RE 500	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (INT.)	(INT. = INTERNATIONAL PROJECTS)
MASONRY WALL TIE	NOT APPLICABLE	VARIES, AS REQ'D	NOT APPLICABLE	SINGLE LAYER OF MATERIAL TO WALL	TYPICALLY 20 GA. GALVANIZED, U.N.O. - REFER TO DETAILS
HILTI X-U SHOT PIN	NOT APPLICABLE	1 1/2" [38.1 mm]	1 1/2" [38.1 mm]	MASONRY WALL TIE TO WALL	
TAPCON	1/4" [6.35 mm]	1 1/2" [38.1 mm]	1 1/2" [38.1 mm]	MASONRY WALL TIE TO WALL	THIS IS AN ALTERNATE TO THE X-U SHOT PIN

ITEMS HIGHLIGHTED IN **YELLOW** ARE UTILIZED IN THIS PROJECT

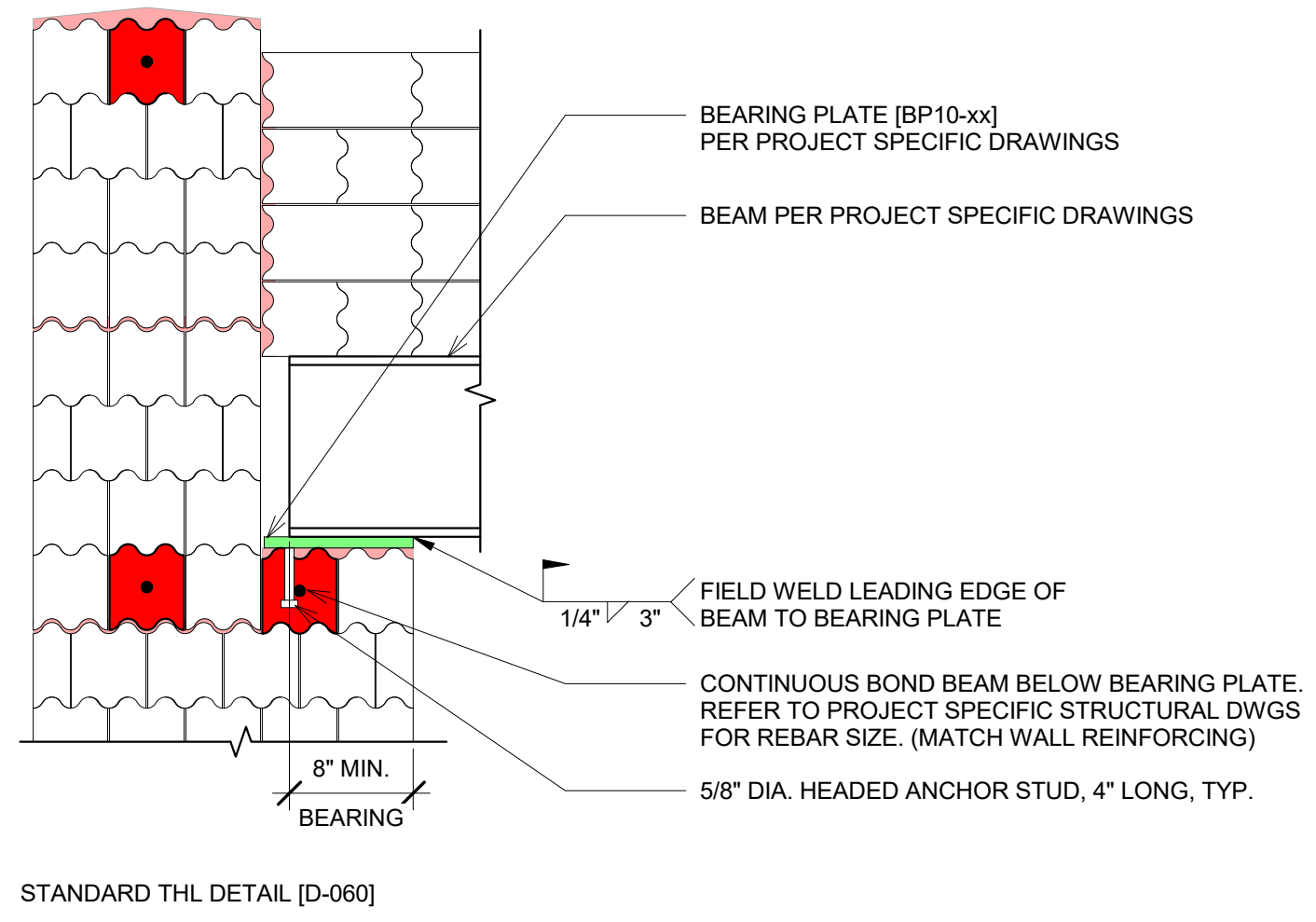
UNLESS NOTED / DETAILED OTHERWISE, ALL HOLES PROVIDED FOR ANCHORS TO BE A MIN. OF 1/16" [1.59mm] LARGER THAN & NO GREATER THAN A MAX. 1/8" [3.175mm] LARGER THAN BOLT DIA.



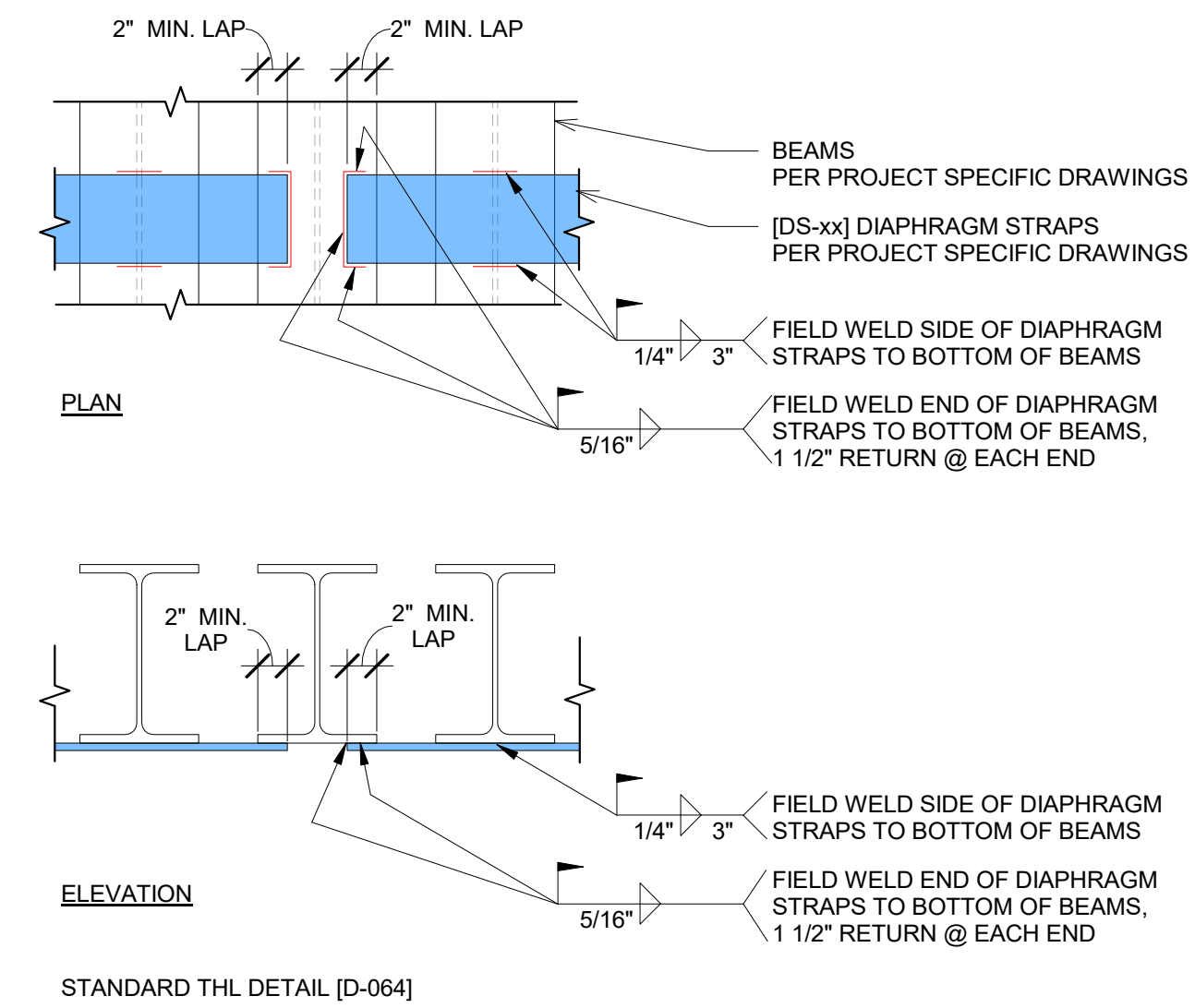
5 WALL TIE TO BEAM - SECTION DETAIL
1" = 1'-0"



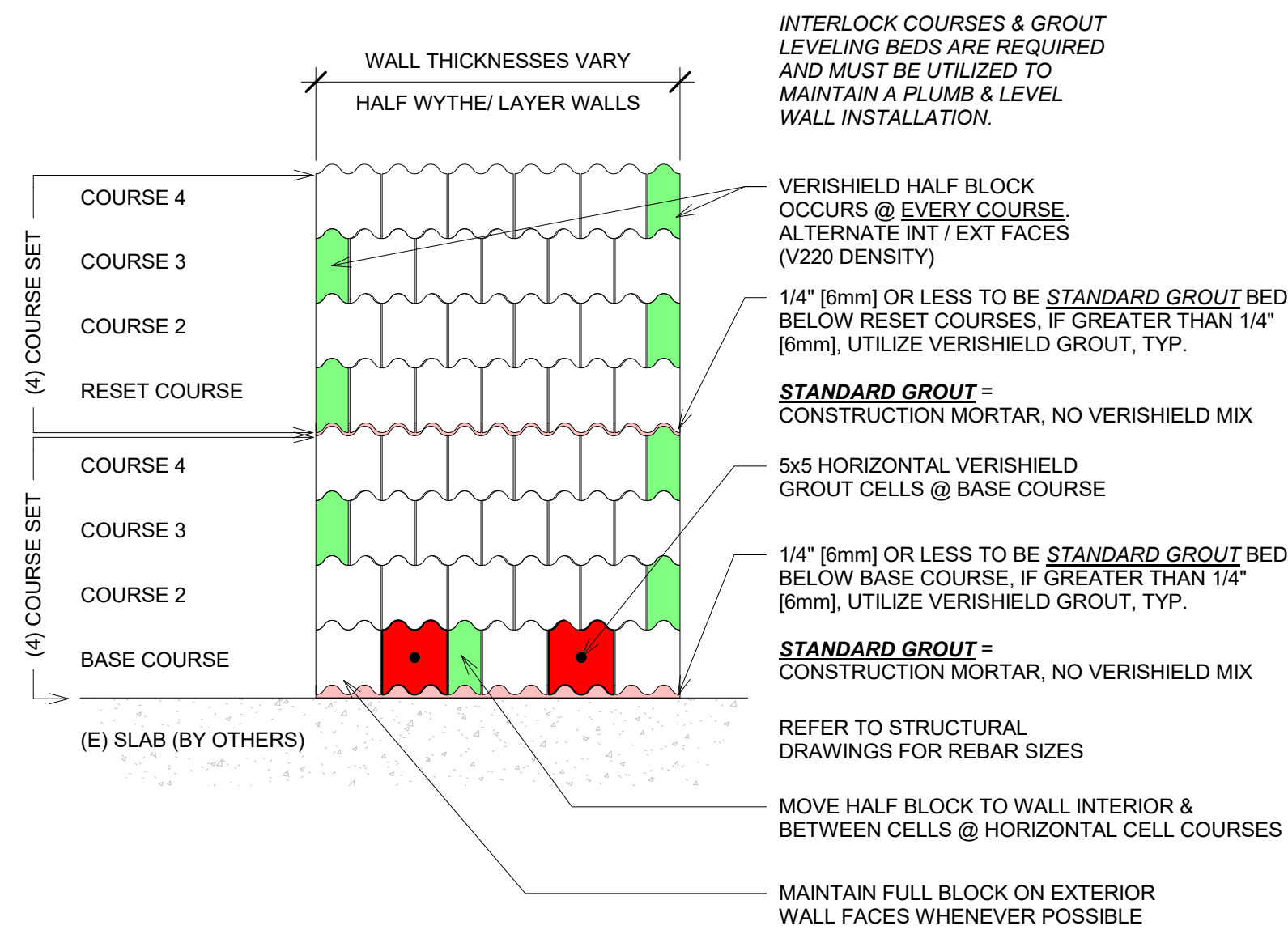
3 WALL TIE TO BEAM - PLAN DETAIL
1" = 1'-0"



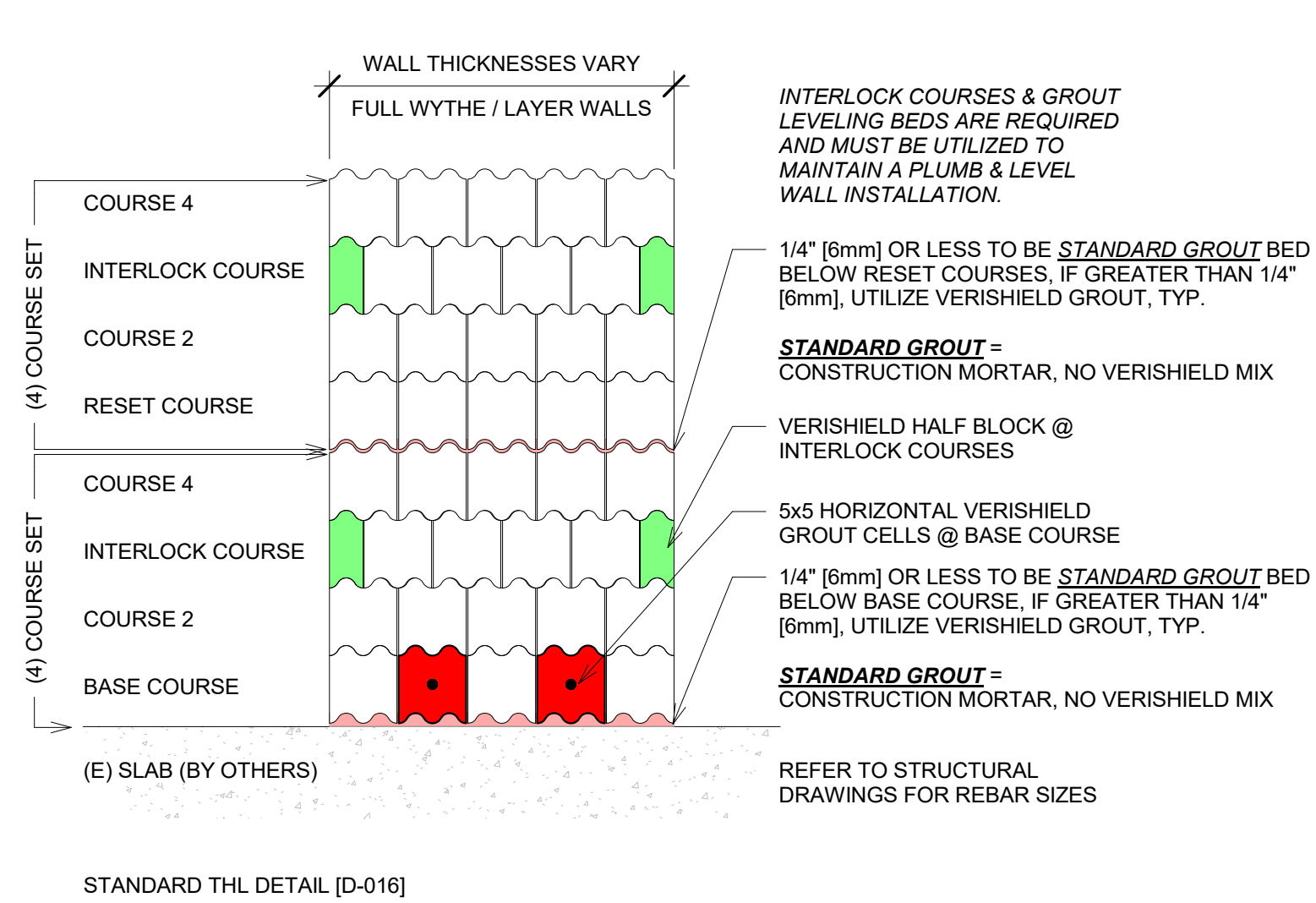
6 BEAM TO BEARING PLATE DETAIL
1" = 1'-0"



4 DIAPHRAGM STRAP TO BEAM DETAIL
1" = 1'-0"



1 Typical Coursing Diagram - Half Layer
1" = 1'-0"



2 Typical Coursing Diagram - Full Layer
1" = 1'-0"

SEAL

180 CASSELL RD.
HARLEYSVILLE, PA 19438
(484) 901-8928

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VeriShield Halcyon Treatment Room & 20" Bi-parting Door Trillium HP Peel Regional CC Mississauga

DRAWING ISSUE LOG		
#	ISSUE TITLE	Date

VERITAS PROJECT TEAM	
SALES REP:	
PHYSICIST:	
DESIGNER:	
PROJECT MANAGER:	
VERITAS PROJECT INFORMATION	
PROJECT #	
PROSPECT #	
PHYSICS REPORT:	
SHIELDED DOOR(S):	
MACHINE:	
MACHINE ENERGY:	

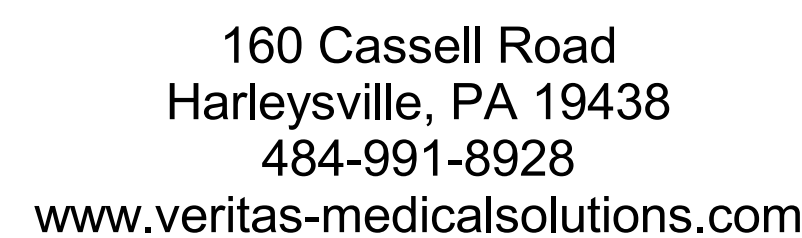
DRAWING TITLE

STRUCTURAL DETAILS

DRAWING NUMBER

XS300

A Anchor, Connection, & Support Chart
3/8" = 1'-0"



Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada



<u>(milestone) SET COORDINATION NOTES:</u>		
<u>COORDINATION ITEM:</u>	<u>PARTY:</u>	<u>COMMENT / ACTION ITEM:</u>
DOSIMETRY (PHYSICS)	(CLIENT/REP)	<u>REVIEW:</u> DOSIMETRY TUBE LOCATION ON (X-110). <u>CONFIRM:</u> IF THE LOCATION IS ACCEPTABLE OR IDENTIFY PREFERRED LOCATION.
DOOR FINISHES	(CLIENT/REP)	<u>REVIEW:</u> DOOR FINISH SELECTION CHART <u>PROVIDED WITH LAYOUT SET</u> . <u>SELECT:</u> PREFERRED FINISH FROM CHART OR PROVIDE ALTERNATE LAMINATE SELECTION (ALTERNATE SELECTION SUBJECT TO PRICE ADJUSTMENT & POTENTIAL LEAD TIME DELAYS)
DOOR CONTROLS	(CLIENT/REP)	<u>REVIEW:</u> DOOR POWER & CONTROL DIAGRAM <u>SK-00x DOOR CONTROL COORDINATION SKETCH</u> <u>PROVIDED WITH LAYOUT SET</u> <u>PROVIDED WITH (Milestone) SET</u> DOOR CONTROLS ON <u>SK-00x</u> ARE PLACEHOLDERS
GENERAL MEP	(CLIENT/REP)	<u>COORDINATE:</u> FINAL DOOR CONTROL LOCATIONS WITH VERITAS <u>PROVIDE:</u> MIN. REQUIRED UTILITY PENETRATION(S) FOR SERVICES ENTERING/ EXITING SHIELDED TREATMENT ROOM. STANDARD VERITAS PLACEHOLDER PENETRATION OPENING IS 15" HIGH x 50" WIDE. (1) SHIELDED PENETRATION PER VAULT IS ACCOUNTED FOR IN PROPOSAL. EXTENT OF SHIELDING AND PENETRATION SHIELD TYPE TO BE COORDINATED .

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Layout Set - 11/06/2025

VERITAS ESTIMATE # XXXX-XX

veritas
Medical Solutions
160 CASSELL RD.
HARLEYSVILLE, PA 19438
(484) 991-8928

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VeriShield Halcyon Treatment Room & 20" Bi-parting Door
Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada

[illegible]

SALES REP:	
------------	--

PHYSICIST:
DESIGNER:

PROJECT MANA

VERITAS PRO.

PROJECT #
PROSPECT #

PHYSICS REPORT

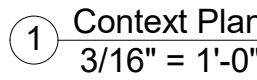
SHIELDED DOOF
MACHINE:

MACHINE ENERGY

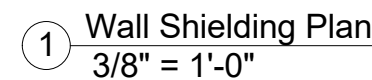
DRAWING TITLE

COVER SHEET

X000



PRELIMINARY - NOT FOR CONSTRUCTION



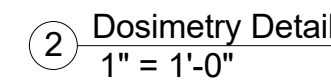
SLIDING & BI-PARTING DOOR CAVITY NOTES:

FLOOR SLAB CONDITIONS:

1. SLAB REINFORCING / FOUNDATION WORK BY OTHERS
REFER TO SHEET XS-100 FOR DOOR LOAD INFORMATION.
2. RECOMMENDED SLAB THICKNESS BELOW DOOR BASE PLATES: 24" (610mm)
REQUIRED MINIMUM SLAB BELOW DOOR BASE PLATES: 18" (457mm)
TYPICAL MIN. DOOR ANCHOR EMBED: 12" (305mm)

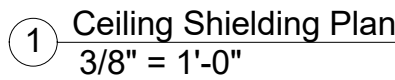
* PLEASE COORDINATE LOCATION SLAB REINFORCING OUTSIDE OF BASE PLATE
FOOTPRINT TO PREVENT DAMAGE TO REBAR OR DELAYS TO INSTALLATION.
3. FINISHED TREATMENT LEVEL FLOOR SLAB CONDITION MUST BE FLAT / LEVEL WITH A TOLERANCE NOT TO
EXCEED 1/8" OVERALL WITHIN THE DOOR CAVITY.
4. DOOR FINISH CAVITY BY OTHERS.
MINIMUM CAVITY SIZE REQUIREMENTS VARY PER DOOR TYPE & MODEL.
ACCESS IS REQUIRED ON ONE SIDE FOR HAND, CATCH & SERVICE.
* RECOMMENDATION: 2'-6" (762mm) x 7'-0" (2,134mm) ACCESS DOOR.
ACCESS IS REQUIRED ABOVE CEILING ALONG THE FRONT OF DOOR SUPPORT BEAM.
* RECOMMENDATION: UTILIZE REMOVABLE CEILING TILES (ACT) OR PROVIDE ACCESS PANELS

- STANDARD DOSIMETRY NOTES:**
- 1) VERITAS TYPICALLY PROVIDES (1) ONE DOSIMETRY TUBE PER TREATMENT ROOM, U.N.O.
 - 2) TYPICAL DOSIMETRY TUBE TO BE NOMINAL 3" (76 mm) MIN. DIAMETER PVC TUBE, U.N.O. REFER TO PROJECT SPECIFIC PHYSICS REPORT AND DRAWINGS.
 - 3) DOSIMETRY TUBES TYPICALLY INSTALLED ON 45 DEGREE ANGLES IN (2) TWO DIRECTIONS (HORIZONTAL PER PLAN & VERTICAL PER SECTION & ELEVATION).
 - 4) DOSIMETRY TUBES TO BE ORIENTED IN A MANNER THAT IS PERPENDICULAR TO THE MACHINE ISOCENTER OR SOURCE OF RADIATION.
 - 5) DOSIMETRY TUBE TO BE INSTALLED IN A MANNER THAT DOES NOT OBSTRUCT REBAR (VERTICALLY OR HORIZONTALLY) IN BOND BEAMS / WALL REINFORCING CELLS WITHIN VERISHIELD WALLS.
 - 6) ALL VOIDS AROUND DOSIMETRY TUBE TO BE FILLED SOLID w/ VERISHIELD GROUT OF COMPARABLE DENSITY & ATTENUATION PROPERTIES OF SURROUNDING BARRIER TO MAINTAIN REQUIRED SHIELDING, TYP. REFER TO PROJECT SPECIFIC PHYSICS REPORT & DRAWINGS.
 - 7) DOSIMETRY TUBE TO BE LOCATED IN A SECONDARY SHIELDING BARRIER. FINAL LOCATION OF DOSIMETRY TUBE TO BE DETERMINED BY CLIENT / CLIENT REPRESENTATIVE.



DRAWING NUMBER

X110



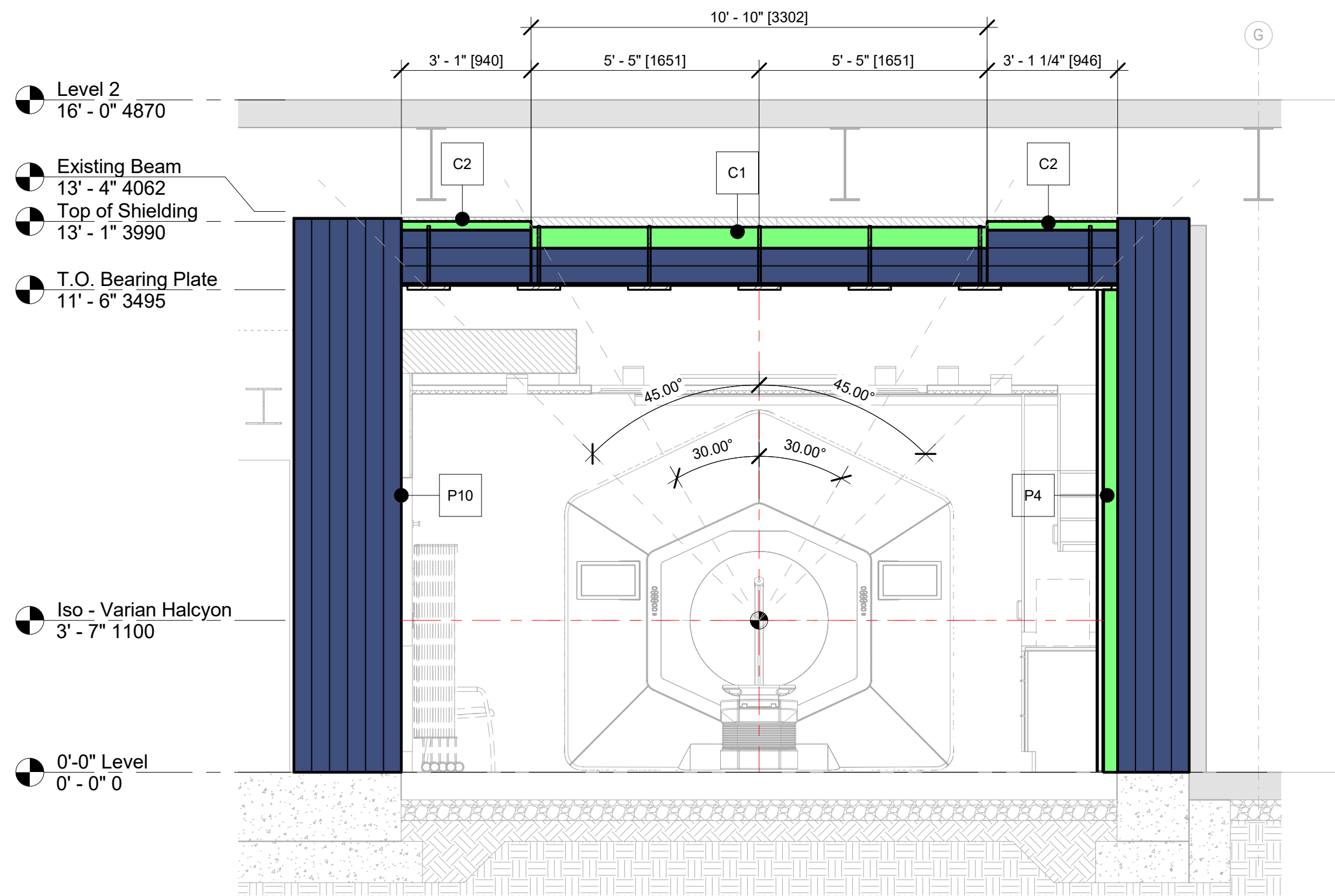
Ceiling Shield Schedule		
Shielding Region C1-3 & L1-2	Type - Thickness	Comments
C1	.5 Fe	
C1	V300 - 2	
C1	6" Pb	
C2	V300 - 3	
C2	.5 Fe	
C2	2.5" Pb	
C3	.5 Fe	
C3	V300 - 3	
C3	1" Pb	
Existing	200mm	

VeriShield Halcyon Treatment Room & 20" Bi-parting Door
Trillium HP Peel Regional CC Mississauga
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Mississauga, ON L5M 2N1
Dominion of Canada

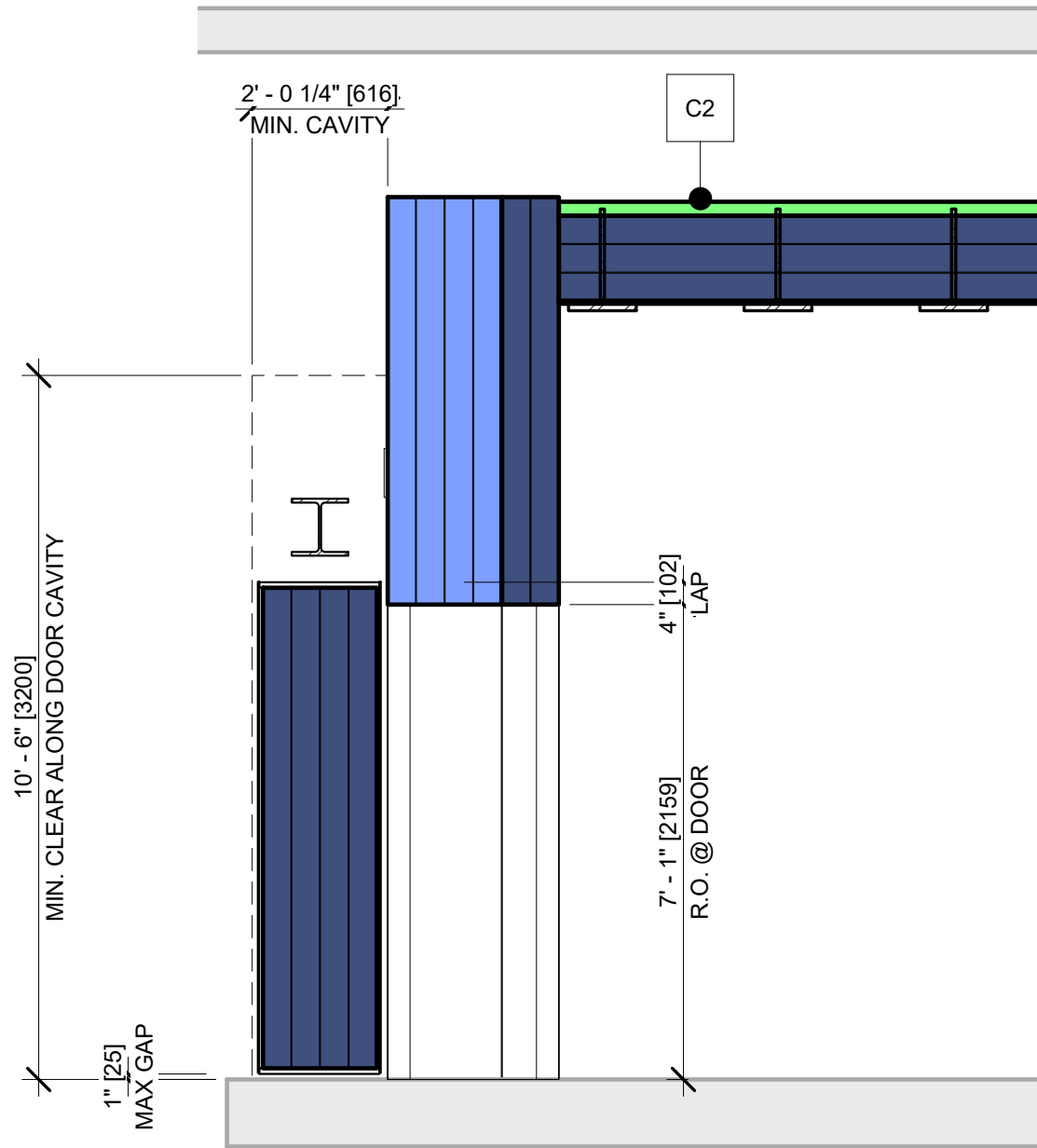
VERITAS PROJECT TEAM
SALES REP:
PHYSICIST:
DESIGNER:
PROJECT MANAGER:
VERITAS PROJECT INFORMATION
PROJECT #
PROSPECT #
PHYSICS REPORT:
SHIELDED DOOR(S):
MACHINE:
MACHINE ENERGY:
DRAWING TITLE

DRAWING NUMBER

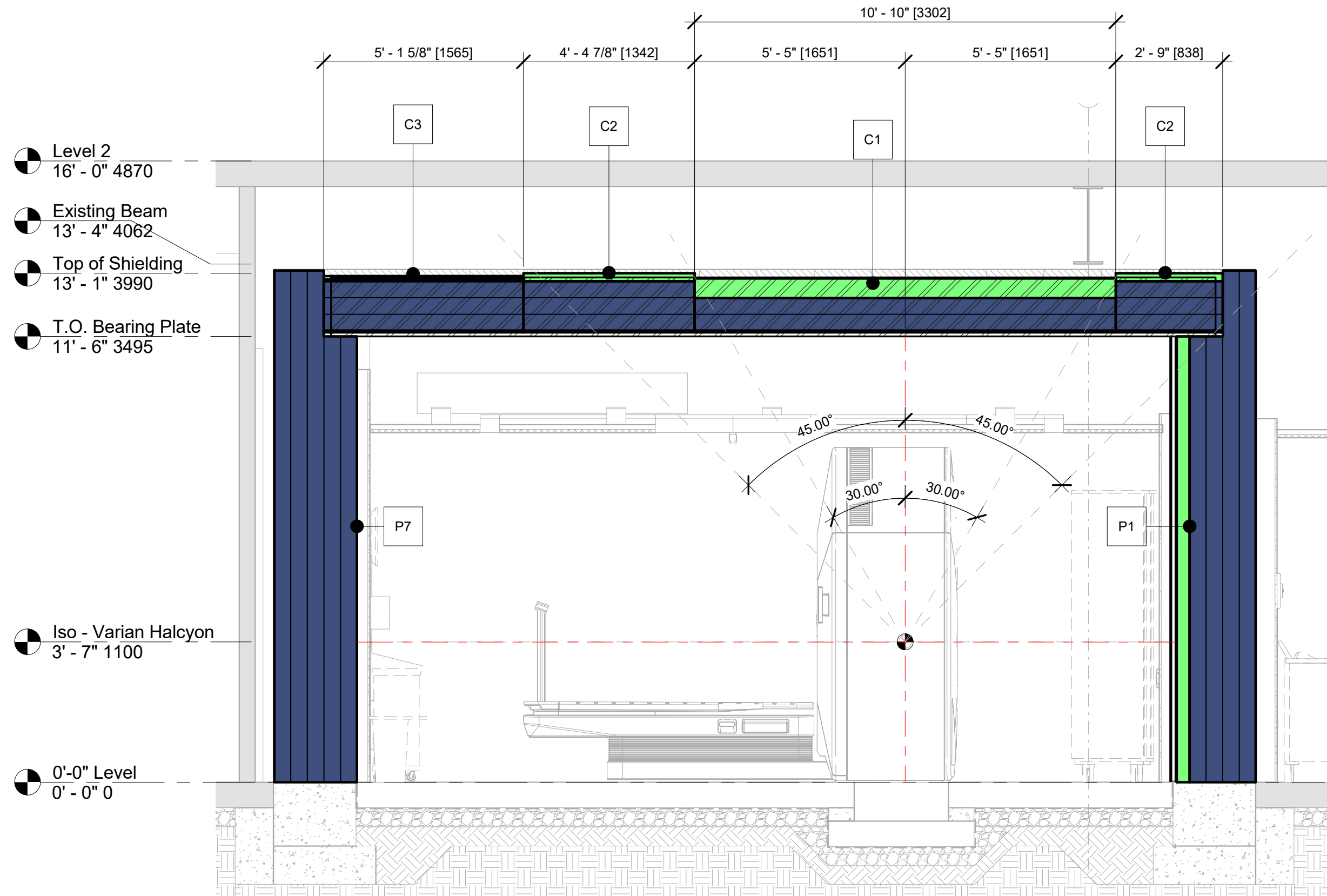
X130



1 Section Through IsoCenter @ P10 & P4
3/8" = 1'-0"



3 Section Through Door
3/8" = 1'-0"



2 Section Through IsoCenter @ P7 & P1
3/8" = 1'-0"

Wall Shield Schedule		
Shielding Region P1 - P12	Type - Layers	Comments
D1	V300 - 4	
P1	V300 - 4 Bearing	
P1	4" Pb	
P2	V300 - 4 Bearing	
P2	3" Pb	
P3	V300 - 4	
P3	3" Pb	
P4	V300 - 4	
P4	4" Pb	
P5	V300 - 4	
P5	3" Pb	
P7	V300 - 5 Bearing	
P9	V300 - 2	
P9	V250 - 4	
P10	V300 - 6	
P11	V300 - 2	
P11	V250 - 4	
P12	V300 - 4 Bearing	
P12	3" Pb	

Ceiling Shield Schedule		
Shielding Region C1-3 & L1-2	Type - Thickness	Comments
C1	.5 Fe	
C1	V300 - 2	
C1	6" Pb	
C2	V300 - 3	
C2	.5 Fe	
C2	2.5" Pb	
C3	.5 Fe	
C3	V300 - 3	
C3	1" Pb	
Existing	200mm	

SEAL



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VeriShield Halcyon Treatment Room & 20" Bi-parting Door
Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada

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VERITAS PROJECT TEAM

SALES REP:

PHYSICIST:

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PROJECT MANAGER:

VERITAS PROJECT INFORMATION

PROJECT #

PROSPECT #

PHYSICS REPORT:

SHIELDED DOOR(S):

MACHINE:

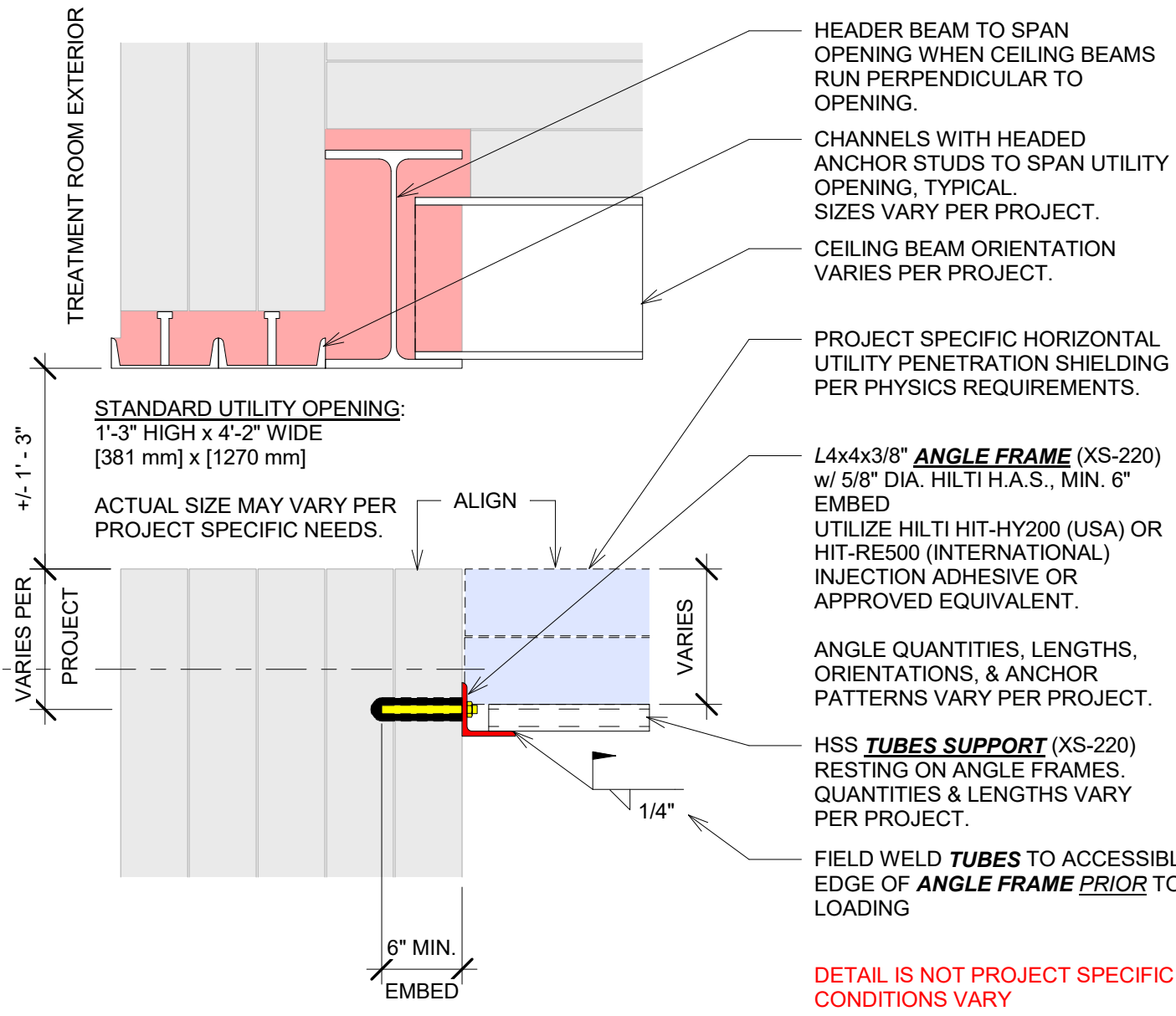
MACHINE ENERGY:

DRAWING TITLE

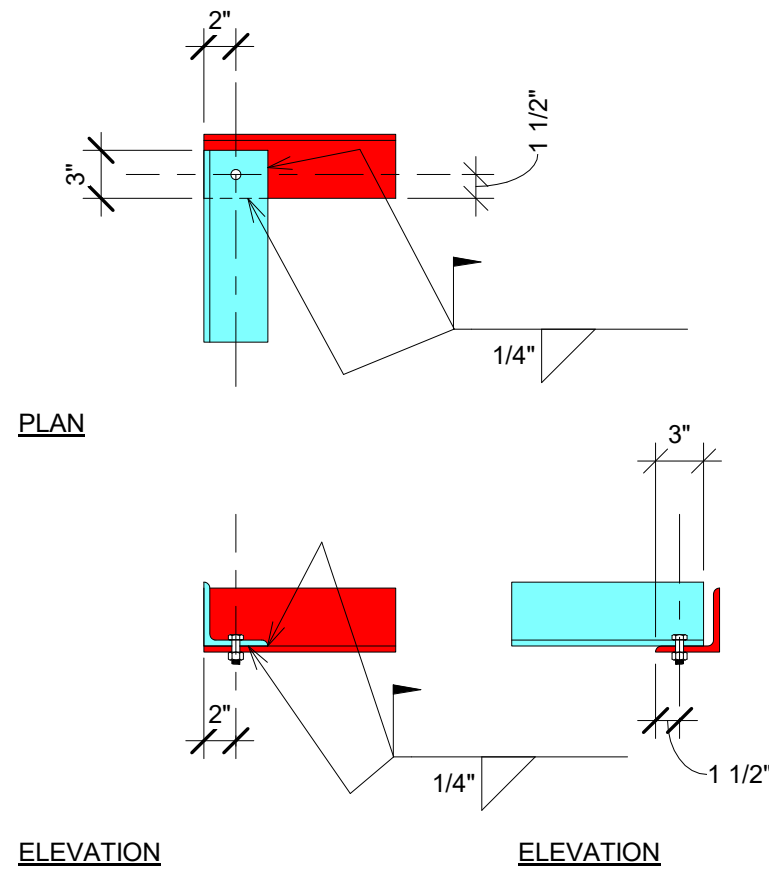
SECTIONS

DRAWING NUMBER

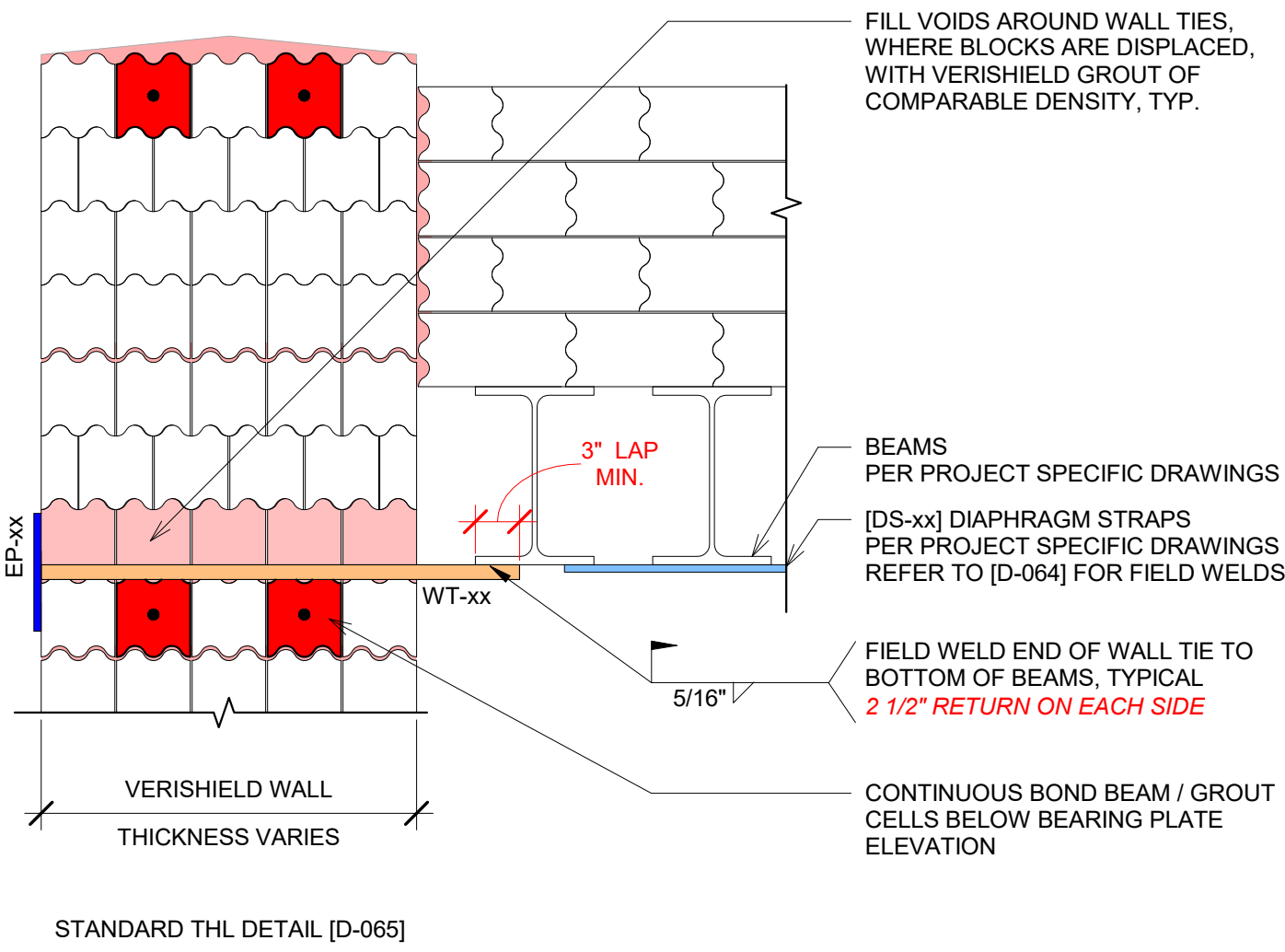
X300



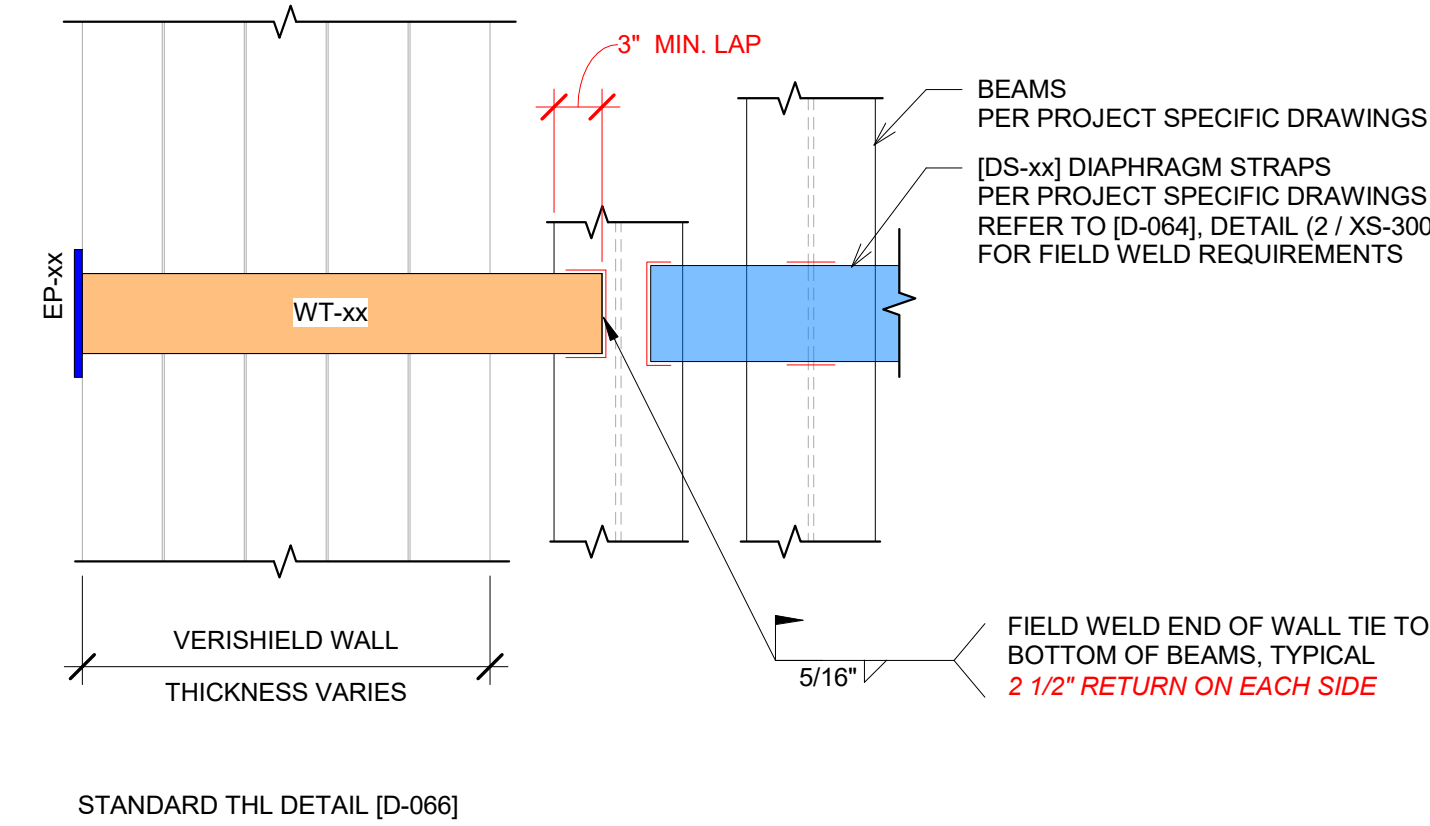
8 ANGLE FRAME TO WALL DETAIL
1" = 1'-0"



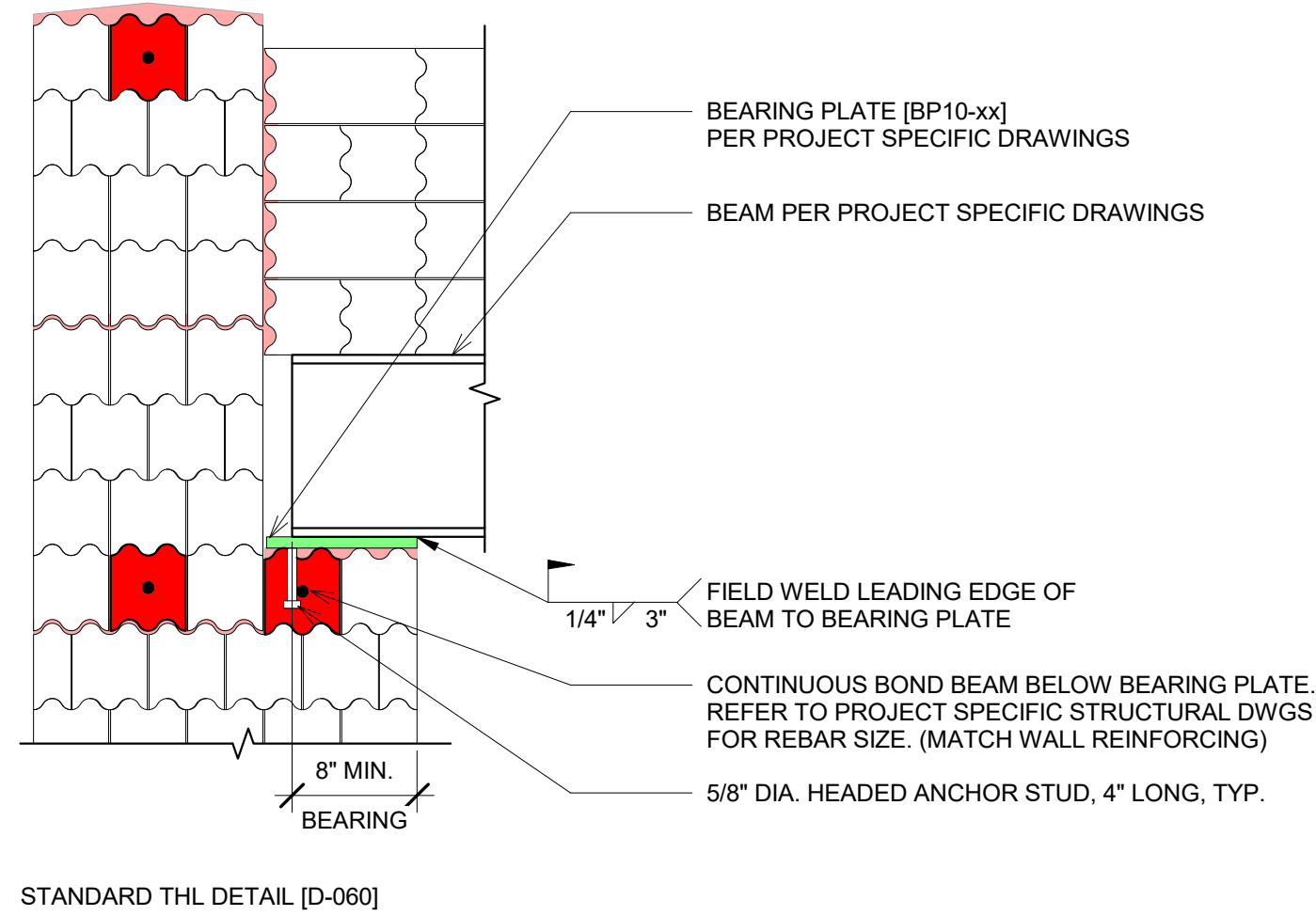
7 ANGLE FRAME BOLTED & FIELD WELDED CONNECTION
1" = 1'-0"



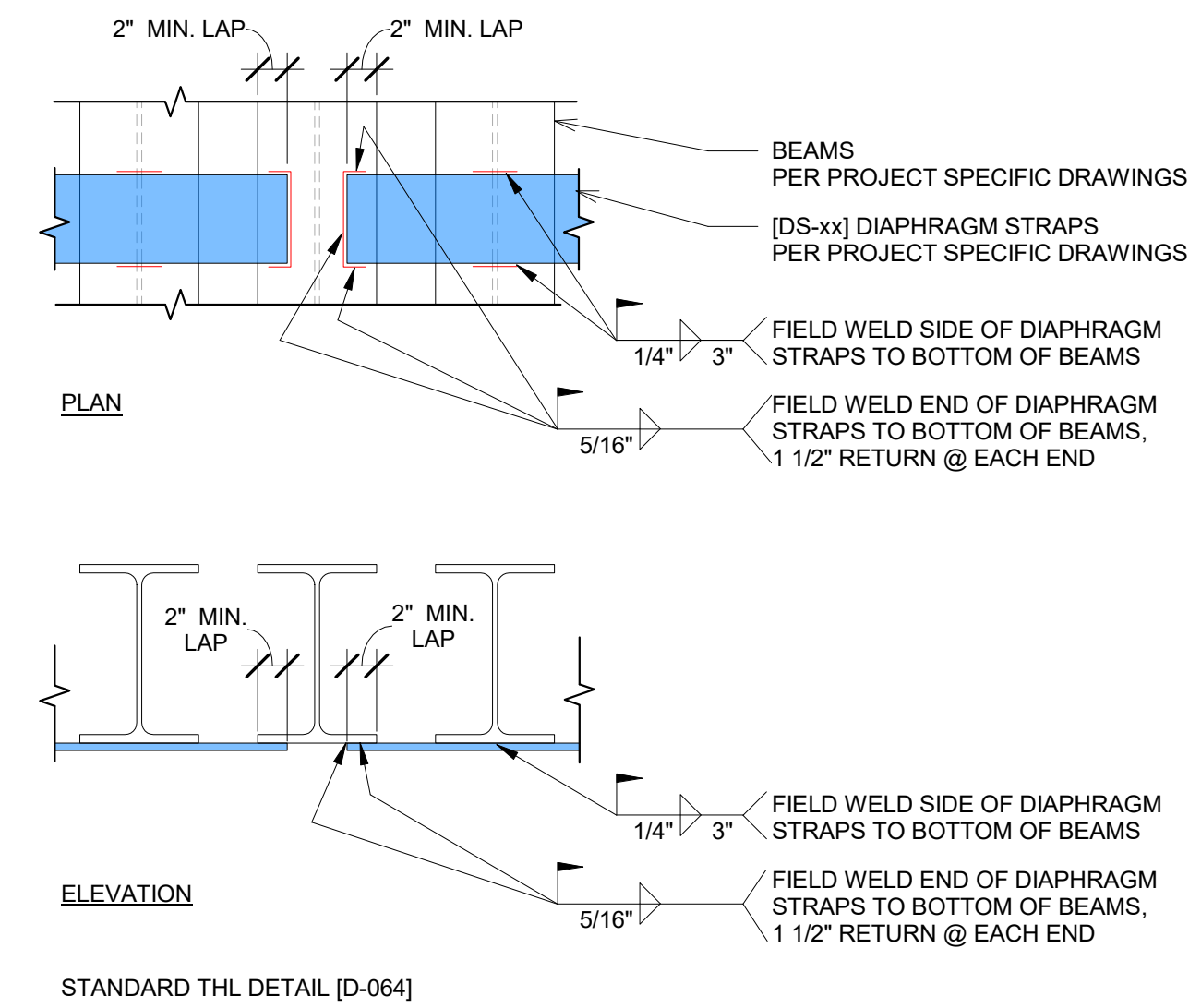
5 WALL TIE TO BEAM - SECTION DETAIL
1" = 1'-0"



3 WALL TIE TO BEAM - PLAN DETAIL
1" = 1'-0"



6 BEAM TO BEARING PLATE DETAIL
1" = 1'-0"



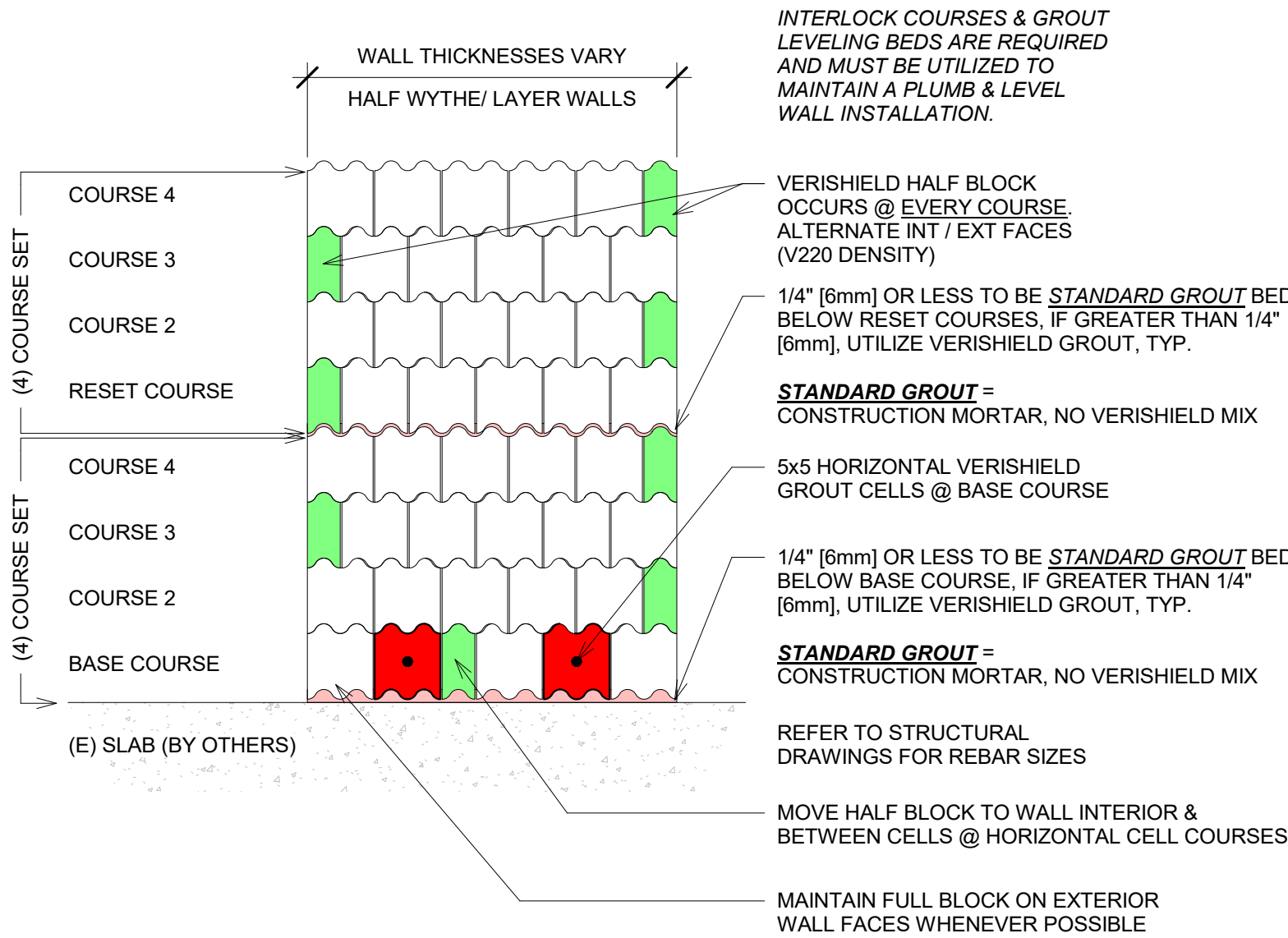
4 DIAPHRAGM STRAP TO BEAM DETAIL
1" = 1'-0"

ANCHOR, CONNECTION, & SUPPORT CHART

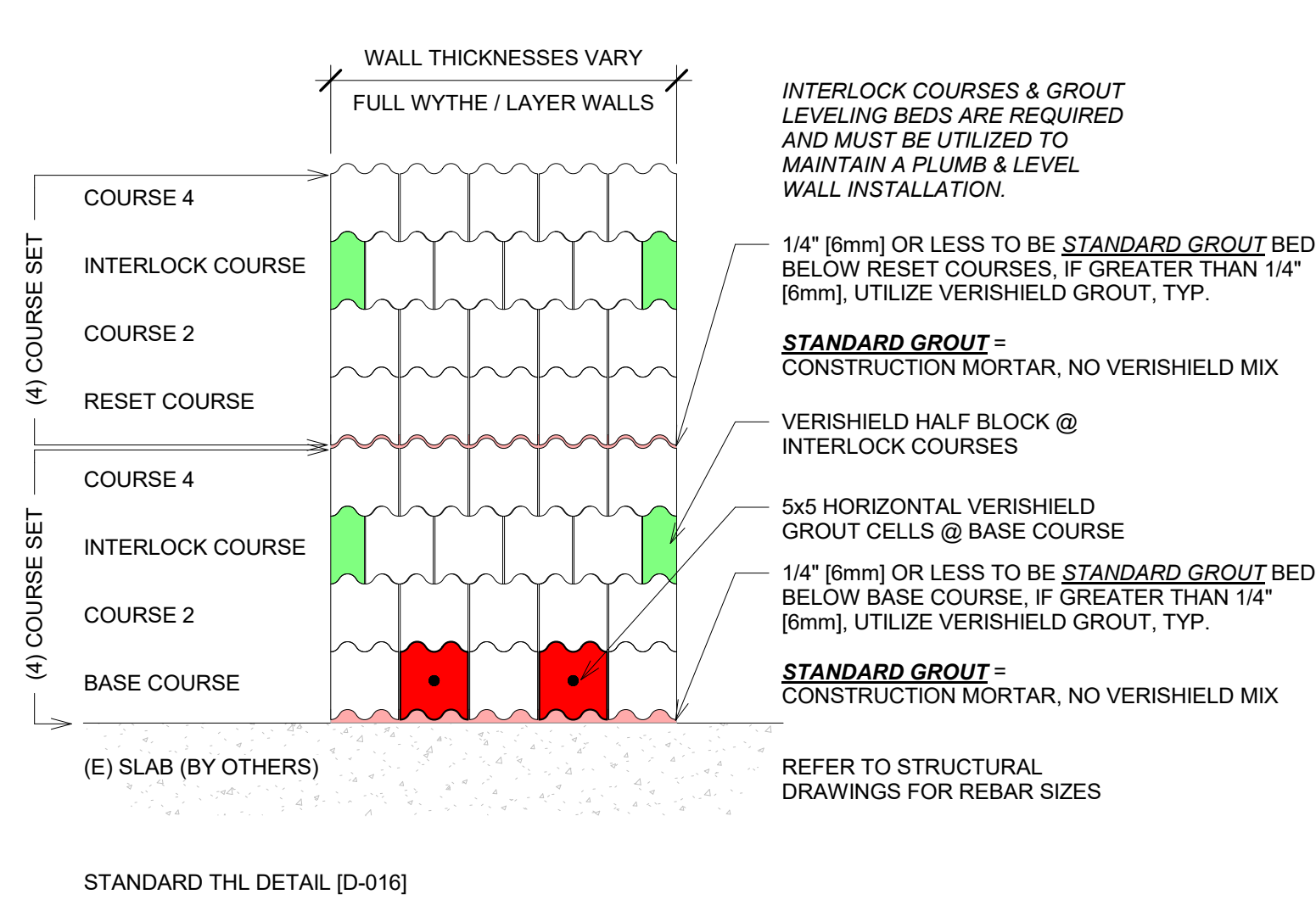
ITEM	DIAMETER	LENGTH	MIN. EMBED	DESCRIPTION (USE / LOCATION)	NOTES
HILTI HAS E-B	1" [25.4 mm]	16" [406.4 mm]	12" [304.8 mm]	BL-PART & SLIDING DOOR FRAME BASE PLATE ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HIT-Z	3/4" [19.05 mm]	9 3/4" [247.65 mm]	6" [152.4 mm]	BL-PART & SLIDING DOOR FRAME WALL TIE-BACK ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HIT-Z	3/4" [19.05 mm]	8 1/2" [215.9 mm]	6" [152.4 mm]	SWING DOOR FRAME & LAP FRAME FLOOR ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HAS -E-55 ROD	5/8" [15.875 mm]	9" [247.65 mm]	6" [152.4 mm]	SHELF ANGLES, PENETRATION ASSEMBLY	UTILIZE APPROVED INJECTION ADHESIVE
A325 - BOLT	5/8" [15.875 mm]	2 3/4" [69.85 mm]	NOT APPLICABLE	PENETRATION ASSEMBLY FRAME	ASSIST BOLTS FOR FRAME ANGLES, FULLY THREADED
A325 - TC BOLTS	3/4" [19.05 mm]	NOT APPLICABLE	NOT APPLICABLE	FRAMING, SET BOLTS FOR OPENINGS	CONNECTION @ FRAMED CEILING OPENINGS
NELSON H4L	5/8" [15.875 mm]	4" [101.6 mm]	NOT APPLICABLE	WELD TO BEARING PLATES & LINTELS	SPACING & QUANTITY PER DETAILS ON XS-50x SHEET(S)
REBAR	VARIES, AS REQ'D	VARIES, AS REQ'D	6" [152.4 mm]	REINFORCING CELLS, 6" MIN. EMBED (SLAB)	SEE XS-110 WALL REINFORCING PLAN FOR REBAR SIZE(S)
HILTI HIT-HY 200(R)	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (USA)	(R = REGULAR), HOUR AND A HALF CURE TIME
HILTI HIT-HY 200(A)	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (USA)	(A = ACCELERATED), 45 MINUTE CURE TIME * DO NOT USE IN REGIONS ASSOCIATED WITH HIGH HEAT or HUMIDITY (i.e.: FLORIDA)
HILTI HIT-RE 500	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (INT.)	(INT. = INTERNATIONAL PROJECTS)
MASONRY WALL TIE	NOT APPLICABLE	VARIES, AS REQ'D	NOT APPLICABLE	SINGLE LAYER OF MATERIAL TO WALL	TYPICALLY 20 GA. GALVANIZED, U.N.O. - REFER TO DETAILS
HILTI X-U SHOT PIN	1/4" [6.35 mm]	1 1/2" [38.1 mm]	1 1/2" [38.1 mm]	MASONRY WALL TIE TO WALL	
TAPCON	1/4" [6.35 mm]	1 1/2" [38.1 mm]	1 1/2" [38.1 mm]	MASONRY WALL TIE TO WALL	THIS IS AN ALTERNATE TO THE X-U SHOT PIN

ITEMS HIGHLIGHTED IN **YELLOW** ARE UTILIZED IN THIS PROJECT

UNLESS NOTED / DETAILED OTHERWISE, ALL HOLES PROVIDED FOR ANCHORS TO BE A MIN. OF 1/16" [1.59mm] LARGER THAN & NO GREATER THAN A MAX. 1/8" [3.175mm] LARGER THAN BOLT DIA.



1 Typical Coursing Diagram - Half Layer
1" = 1'-0"



2 Typical Coursing Diagram - Full Layer
1" = 1'-0"

SEAL

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HARLEYSVILLE, PA 19438
(484) 901-8928

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VeriShield Halcyon Treatment Room & 20" Bi-parting Door Trillium HP Peel Regional CC Mississauga

DRAWING ISSUE LOG		
#	ISSUE TITLE	Date

VERITAS PROJECT TEAM	
SALES REP:	
PHYSICIST:	
DESIGNER:	
PROJECT MANAGER:	
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PROJECT #	
PROSPECT #	
PHYSICS REPORT:	
SHIELDED DOOR(S):	
MACHINE:	
MACHINE ENERGY:	

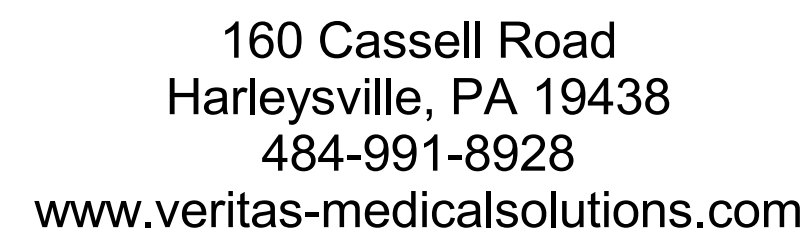
DRAWING TITLE

STRUCTURAL DETAILS

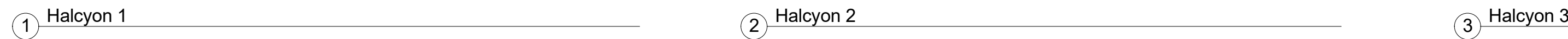
DRAWING NUMBER

XS300

A Anchor, Connection, & Support Chart
3/8" = 1'-0"



Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada



<u>(milestone) SET COORDINATION NOTES:</u>		
<u>COORDINATION ITEM:</u>	<u>PARTY:</u>	<u>COMMENT / ACTION ITEM:</u>
DOSIMETRY (PHYSICS)	(CLIENT/REP)	<u>REVIEW:</u> <u>CONFIRM:</u> DOSIMETRY TUBE LOCATION ON (X-110). IF THE LOCATION IS ACCEPTABLE OR IDENTIFY PREFERRED LOCATION.
DOOR FINISHES	(CLIENT/REP)	<u>REVIEW:</u> <u>SELECT:</u> DOOR FINISH SELECTION CHART <u>PROVIDED WITH LAYOUT SET</u> . PREFERRED FINISH FROM CHART OR PROVIDE ALTERNATE LAMINATE SELECTION *(ALTERNATE SELECTION SUBJECT TO PRICE ADJUSTMENT & POTENTIAL LEAD TIME DELAYS)
DOOR CONTROLS	(CLIENT/REP)	<u>REVIEW:</u> <u>SK-00x DOOR CONTROL COORDINATION SKETCH.</u> <u>PROVIDED WITH LAYOUT SET</u> <u>PROVIDED WITH (Milestone) SET</u> DOOR CONTROLS ON <u>SK-00x</u> ARE PLACEHOLDERS
		<u>COORDINATE:</u> FINAL DOOR CONTROL LOCATIONS WITH VERITAS
GENERAL MEP	(CLIENT/REP)	<u>PROVIDE:</u> MIN. REQUIRED UTILITY PENETRATION(S) FOR SERVICES ENTERING/ EXITING SHIELDED TREATMENT ROOM. STANDARD VERITAS PLACEHOLDER PENETRATION OPENING IS 15" HIGH x 50" WIDE. (1) SHIELDED PENETRATION PER VAULT IS ACCOUNTED FOR IN PROPOSAL. EXTENT OF SHIELDING AND PENETRATION SHIELD TYPE TO BE COORDINATED .

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Layout Set - 10/31/2025

veritas
Medical Solutions
160 CASSELL RD.
HARLEYSVILLE, PA 19438
(484) 991-8928

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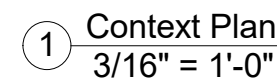
Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada

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RITAS PROJECT TEAM	
LES REP:	
YSICIST:	
SIGNER:	
JECT MANAGER:	
RITAS PROJECT INFORMATION	
JECT #	
OSPECT #	
YSICS REPORT:	
ELDED DOOR(S):	
CHINE:	
CHINE ENERGY:	
AWING TITLE	

AWING NUMBER

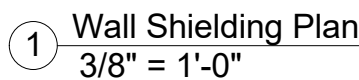
X000



DRAWING NUMBER

X100

PRELIMINARY - NOT FOR CONSTRUCTION



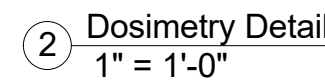
SLIDING & BI-PARTING DOOR CAVITY NOTES:

FLOOR SLAB CONDITIONS:

1. SLAB REINFORCING / FOUNDATION WORK BY OTHERS
REFER TO SHEET XS-100 FOR DOOR LOAD INFORMATION.
2. RECOMMENDED SLAB THICKNESS BELOW DOOR BASE PLATES: 24" (610mm)
REQUIRED MINIMUM SLAB BELOW DOOR BASE PLATES: 18" (457mm)
TYPICAL MIN. DOOR ANCHOR EMBED: 12" (305mm)

* PLEASE COORDINATE LOCATION SLAB REINFORCING OUTSIDE OF BASE PLATE
FOOTPRINT TO PREVENT DAMAGE TO REBAR OR DELAYS TO INSTALLATION.
3. FINISHED TREATMENT LEVEL FLOOR SLAB CONDITION MUST BE FLAT / LEVEL WITH A TOLERANCE NOT TO
EXCEED 1/8" OVERALL WITHIN THE DOOR CAVITY.
4. DOOR FINISH CAVITY BY OTHERS.
MINIMUM CAVITY SIZE REQUIREMENTS VARY PER DOOR TYPE & MODEL.
ACCESS IS REQUIRED ON ONE SIDE FOR HAND CRANK SERVICE
+ RECOMMENDATION: A 2'-6" (762mm) x 7'-0" (2,134mm) ACCESS DOOR.
ACCESS IS REQUIRED ABOVE CEILING ALONG THE FRONT OF DOOR SUPPORT BEAM.
+ RECOMMENDATION: UTILIZE REMOVABLE CEILING TILES (ACT) OR PROVIDE ACCESS PANELS

- STANDARD DOSIMETRY NOTES:**
- 1) VERITAS TYPICALLY PROVIDES (1) ONE DOSIMETRY TUBE PER TREATMENT ROOM, U.N.O.
 - 2) TYPICAL DOSIMETRY TUBE TO BE NOMINAL 3" (76 mm) MIN. DIAMETER PVC TUBE, U.N.O. REFER TO PROJECT SPECIFIC PHYSICS REPORT AND DRAWINGS.
 - 3) DOSIMETRY TUBES TYPICALLY INSTALLED ON 45 DEGREE ANGLES IN (2) TWO DIRECTIONS (HORIZONTAL PER PLAN & VERTICAL PER SECTION & ELEVATION).
 - 4) DOSIMETRY TUBES TO BE ORIENTED IN A MANNER THAT IS PERPENDICULAR TO THE MACHINE ISOCENTER OR SOURCE OF RADIATION.
 - 5) DOSIMETRY TUBE TO BE INSTALLED IN A MANNER THAT DOES NOT OBSTRUCT REBAR (VERTICALLY OR HORIZONTALLY) IN BOND BEAMS / WALL REINFORCING CELLS WITHIN VERISHIELD WALLS.
 - 6) ALL VOIDS AROUND DOSIMETRY TUBE TO BE FILLED SOLID w/ VERISHIELD GROUT OF COMPARABLE DENSITY & ATTENUATION PROPERTIES OF SURROUNDING BARRIER TO MAINTAIN REQUIRED SHIELDING, TYP. REFER TO PROJECT SPECIFIC PHYSICS REPORT & DRAWINGS.
 - 7) DOSIMETRY TUBE TO BE LOCATED IN A SECONDARY SHIELDING BARRIER. FINAL LOCATION OF DOSIMETRY TUBE TO BE DETERMINED BY CLIENT / CLIENT REPRESENTATIVE.



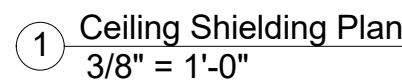
VeriShield Halcyon Treatment Room & 20" Bi-parting Door
Trillium HP Peel Regional CC Mississauga
2200 Eglinton Ave W,
Mississauga, ON L5M 2N1
Dominion of Canada

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DRAWING TITLE

DRAWING NUMBER

X110

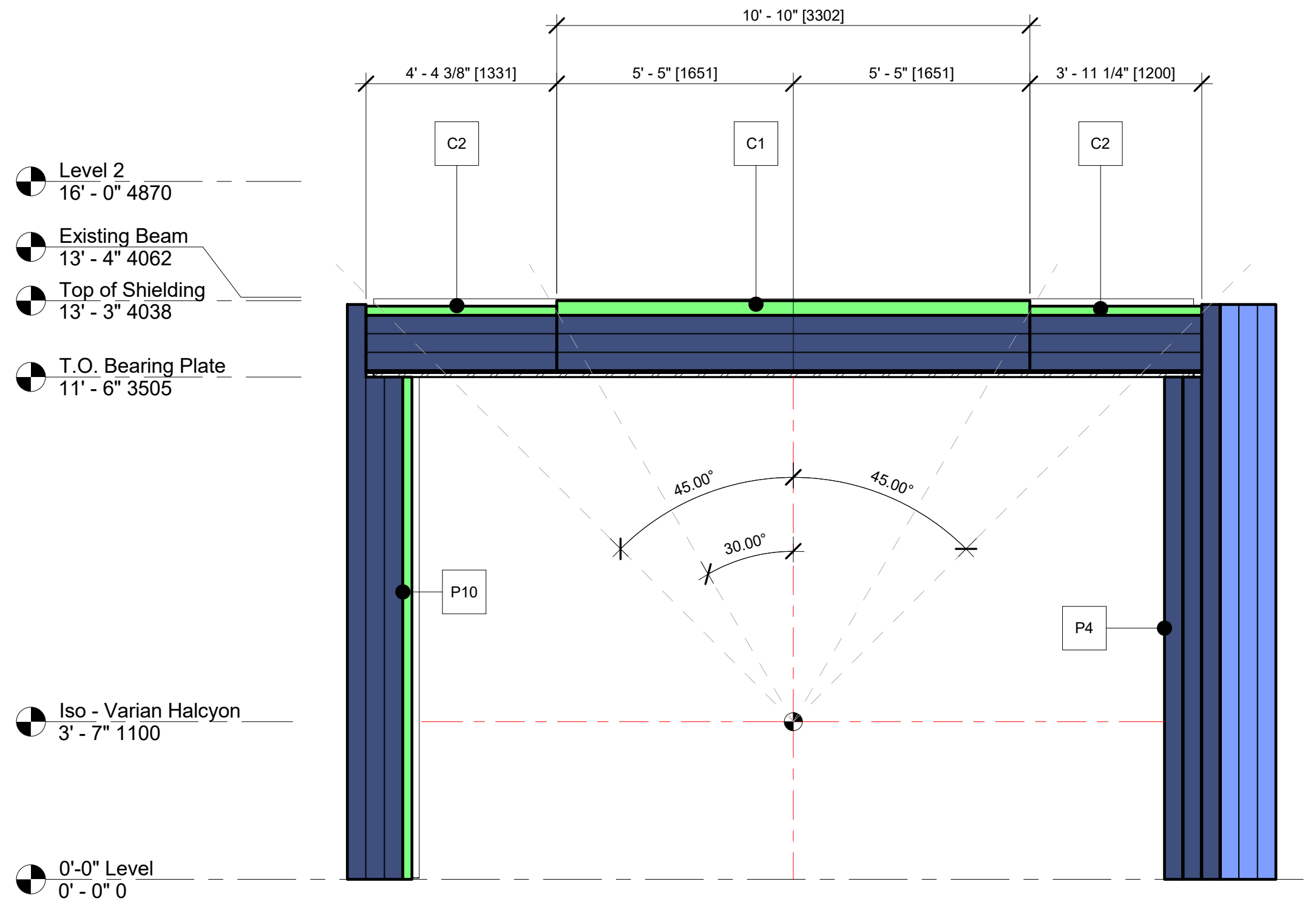


Ceiling Shield Schedule		
Shielding Region C1-3 & L1-2	Type - Thickness	Comments
C1	.5 Fe	
C1	V300 - 3	
C1	4" Pb	
C2	V300 - 3	
C2	.5 Fe	
C2	2.5" Pb	
C3	.5 Fe	
C3	V300 - 3	
C3	1" Pb	

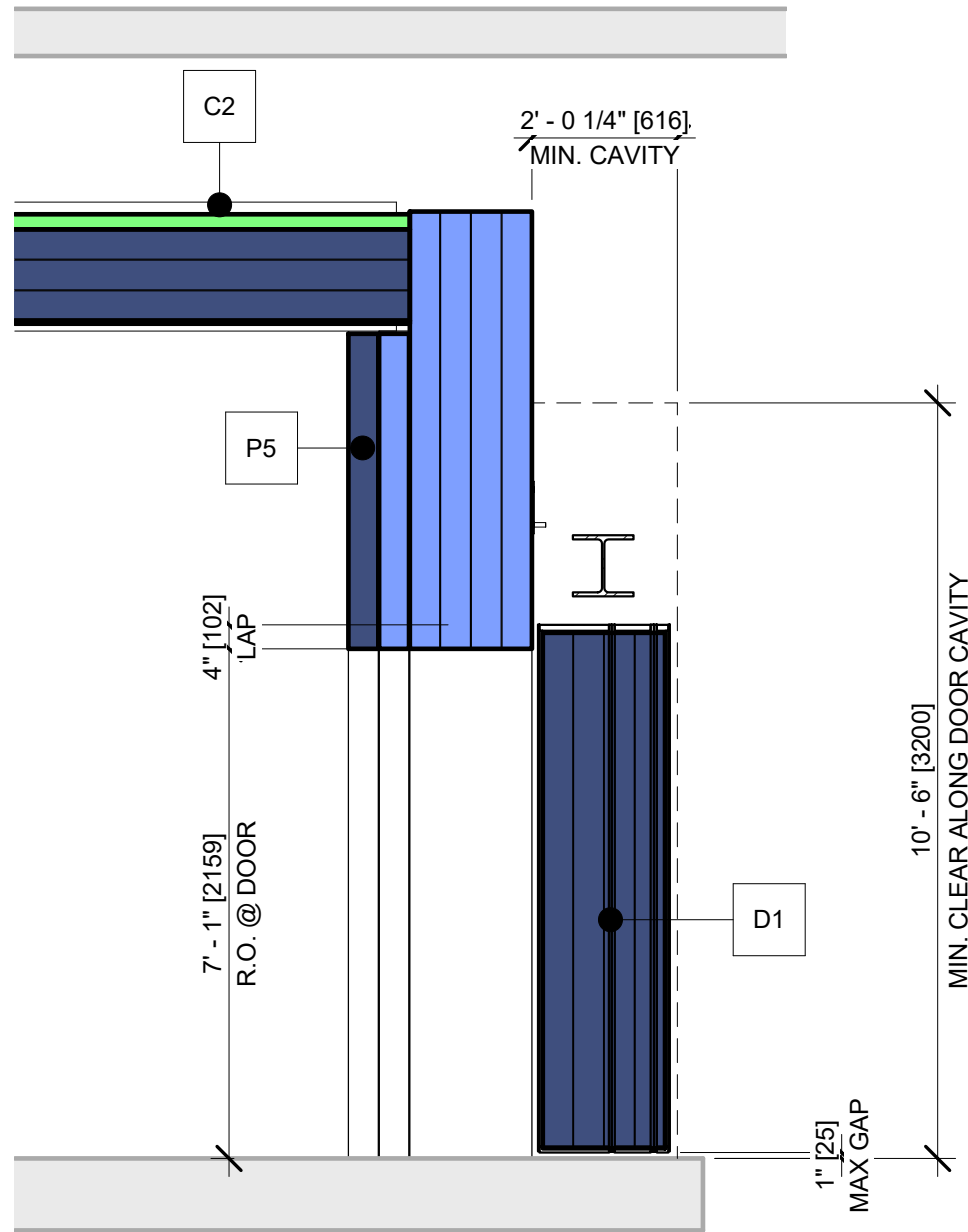
MACHINE ENERGY:

DRAWING NUMBER

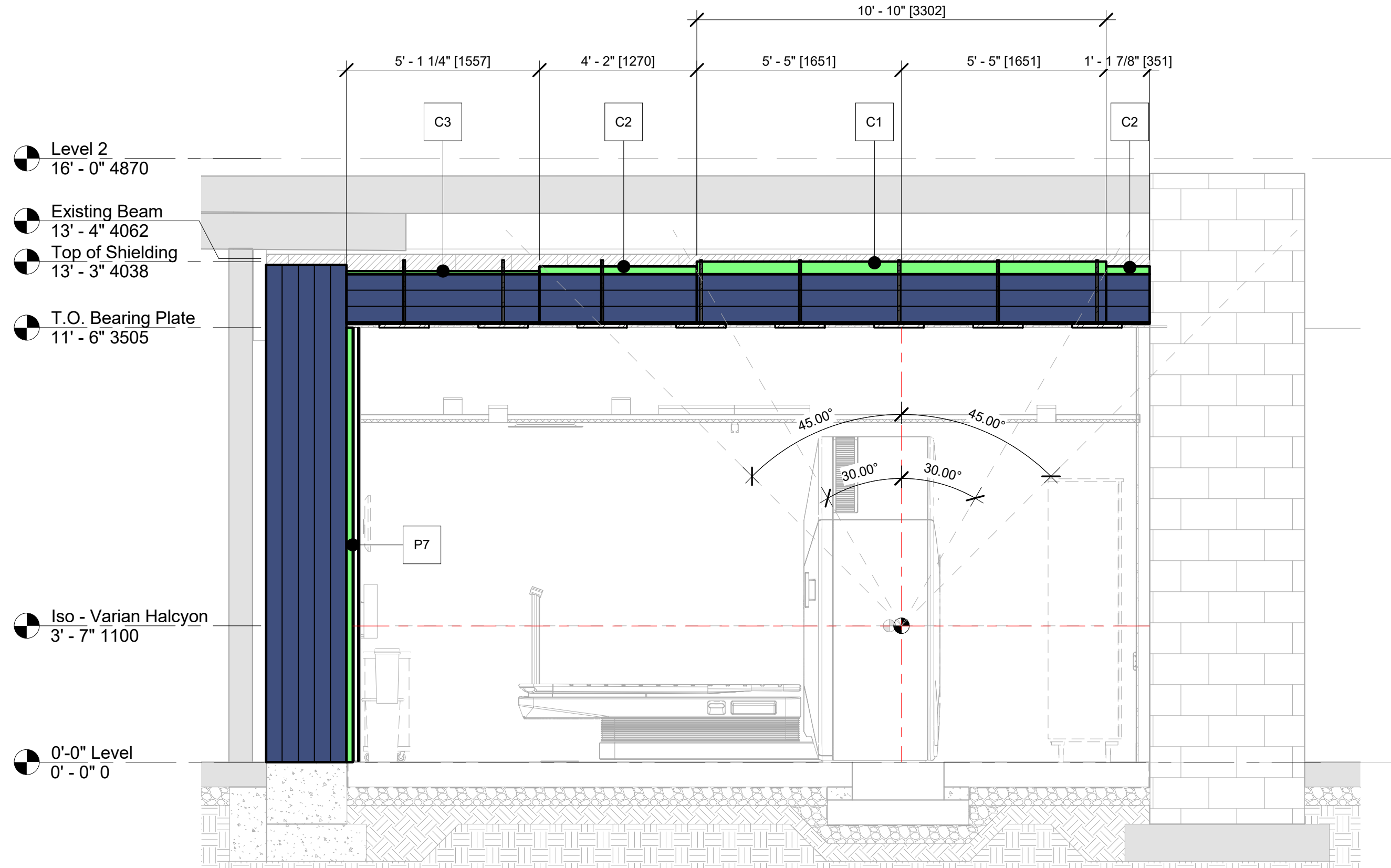
X130



① Section Through IsoCenter @ P10 & P4
3/8" = 1'-0"



③ Section Through Door
3/8" = 1'-0"



② Section Through IsoCenter @ P7 & P1
3/8" = 1'-0"

Wall Shield Schedule		
Shielding Region P1 - P12	Type - Layers	Comments
D1	V300 - 4	
P2	V300 - 5	
P3	V250 - 4	
P3	V250 - 1	
P3	V300 - 1	
P4	V300 - 1	
P4	V250 - 3	
P4	V300 - 1	
P5	V250 - 4	
P5	V250 - 1	
P5	V300 - 1	
P7	V300 - 5	
P7	2" Pb	
P10	V300 - 3B	
P10	2.5" Pb	

Ceiling Shield Schedule		
Shielding Region C1-3 & L1-2	Type - Thickness	Comments
C1	.5 Fe	
C1	V300 - 3	
C1	4" Pb	
C2	V300 - 3	
C2	.5 Fe	
C2	2.5" Pb	
C3	.5 Fe	
C3	V300 - 3	
C3	1" Pb	

SEAL



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VeriShield Halcyon Treatment Room & 20" Bi-parting Door
Trillium HP Peel Regional CC Mississauga
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DRAWING ISSUE LOG

#	ISSUE TITLE	Date
1	Layout Set	10/31/2025

VERITAS PROJECT TEAM

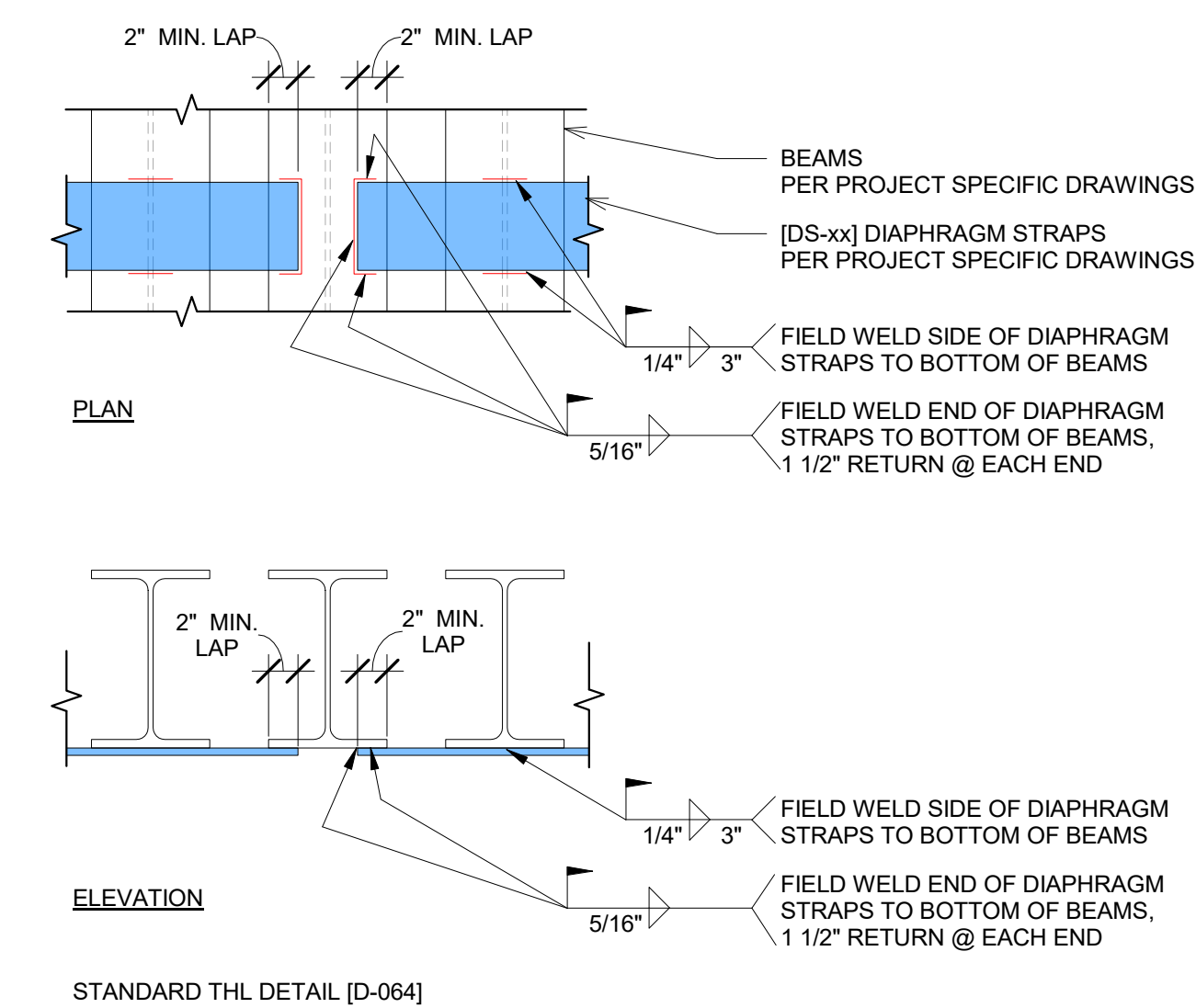
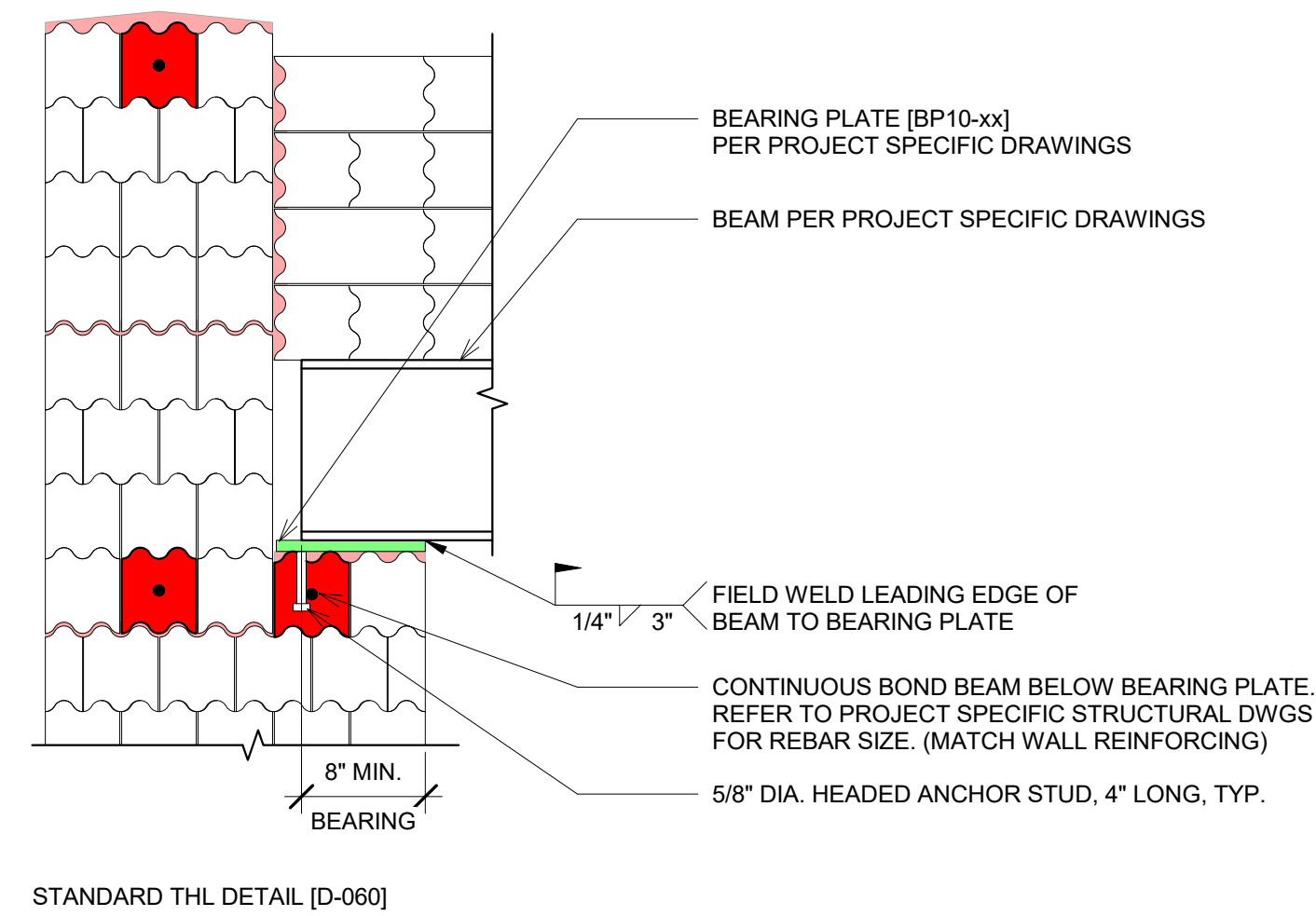
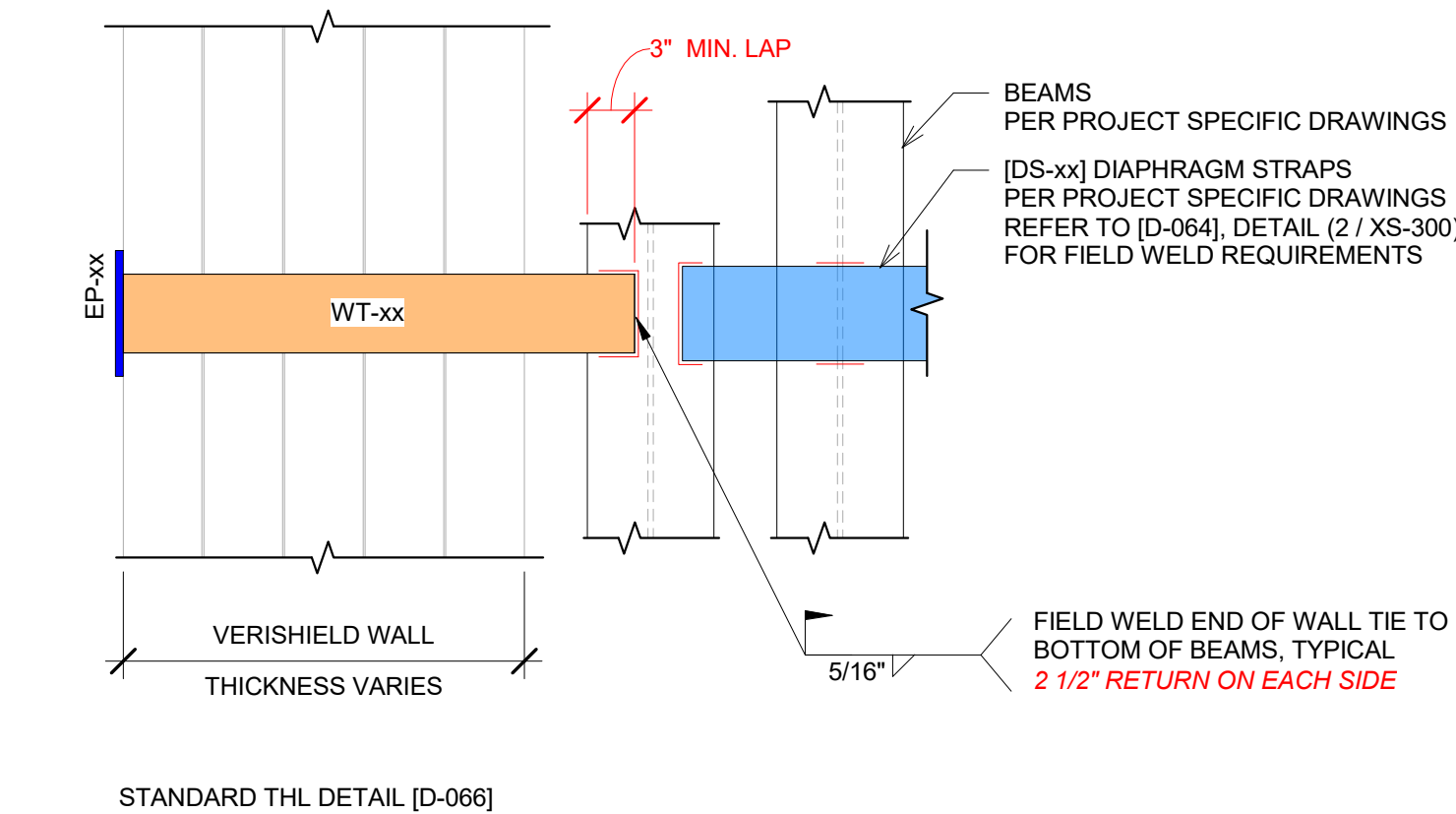
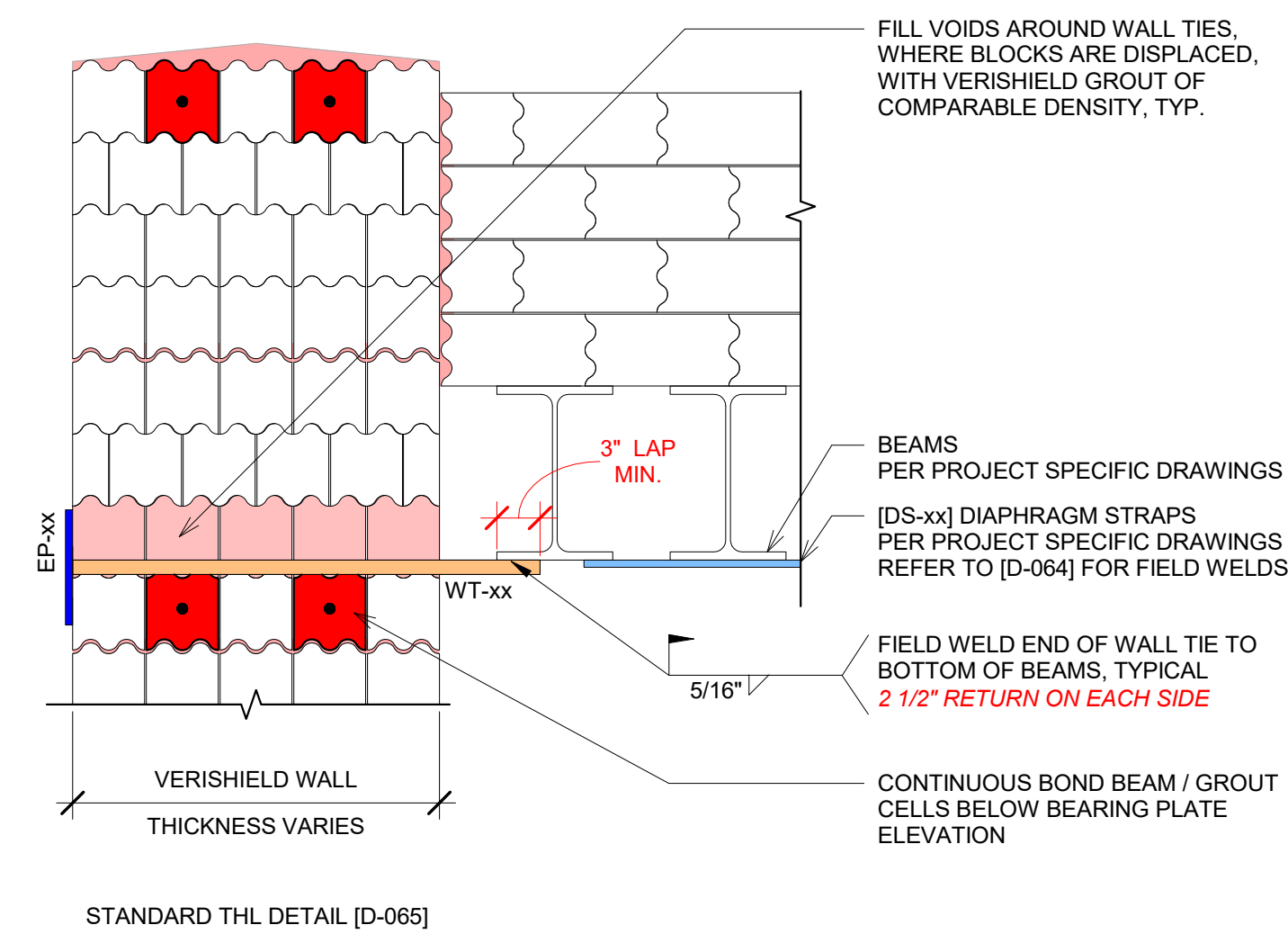
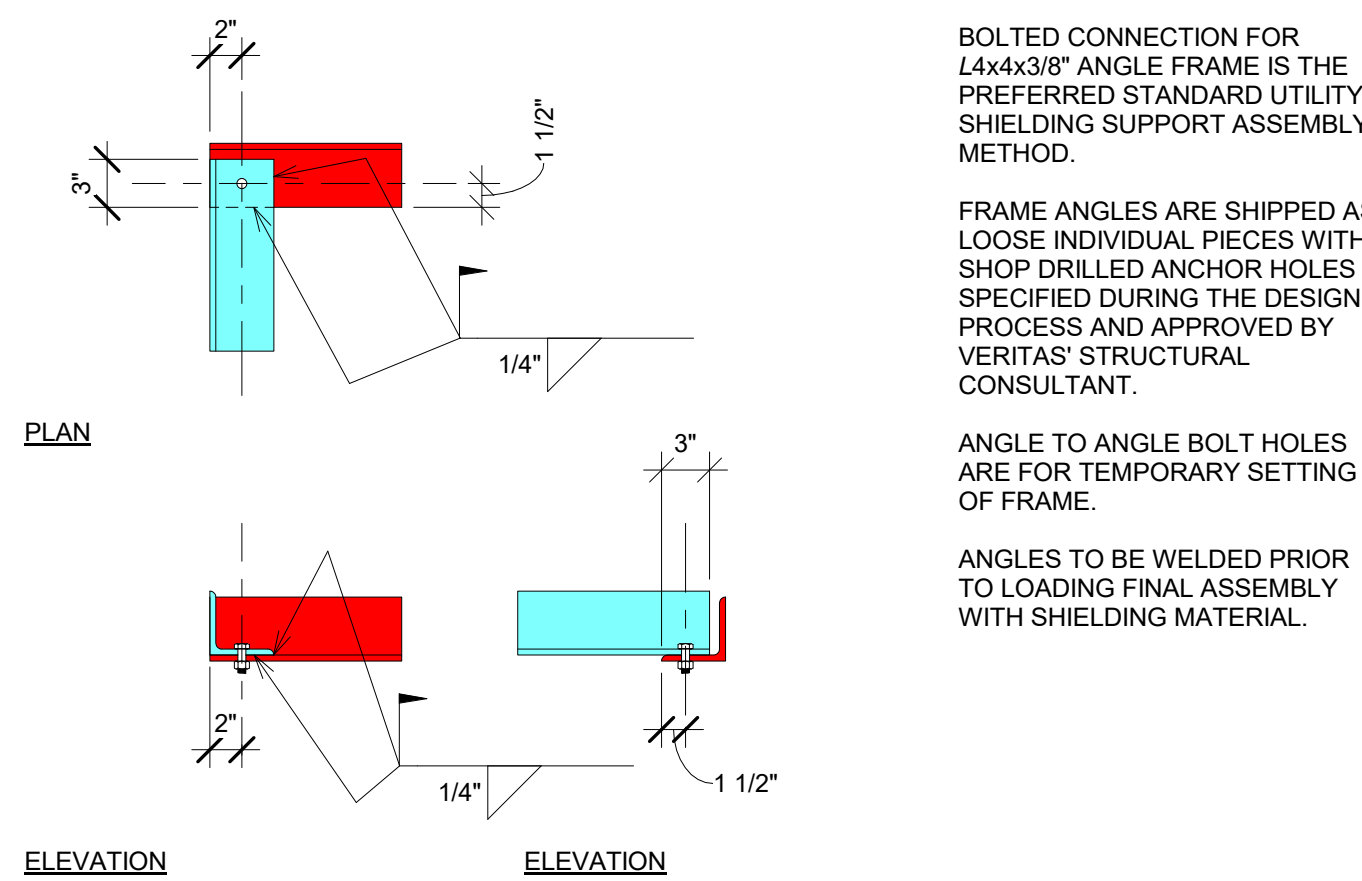
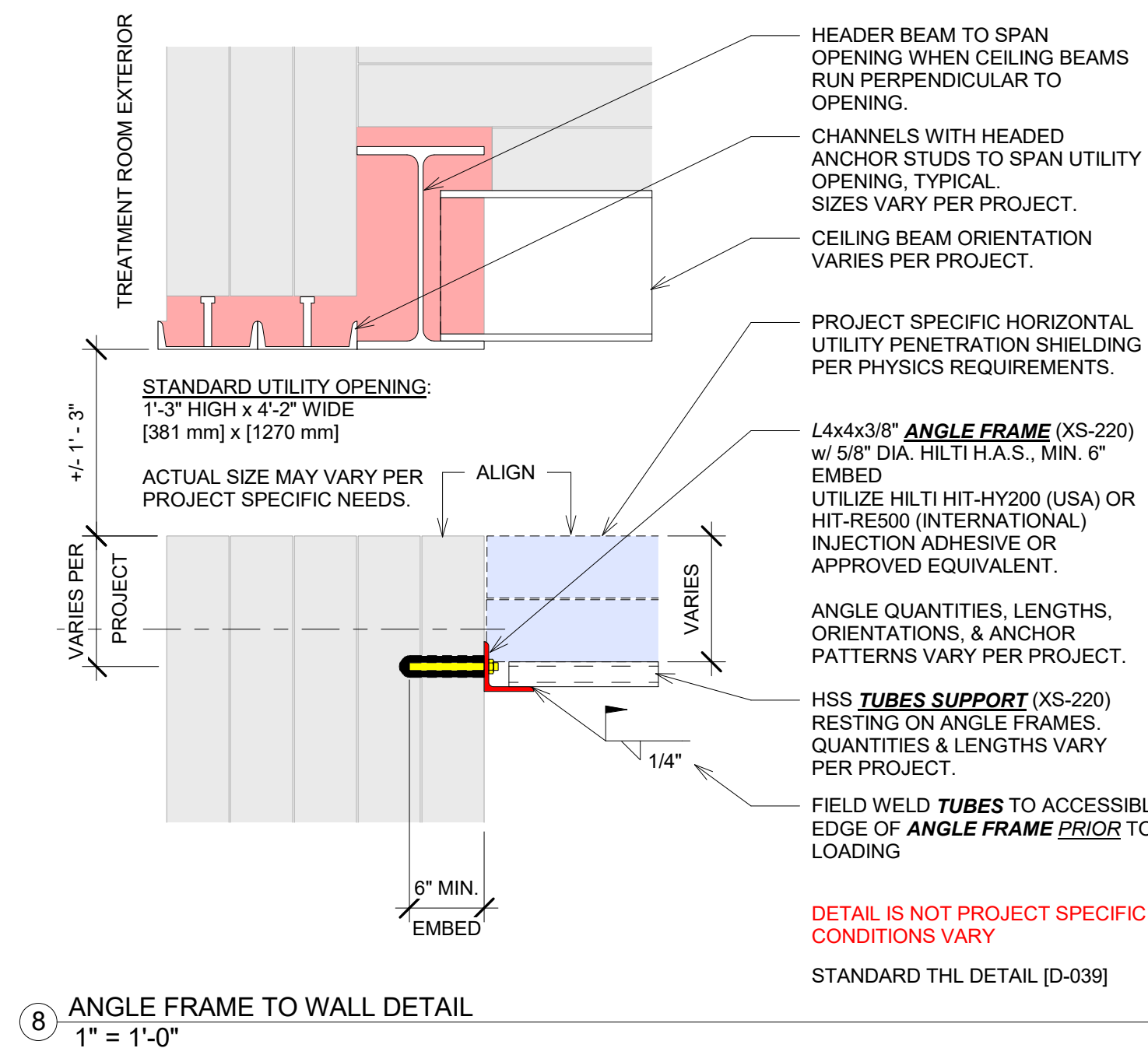
SALES REP:	
PHYSICIST:	
DESIGNER:	
PROJECT MANAGER:	
VERITAS PROJECT INFORMATION	
PROJECT #	
PROSPECT #	
PHYSICS REPORT:	
SHIELDED DOOR(S):	
MACHINE:	
MACHINE ENERGY:	

DRAWING TITLE

SECTIONS

DRAWING NUMBER

X300



ANCHOR, CONNECTION, & SUPPORT CHART								
ITEM	DIAMETER		LENGTH		MIN. EMBED	DESCRIPTION (USE / LOCATION)	NOTES	
HILTI HAS E-B	1"	[25.4 mm]	16"	[406.4 mm]	12"	[304.8 mm]	<i>BI-PART & SLIDING</i> DOOR FRAME BASE PLATE ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HIT-Z	3/4"	[19.05 mm]	9 3/4"	[247.65 mm]	6"	[152.4 mm]	<i>BI-PART & SLIDING</i> DOOR FRAME WALL TIE-BACK ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HIT-Z	3/4"	[19.05 mm]	8 1/2"	[215.9 mm]	6"	[152.4 mm]	<i>SWING</i> DOOR FRAME & LAP FRAME FLOOR ANCHORS	UTILIZE APPROVED INJECTION ADHESIVE
HILTI HAS -E-55 ROD	5/8"	[15.875 mm]	9"	[247.65 mm]	6"	[152.4 mm]	SHELF ANGLES, PENETRATION ASSEMBLY	UTILIZE APPROVED INJECTION ADHESIVE
A325 - BOLT	5/8"	[15.875 mm]	2 3/4"	[69.85 mm]	NOT APPLICABLE	PENETRATION ASSEMBLY FRAME	ASSIST BOLTS FOR FRAME ANGLES, FULLY THREADED	
A325 - TC BOLTS	3/4"	[19.05 mm]			NOT APPLICABLE	FRAMING, SET BOLTS FOR OPENINGS	CONNECTION @ FRAMED CEILING OPENINGS	
NELSON H4L	5/8"	[15.875 mm]	4"	[101.6 mm]	NOT APPLICABLE	WELD TO BEARING PLATES & LINTELS	SPACING & QUANTITY PER DETAILS ON XS-50x SHEET(S)	
REBAR	VARIABLES, AS REQ'D	VARIABLES, AS REQ'D			6"	[152.4 mm]	REINFORCING CELLS, 6" MIN. EMBED (SLAB)	SEE XS-110 WALL REINFORCING PLAN FOR REBAR SIZE(S)
HILTI HIT-HY 200(R)	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (USA)	(R = REGULAR), HOUR AND A HALF CURE TIME	
HILTI HIT-HY 200(A)	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (USA)	(A = ACCELERATED), 45 MINUTE CURE TIME * DO NOT USE IN REGIONS ASSOCIATED WITH HIGH HEAT or HUMIDITY (i.e.: FLORIDA)	
HILTI HIT-RE 500	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPROVED INJECTION ADHESIVE (INT.)	(INT. = INTERNATIONAL PROJECTS)	
MASONRY WALL TIE	NOT APPLICABLE	VARIABLES, AS REQ'D	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	SINGLE LAYER OF MATERIAL TO WALL	TYPICALLY 20 GA. GALVANIZED, U.N.O. - REFER TO DETAILS	
HILTI X-U SHOT PIN					1 1/2"	[38.1 mm]	MASONRY WALL TIE TO WALL	
TAPCON	1/4"	[6.35 mm]			1 1/2"	[38.1 mm]	MASONRY WALL TIE TO WALL	THIS IS AN ALTERNATE TO THE X-U SHOT PIN
ITEMS HIGHLIGHTED IN YELLOW ARE UTILIZED IN THIS PROJECT								
UNLESS NOTED / DETAILED OTHERWISE, ALL HOLES PROVIDED FOR ANCHORS TO BE A MIN. OF 1/16" [1.59mm] LARGER THAN & NO GREATER THAN A MAX. 1/8" [3.175mm] LARGER THAN BOLT DIA.								

