

Municipality of Clarington
Orono Arena and Community Centre
Change Room Improvement and Rink Replacement
2 Princess Street, Orono, Ontario
"ISSUED FOR CONSTRUCTION"

BBA Project No. 22119B

DATE February 5, 2024



BARRY BRYAN ASSOCIATES

Architects, Engineers, Project Managers

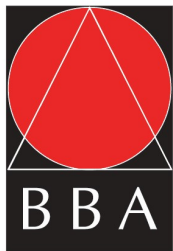
250 Water Street Telephone: 905 666-5252

Suite 201 Fax: 905 666-5256

Whitby, Ontario

Canada Email: bba@bba-archeng.com

L1N 0G5 Web Site: www.bba-archeng.com



**BARRY BRYAN
ASSOCIATES**

Architects
Engineers
Project Managers



250 Water Street,
Suite 201
Whitby, Ontario
Canada
L1N 0G5

Tele: **905-666-5252**
Fax: **905-666-5256**
Email: bba@bba-archeng.com
www.bba-archeng.com

Addendum No. 1

Page 1 of 7

Project No.: 22119B

Date: January 11, 2024

Tender No.: CL2023-41

Project: **MUNICIPALITY OF CLARINGTON**
Newcastle Memorial Arena & Orono Arena & Community Centre

The following information supplements and/or supersedes the bid documents issued to Tender by the Municipality of Clarington.

This Addendum forms part of the contract documents and is to be read, interpreted, and coordinated with all other parts. The cost of all contained herein is to be included in the contract sum. The following revisions supersede the information contained in the original drawings and specifications issued for the above-named project to the extent referenced and shall become part thereof. Acknowledge receipt of this Addendum by inserting its number and date on the Tender Form. Failure to do so may subject bidder to disqualification.

GENERAL

- 1.1 The project shall be extended to January 19th, 2024 at 2:00pm.
- 1.2 The Municipality of Clarington will not accept costs and/or claims for material cost escalations from the time of bid from the general contractor or subtrades after the award of tender.
- 1.3 The windows being replaced from the lobby to the rink surface shall include removal of the tile sill and replacement with a new plywood and PLAM sill. All surfaces around the windows being replaced shall be painted to match existing.
- 1.4 The existing receptacles in the dashboards shall be removed and re-instated in the new dashboards. Refer to HCC CCN No. E01 dated December 4th, 2023 for additional information. Note: locations of the receptacles as shown are to be site verified.
- 1.5 The painting scope shall be clarified to only include the exposed rigid frames and purlins on the exterior of the building over the outside seating area. The interior purlins and frames within the rink area are not included in the base bid scope of work.
- 1.6 The contractors must include proper sign off of specialty engineered products that require compliance by the 3rd party engineer who signed and sealed the submission. The 3rd party compliance is to confirm that their component of the design has been installed and completed in compliance with their engineered design. Examples of 3rd party engineered systems include but are not limited to miscellaneous metals, structural steel connections, glazing systems, dashboards etc. Provisions of this letters is a requirements of project closeout and must be provided prior to release of the project completion security. Note: multiple reviews may be required by these 3rd party engineers due to the phasing of the project.
- 1.7 The bidders must include for project close out and occupancy information as provided in the specifications such as fire alarm verification, ESA, emergency lighting reports etc. Where indicated the documents shall be stamped by a professional engineer for compliance in the bid documents it must be followed and will not be amended.
- 1.8 There are two (2) sloped concrete ramps at the stairs to the viewing area in the rink. These ramps must remain, the void between the new dashboards (located on the rink) and the existing concrete ramp must be sealed with a HDPE from the dashboard to edge of concrete or infilled with concrete to match the existing ramp profile and provide closure. Refer to Barry Bryan Associates SKA-01 for additional information.

- 1.9 The facility will remain operational during construction, the facility will utilize the main lobby, 2nd floor banquet, and office / administration spaces during construction. Services and utilities to the building must be maintained during construction and proper notice of shutdown provided to the Municipality of Clarington.
- 1.10 The Municipality reserves the right to request the contractor to undertake an open book bid process for the supply and installation of work identified in the cash allowances (e.g security, hardware, testing inspection etc.).
- 1.11 Consultants will complete periodic reviews of the work for general conformance with the design drawings and specifications. Construction meetings will take place on a bi-weekly basis for the duration of the project, meeting minutes will be taken by the general contractor at each meeting and distributed to the project teams.
- 1.12 The general contractor will be required to complete an interference meeting with applicable sub-trades, consultants, and the Municipality to proactively identify site issues, constraints, and possible constraints for the project. Please note extensive existing and new servicing will be present in the change room ceiling space and special coordinated efforts will be required as part of the base bid scope of work for the mechanical / electrical rough ins with the masonry work. The contractor will be responsible for coordinating these efforts and schedule the work and forces accordingly to suit the completion dates.
- 1.13 Clarify below rink slab insulation as Hi-Load 40 compressive strength in accordance with Specification 07 21 13.
- 1.14 The rink slab shall only have one (1) 6 MIL poly slip sheet as indicated on 4/S101.
- 1.15 Existing cold brine pump shall be reused. Do not demolish or replace.
- 1.16 Existing cold brine expansion tank shall be reused. Do not demolish or replace.
- 1.17 Replace existing condenser water pump like for like replacement. Reuse condenser water pump motor starters and wiring.
Condenser Water Pump
One (1) Condenser Water Pump
S.A. Armstrong
Flow: 120 USGPM
Horsepower: 3HP
- 1.18 Replace existing condenser water tank like for like replacement.
Condenser Water Tank
One (1) Condenser Water Tank
ACO Containers
Sized to match existing
- 1.19 Section 13 18 30 Ice Rink item 2.5.4 page 8 of 12 shall be removed from scope of work.
- 1.20 Section 13 18 30 Ice Rink item 2.6.2, 2.6.4, 2.6.5, 2.6.6 and 2.6.7 page 9 of 12 shall be removed from scope of work.
- 1.21 Refrigeration contractor to supply and install a new 4" relief header complete with diffuser to the roof for the two (2) new compressors.



QUESTIONS AND ANSWERS

1.22 **Question:** I request that North West Rubber's Reaction be approved as an alternate to Mondo Ramflex. Please see attached documents.

Answer: The alternative is not acceptable.

1.23 **Question:** We would like to submit a substitution request for RHINO 7000 as an approve equal from Rhinotek Entrance Solutions. Please see attached for your reference.

Answer: The alternative is acceptable.

1.24 **Question:** Westpoint would like to propose an equivalent for section 09 65 66.13 Resilient Athletic Flooring. Product Northwest Rubber Reaction Skatetile by Westpoint, data sheet attached, see their website:
<https://northwestrubber.com/sportfloor/products/reaction/>

Answer: The proposed alternative is not acceptable.

1.25 **Question:** Will a new scoreboard be required for this refurbishment?

Answer: No, this will not be part of the project scope of work..

1.26 **Question:** We kindly request Northwest Rubber ProXL as an equal to Mondo Ramflex for section 09 65 66.13.

Answer: The proposed alternative is not acceptable.

1.27 **Question:** The Electrical specifications include a Supplementary Tender Form. Are we to submit this with our regular tender submission?

Answer: The electrical sub-tender can be submitted after the project close and is not part of the project tender.

1.28 **Question:** Please include MaxFlor+ by Advantage Sport in section 09 65 66.13. Municipality of Clarington has already installed our product in recent facility renovations (Garnet. B. Rickard, Newcastle).

Answer: The proposed alternative is not accepted for this project.

1.29 **Question:** Detail 1/A702 shows fastening of the maple wood slats to the angle with non-ferrous fasteners from below. Detail 4/A702 shows fastening via 10mm diameter stainless steel carriage bolts. Please clarify.

Answer: Stainless steel carriage bolt fasteners.

1.30 **Question:** Detail 1/A203 and 5/A701 shows a new toilet partition for WC 121B. Please provide specification.

Answer: Refer to attached specification for the washroom partition.

1.31 **Question:** Detail 1/A203 and 7/A701 shows a new double stack metal locker. Please provide specification.

Answer: See attached specification.



- 1.32 **Question:** Provide spec for FRP Panels (C2). I do not see it in Section 09 51 13.
- Answer:* The FRP is will be a standard white smooth sheet adhered to the underside of the gypsum board. The FRP is a standard sheet having a minimum thickness of 0.09" thickness or better.
- 1.33 **Question:** Wattstopper on site services as per dwg E-1.2 note N-15/N-16 and dwg E-3.1 notes N-13/N-23/N-25.
- Answer:* Required.
- 1.34 **Question:** 3rd party engineer to verify light levels as per dwg E-1.2 note N-16 and spec 26 60 02 item 3.9 are required?
- Answer:* Required.
- 1.35 **Question:** Does the contractor do the actual drawing edits AutoCAD for as built drawings including associated fees noted in spec 26 05 00 item 1.20?
- Answer:* Yes, this is required.
- 1.36 **Question:** Full electrical system studies noted in spec 26 60 02 required?
- Answer:* Yes, this is required.
- 1.37 **Question:** 3rd Party ULC-S1001 integrated system testing noted in spec 28 31 00.01 Item 1.1.6.
- Answer:* This will not be required for this facility.
- 1.38 **Question:** If additional scope identified in the following notes are not used during construction will a credit be requested from the contractor? Dwg E2.1 note N-14, Dwg E3.1 notes N-9, N-22, & N-27, Dwg E5.1 note N-3.
- Answer:* A credit for the un-used scope will be requested.
- 1.39 **Question:** Can the submission and RFI Deadline be extended by 1 week.
- Answer:* See addendum items above.
- 1.40 **Question:** Please confirm the extents of backer panel.
- Answer:* Backer panel is required around the entire perimeter of the new dasher boards. Additionally, the lobby wall which is currently acting as the dasher boards at the south end of the rink shall be re-faced with new plastic laminate puck board and top closure see attached sketch SKA-02.
- 1.41 **Question:** Drawing A201-1. Demolition plan legend (10) remove and replace existing rubber skate tile, extent to be confirmed. Can you please confirm the extent of rubber replacement on this side of the rink.
- Answer:* The extent limit is defined by the extents limit shown for this demolition item on the plan.
- 1.42 **Question:** Drawing A201 note#12 calls to replace puck paneling. Could you please provide specifications and details.



Answer: See addendum points above.

- 1.43 **Question:** **Drawing A201 note#6 calls for preparation of purlins for new paint. Please describe preparation process and what is required.**

Answer: The exterior purlins being repainted must be prepared (cleaned) to receive primer and finish coats in accordance with the manufacturers written instruction and specifications. Refer to the exterior painting specifications for additional information.

- 1.44 **Question:** **Demolition notes on drawing A201 calls for dust protection since the building will be operational and occupied. Could you please let us know which areas will be occupied and what type of activities will be performed.**

Answer: See addendum points above.

- 1.45 **Question:** **Please confirm that ice line painting is not part of this contract.**

Answer: Ice painting is not included as part of the project scope.

- 1.46 **Question:** **Drawing A203, room 115 shows locker. Please provide specifications.**

Answer: See addendum points above.

- 1.47 **Question:** **Drawing A203 calls for C2 ceiling type which is fiberglass reinforced plastic (FRP) paneling on gypsum board. Could you please provide specifications for this item.**

Answer: See addendum points above.

- 1.48 **Question:** **Drawing A203 shows toilet partitions. Please provide specifications.**

Answer: See addendum points above.

- 1.49 **Question:** **S101 slab on grade notes call for saw cutting, could you please confirm it is not required.**

Answer: Slab cutting will be part of this project refer to the drawings for the scope work.

- 1.50 **Question:** **Drawing S202 Foundation Plan Notes. Please confirm notes 8 and 15 is not required for this project.**

Answer: These notes are not applicable to the project scope of work.

PRE BID MEETING MINUTES

- 1.51 The project requires extensive sequencing of the work to maintain the continued facility operations. Multiple mobilizations and demobilizations of sub-trades should be expected to facilitate the construction work to meet the project schedule.
- 1.52 All work for the rink must be completed and ready for operation / occupancy by September 1st, 2024 as outlined in the bid documents. This includes all inspections necessary for full or partial occupancy complete by the turn over date.
- 1.53 The Municipality reserves the right to request the contractor to undertake an open book bid process for the supply and installation of work identified in the cash allowances (e.g security, hardware, testing inspection etc.).



- 1.54 Alternative or equivalent products must be approved by addendum prior to the tender closing. Product substitutions after the award will only be considered if they demonstrate a benefit to the Municipality in contract price or contract time.
- 1.55 The contractor is responsible for completing utility locates. Costs for locates shall be included in the base bid and are not included in the cash allowance.
- 1.56 General demolition extents and elements are shown on the demolition plan. However, the scope of the demolition work is as required to complete the new project scope of work. The general contractor shall include coordination of the demolition works as part of the base bid scope of work to complete and execute the overall project intent. This includes slab removals, contractors must anticipate working around locates in the slab and include for hand removals at live conduit as part of their base bid.
- 1.57 Contractors were made aware of the of the tight working spaces and the importance of organized sub-trade coordination for the new foundation scope of work mechanical / electrical. It is the contractors responsibility to coordinate sub-trades mobilization and re-mobilization around the sequenced work plan. The Municipality will not entertain additional costs for re-mobilization costs resulting from sequencing of the work.
- 1.58 The Contractor can us the existing building facilities for a construction office and washrooms. The contractor is responsible for cleaning areas used for construction purposes.
- 1.59 It was recommended that all access doors and hatches be supplied by the mechanical sub-trade and installed by the ceilings.

End of Addendum No. 1

Barry Bryan Associates

Architects, Engineers, Project Managers



Doug McLaughlin, P. Eng.

DM/al

| | | |
|--------------|---|-----------|
| Attachments: | Barry Bryan Associates Sketches SKA-01/SKA-02 | (2 Pages) |
| | HCC Engineering CCN No. E01 | (1 Page) |
| | Specification 10 51 13 | (6 Pages) |
| | Specification 10 21 13 | (6 Pages) |
| | Specification 07 21 13 | (5 Pages) |

I/We hereby acknowledge receipt of this Addendum.



Addendum No. 1

Page 7 of 7

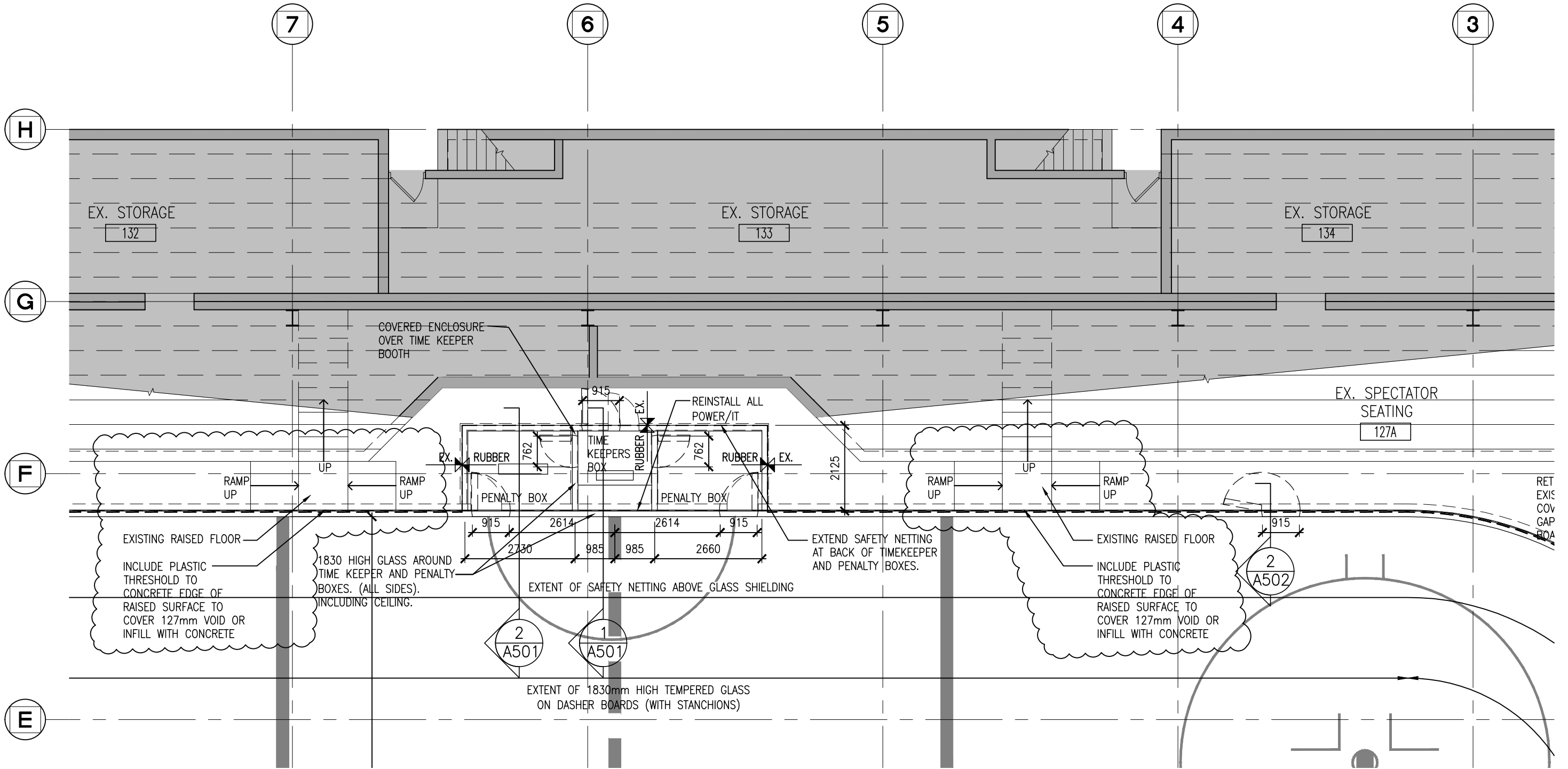
Signature (signing officer of firm)

Position

Name of Firm

One copy of the addendum must be signed and returned with the completed tender, or the tender submitted shall be rejected.



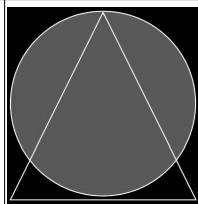


PROJECT:
**ORONO ARENA AND COMMUNITY CENTRE
RINK REPLACEMENT AND CHANGEROOM RENO.**
2 PRINCESS STREET
ORONO, ONTARIO
LOB 1M0

MUNICIPALITY OF CLARINGTON

DRAWING:
**REVISED FIRST
FLOOR PLAN
1/A202**

DO NOT SCALE THE DRAWINGS
CHECK AND VERIFY ALL DIMENSIONS AT THE SITE.
ALL DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS ARE THE
COPYRIGHT PROPERTY OF THE CONSULTANT AND MUST BE RETURNED
UPON REQUEST. REPRODUCTION OF DRAWINGS IN PART OR WHOLE
WITHOUT THE PERMISSION OF THE CONSULTANT IS FORBIDDEN.
DRAWINGS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED
AND SEALED BY THE CONSULTANT.

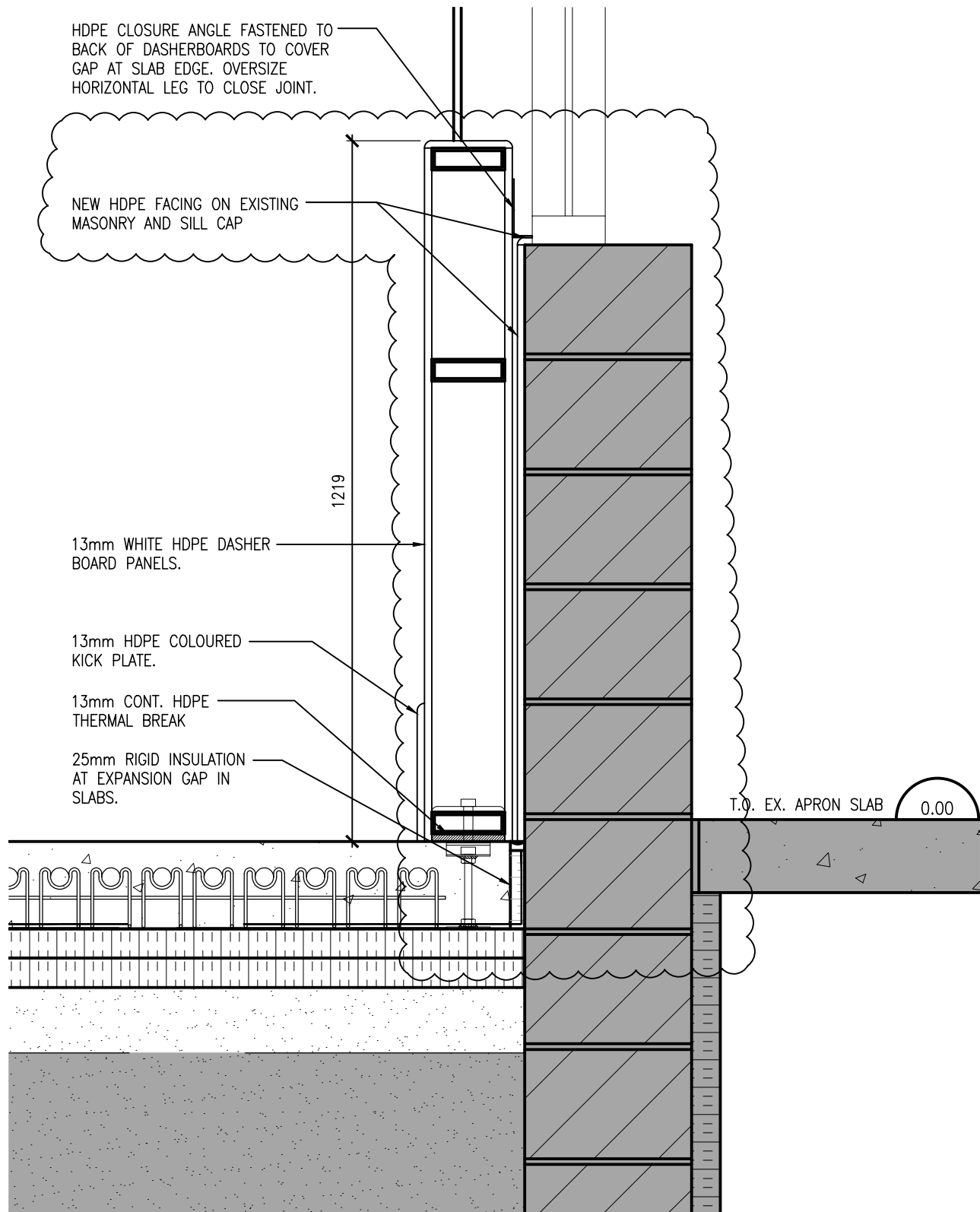


**BARRY BRYAN
ASSOCIATES**
Architects
Engineers
Project Managers
250 Water Street
Suite 201
Whitby, Ontario
L1N 0G5
Tel: (905) 666-5252
Fax: (905) 666-5256
e-mail: bba@bba-archeng.com

PROJECT NO:

22119B

| | |
|------------------------|----------------------|
| DESIGN BY: BBA | DCC CONTROL DATE: |
| DRAWN BY: LQ | % COMPLETE: |
| CHECKED BY: DM | INITIAL: |
| DATE: JAN. 10, 2024 | |
| SCALE: 1:100 | |
| FILE: | |
| DRAWING NO: | |
| SKA-01 | |



PROJECT:

**ORONO ARENA AND COMMUNITY CENTRE
RINK REPLACEMENT AND CHANGEROOM RENO.**

2 PRINCESS STREET
ORONO, ONTARIO
L0B 1M0

MUNICIPALITY OF CLARINGTON

DRAWING:

**REVISED SECTION @
VIEWING AREA
1/S503**

DO NOT SCALE THE DRAWINGS
CHECK AND VERIFY ALL DIMENSIONS AT THE SITE.

ALL DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS ARE THE
COPYRIGHT PROPERTY OF THE CONSULTANT AND MUST BE RETURNED
UPON REQUEST. REPRODUCTION OF DRAWINGS IN PART OR WHOLE
WITHOUT THE PERMISSION OF THE CONSULTANT IS FORBIDDEN.
DRAWINGS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED
AND SEALED BY THE CONSULTANT.



**BARRY BRYAN
ASSOCIATES**

Architects
Engineers
Project Managers

250 Water Street
Suite 201
Whitby, Ontario
L1N 0G5

Tel: (905) 666-5252
Fax: (905) 666-5256
e-mail: bba@bba-archeng.com

PROJECT NO:

22119B SKA-02

| | |
|------------------------|------------------------|
| DESIGN BY: BBA | DOC. CONTROL: DATE: |
| DRAWN BY: LQ | % COMPLETE: |
| CHECKED BY: DM | INITIAL: |
| DATE: JAN. 11, 2024 | |
| SCALE: 1:10 | |
| FILE: | |

DRAWING NO:

HCC ENGINEERING LIMITED

Design and Technology Services Group

40 Eglinton Avenue East

Suite 600

Toronto, Ontario

M4P 3A2

Tel: (416) 932-2423

Contemplated Change Notice - CCN #E-01

Orono Arena and Community Centre

2 Princess Street

Orono, Ontario

HCC Project #23153

BCIN# 28954

Date: December 1, 2023

From: Phoenix Chen

Contractor:

Distribution: BBA

Submit detailed, itemized costs for each addition, deletion and/or revision listed below. Include profit, overhead and service charges, if applicable.

Reason for change: Requested by Owner.

1. Remove nine (9) existing receptacles and existing associated junction boxes (9 in total) in existing dasher boards to accommodate the removal of dasher boards to accommodate architectural upgrades. Cap and make safe all wiring to be reused after architectural upgrades.
2. Provide nine (9) 6" x 6" x 4" pull boxes Hammond Manufacturing C4XSC664SS at slab level to accommodate joints between existing wiring made safe during demolition and new wiring provided as part of this scope of work to receptacles in upgraded dashboards.
3. Provide one (1) single gang RAB box (9 in total) c/w single gang flip weatherproof cover (Bell model MX1050Z) (9 in total) at each new junction box location.
4. Provide nine (9) 15A/120V u-ground split receptacles.
5. Provide eighteen (18) 15A GFCI breakers in Panel LP-D in Electrical Room 130 to protect all circuits associated with the above noted receptacles.

End of CCN #E-01

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 06 10 00 Rough Carpentry
- .2 Section 06 20 00 Finish Carpentry

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A1008/A1008M-20 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit detailed shop drawings of metal lockers.
 - .1 Provide layout plans and elevations of banks of lockers.
 - .2 Clearly indicate type and class of locker, materials, thickness of metals, fabricating and assembly methods, assembled banks of lockers, trim, shelves, tops, end panels, filler panels, bases, doors, hardware, numbering, locking assemblies, ventilation method, installation methods and finishes.
- .3 Submit samples of locker components, finishes and fastening devices.
- .4 Submit triplicate colour charts showing full range of manufacturer's standard colours for selection by the Consultant.
- .5 Maintenance Data: Submit manufacturer's written instructions for cleaning and operation of lockers for inclusion in Operation and Maintenance manuals specified in Section 01 78 00 – Closeout Submittals.

1.5 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed

instructions.

- .3 Deliver lockers only after closing-in of building.
- .4 Handle products to prevent bending, racking or otherwise damaging lockers. Protect refinished surfaces from marring. Damaged products shall not be installed and shall be removed from project site.

1.6 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.7 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of two years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

PART 2 PRODUCTS

2.1 General

- .1 Lockers:
 - .1 Single full-height and double tier lockers as indicated, 305 mm and 406 mm wide.
 - .2 All lockers shall be mounted on 100 mm high concrete curbs as detailed.
 - .3 All welded construction.
 - .4 Lockers shall be all powder coat painted steel.
 - .5 Full height piano hinges.

2.2 Painted Steel Lockers

- .1 Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS) Type B, suitable for exposed applications.
- .2 Locker Bodies: Locker sides, backs, tops, bottoms, bases, end closers, and shelves shall be fabricated from pre-painted cold rolled, electro-zinc coated sheet steel. Edges to be suitable formed to provide a rigid assembly when bolted or riveted together. Tops, bottoms and shelves shall be flanged on all sides. Sides

shall be double ribbed their entire length to ensure a stiff, rigid installation. Tops to be sloped.

- .3 Frames to be 1.60 mm specially formed channel sections of prime cold rolled steel with 16 mm wide full closure strike, full height of door. Doors to close flush with outside face of frame.
- .4 Top, Bottom, Backs and Shelves: 0.81 mm pre-painted steel.
- .5 Sides: 0.60 mm painted steel.
- .6 The locker bottom shall have a 1.60 mm support bracket installed across the center of the locker bottom.
- .7 Tiers:
 - .1 Double Tier 305 x 915 x 455 mm deep.
 - .1 Complete with three (3) hooks at each compartments on each wall.
 - .2 Complete with a wall shelf in each compartment
 - .3 Complete with filler and closure pieces at corners and end units as necessary.

2.3 Doors

- .1 Doors shall be double skin, minimum 21 mm thick with 1.60 mm outer panel and 0.60 mm inner panel welded together to form a rigid box.
- .2 Honeycomb filler for locker doors shall contain minimum 18% recycled content.

2.4 Accessories

- .1 Locker numbers: Engraved plastic or aluminum number plates with black numerals. Locker numbering to Owner's requirements.
- .2 Provide manufacturer's standard sloping top, fillers and trim required to complete the installation.
- .3 Ventilation shall be by louvres in the top and bottom frame members.

- .4 Fillers: Provide sheet metal trim finished to match lockers for closure and transition of lockers to adjacent surfaces as detailed on drawings and approved shop drawings.
- .5 End panels: Provide exposed ends of locker modules with sheet metal end panels finished to match lockers.
- .6 Interior Equipment: Each locker to be provided complete with a shelf located approximately 350 mm below the top of the locker and 3 round tip, zinc plated metal coat hooks attached with 2 bolts per hook.
- .7 Provide lockers complete with all hardware necessary for a complete installation. Hardware for each locker includes, but is not limited to, one recessed chrome plated steel or aluminum pocket for padlock locking, flush face, rubber bumpers on strike jamb of frame, and concealed nylon friction action door stop.
- .8 Hinges: 1.60 mm continuous integral one piece steel hinge, painted to match lockers.
- .9 Fastenings shall be concealed where possible. Exposed fastenings shall be neatly executed and shall be of the same material and finish as the base metal on which they occur.
- .10 Mounting hardware: Provide brackets, perforated ventilation strips, fasteners, and other hardware of type and size recommended by manufacturer for type of substrate.

2.5 Finishes

- .1 Finish: all cold rolled surfaces shall be thoroughly cleaned before painting with a phosphoric acid based cleaner. The parts shall be finished with an abrasion and graffiti resistant electrostatically applied polymer powder coating baked with the proper temperature/time relationship to ensure a tough, durable finish.
- .2 Colours: Locker sides, backs, tops, bottoms and shelves shall be manufacturer's standard colour. Doors, frames, bases, end closers and sloping tops to be of colours as selected by the Consultant from the manufacturers full range of standard colours. Up to four (2) colours may be selected.

PART 3 EXECUTION

3.1 Fabrication

- .1 Verify all dimensions on the site prior to proceeding with shop fabrication.
- .2 Fabricate the work true to dimensions, square, plumb, and level. Accurately fit members with hairline joints.
- .3 Secure intersecting members with appropriate fasteners.
- .4 Fabricate the finished work free from distortion and defects detrimental to appearances and performance.
- .5 Lockers shall be completely factory assembled by riveting frames and doors to body.
- .6 Frame: Welded overlapping construction with double material thickness for lock housing.
- .7 Body: Flanged, reinforced and back ventilated.
- .8 Base: none required.

3.2 Installation

- .1 Prior to installation, check and verify work of other sections on which lockers are to be mounted. Report any discrepancies to the Consultant.
- .2 Wood furring for lockers shall be installed as specified in Section 06 10 00.
- .3 Assemble and install lockers in accordance with manufacturer's written instructions.
- .4 Securely fasten lockers to grounds and nailing strips.
- .5 Install filler panels (false fronts) where indicated and where obstructions occur.
- .6 Arrange locker modules in sequence of locker numbers.
- .7 Install locker numbers.
- .8 Provide all metal trim and closures necessary for a complete, finished installation.

- .9 Securely anchor lockers in place, true and plumb. Method of fastening shall ensure that lockers are capable of withstanding expected loads without movement.
- .10 Install lockers secure, plumb, square, and in line.
- .11 Position lockers with 25 mm air flow space between module and wall and 51 mm space between back-to-back lockers. Install perforated filler strip at top of air spaces.
- .12 Anchor lockers at spacing indicated on approved shop drawings with appropriate anchor devices to suit adjacent materials and finishes:
 - .1 For each locker module, install minimum of 1 locker-to-wall bracket.
 - .2 Bolt adjoining locker modules together to provide rigid installation with stainless steel bolts of type, size, and spacing as recommended by manufacturer.
- .13 Install filler panels, end panels, filler, sloping tops and trim to completely close off openings.

3.3 Adjustment

- .1 Test mechanisms, hinges, locks and latches and where necessary, adjust and lubricate and ensure that accessories are in perfect working order.

3.4 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Upon completion of the work remove all traces of protective coatings or paper.
- .3 Wash exposed surface using a solution of mild detergent in warm water, applied with soft, clean cloths. Do not use abrasives.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 50 00 Metal Fabrications
- .2 Section 10 28 10 Toilet and Bath Accessories

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A480/A480M-20a Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
 - .2 ASTM E84-21a Standard Test Method for Surface Burning Characteristics of Building Materials
- .2 CSA Group (CSA)
 - .1 CSA-B651-12 Accessible Design for the Built Environment.
- .3 American National Standards Association (ANSI)
 - .1 ANSI/NEMA LD 3-2005 High-Pressure Decorative Laminates (HPDL)
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102 Surface Burning Characteristics of Building Materials and Assemblies
- .5 Accessibility for Ontarians with Disabilities Act (AODA)

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Submit manufacturer's data sheets for each product specified.
- .3 Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
 - .1 Plans, elevations, details of construction and attachment to adjacent construction.
 - .2 Show anchorage locations and accessory items.
 - .3 Verify dimensions with field measurements prior to final production of the toilet compartments.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of panel showing finish on both sides, two finished edges and core construction.

- .5 Submit duplicate representative samples of each hardware item, including brackets, fastenings and trim.
- .6 Provide maintenance data for toilet compartments for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 Quality Assurance

- .1 Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- .2 Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- .3 Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to AODA, ADA and ICC/ANSI A117.1 requirements as applicable.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, store, and handle materials and products in strict compliance with manufacturer's instruction and recommendations. Protect from damage.
- .3 Protect finished surfaces during shipment and installation. Do not remove until immediately prior to final inspection.

1.7 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.8 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of ten years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

Part 2 Products

2.1 Approved Manufacturers

- .1 Basis-of-Design Products: Specifications are based on the products of Bobrick, www.bobrick.com.
- .2 Equivalent products by other manufacturer's will be considered subject to compliance with specifications.

2.2 Compartments with Aluminum Frame and Pedestal Support

- .1 Substrate Material:
 - .1 Compact Grade Laminate (Phenolic Black Core)
 - .1 Materials: Solidly fused plastic laminate with matte-finish melamine surfaces; integrally bonded colored face sheets and black phenolic-resin core
 - .2 Edges: Black; brown edges not acceptable
 - .3 Colour: Charcoal 0077-FH
 - .4 Optional Dividing Panel Size: Panel up to 1829 mm deep to be one-piece panels
- .2 Toilet Compartments:
 - .1 Configuration: Floor-anchored, Overhead-braced toilet cubicles.
 - .2 Basis-of-Design: Bobrick Evolve Toilet Cubicles
- .3 Door Hardware and Pedestal: clear anodized aluminum
 - .1 Standard Height: Overall height from finished floor to top of headrail is 2083 mm consisting of 229 mm floor clearance, 1811 mm doors, and 25 mm headrail.
- .4 Fire Resistance:
 - .1 Class A
 - .1 Flame Spread Index (ASTM E 84): No more than 25 for panels, doors, and fascia panels
 - .2 Smoke Developed Index (ASTM 84): No more than 450 for panels, doors, and fascia panels
 - .3 National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class A
 - .4 Uniform Building Code: Class I
- .5 Frame:
 - .1 Headrail: Secured to the top of the fascia for stability
 - .2 Mounting Brackets and Fasteners: Clear anodized aluminum U-Channel brackets.
 - .3 Privacy:

- .1 Full-length clear anodized aluminum frame provides built-in, no-sightline privacy on hinge and keeping-sides of the door.
- .4 Continuous clear anodized aluminum U-Channels fasten divider and fascia panels to the wall.
- .6 Hardware:
 - .1 Compliance:
 - .1 Door handle shall be operable with one hand, without tight grasping, pinching, or twisting of the wrist, force to operate shall not exceed 5 pounds. Door pull: Barrier-free type suited for out-swinging doors, stainless steel. Conform to AODA and Ontario Building Code requirements.
 - .2 Floor Clearance: 229 mm high minimum clearance maintained under fascia panel and side divider panels
 - .3 Keyed Emergency Access: Latch shall allow door to be opened from the outside of the compartment with a 3mm Allen wrench in emergency release slot in the indicator
 - .4 Fastening: Hardware secured to door and fascia by stainless steel sheet metal screws
 - .5 Door-closing:
 - .6 Standard: Clear anodized aluminum pedestal secured beneath door incorporates a spring closing mechanism, creating a soft door close and includes (+/-) 25 mm adjustment.
 - .7 Door Hardware Type:
 - .1 Locking: clear anodized aluminum door handle located directly into the vertical keeping extrusion. Integral rubber door bumper shall cushion doors when closing.
 - .2 Occupancy indicator: Clear anodized aluminum circular escutcheon with red and white indicator.
 - .3 Standard: Cylindrical pedestal supports divider panels and shall maintain a 229 mm high floor clearance under fascia panel and side divider panels and include (+/-) 25 mm adjustment.
 - .4 Robe hook: Clear anodized aluminum in matte finish.

Part 3 Execution

3.1 Manufacturer's Instructions

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Preparation

- .1 Prepare substrates including, but not limited to, blocking and supports in walls at points of attachment using methods recommended by the manufacturer for achieving the best results for the substrates under the project conditions
 - .1 Inspect areas scheduled to receive compartments scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets
 - .2 Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
 - .3 If preparation is the responsibility of another installer, notify the Consultant in writing of deviations from manufacturer's recommended installation tolerances and conditions
- .2 Do not proceed with installation until substrates have been properly prepared with blocking, supports in walls at points of connections, and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitute acceptance of conditions

3.3 Installation

- .1 Installation must be performed by a manufacturer trained and certified installer.
- .2 Do work in accordance with CSA-B651.
- .3 Install products in strict compliance with manufacturer's written instructions and recommendations, include the following:
 - .1 Verify blocking and supports in walls have been installed properly at points of attachment
 - .2 Verify location does not interfere with door swings or use of fixtures
 - .3 Use fasteners and anchors suitable for substrate and project conditions
 - .4 Install compartments rigid, straight, plumb, and level
 - .5 Conceal evidence of drilling, cutting, and fitting to room finish
 - .6 Test for proper operation
 - .7 Verify that gaps between fascia panels and doors are blocked and ensure privacy
- .4 Adjust hardware for proper operation after installation. Verify the doors self-close from the 90-degree position and door closes in no fewer than 4 seconds

3.4 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Compartments
And Cubicles
Section 10 21 13

.2 Touch-up, repair or replace damaged products.

.3 Clean exposed surfaces of compartments, hardware, and fittings.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 03 30 00 Cast-in-Place Concrete
- .4 Section 07 26 00 Vapour Retarders
- .5 Section 31 23 10 Excavating, Trenching and Backfilling

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C518-15 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - .2 ASTM C578-15 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
 - .3 ASTM D1621-10 Standard Test Method for Compressive Properties of Rigid Cellular Plastics
 - .4 ASTM D1623-09 Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
 - ASTM E84-15a Standard Test Method for Surface Burning Characteristics of Building Materials
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering
 - .2 CAN/ULC-S702 Thermal Insulation Mineral Fibre for Buildings
 - .3 CAN/ULC S704 Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.
- .3 Canadian General Services Board (CGSB)
 - .1 CGSB 71-GP-24M Adhesive, Flexible, for Bonding to Cellular Polystyrene Insulation.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit manufacturer's literature.
- .3 Submit minimum 8" x 8" samples of each type of insulation specified.

1.5 Quality Assurance

.1 Pre-Construction Conference:

- .1 Attend a rink slab pre-installation conference with the Owner, Consultant, Structural Engineer, General Contractor, reinforcing installer, floor finishing contractor, concrete supplier, manufacturer of admixture products, refrigeration contractor, and independent testing agency, to establish correct procedures and methods for placing insulation below concrete rink slabs. The meeting will be held within seven days prior to the placing of rink slab concrete. Refer to Section 03 30 00.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 16 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Deliver material to the site in the original unbroken packages bearing the name of manufacturer.
- .4 Store materials in an approved manner at the site preceding application and protect from damage at all times.
- .5 Remove damaged or deteriorated materials from site

1.7 Waste Management and Disposal

- .1 Refer to Section 01 74 10 – Cleaning.

Part 2 Products

2.1 Rigid Insulation

- .1 Refrigerated Rink Slab Insulation: Rigid Insulation below refrigerated rink slabs and apron slabs shall conform to ASTM C578-15 Type VII 40 psi minimum compressive strength, 2.20 lb/cu. ft. (35 kg/cu. m). Thickness shall be 2 layers, 2" thickness each; 16" x 8'-0" boards with butt edges. Material shall have the following characteristics when tested to the reference standards:
 - .1 Tensile Strength: ASTM D1623: 590 kPa.
 - .2 Compressive Strength: ASTM D1621 415 kPa.
 - .3 Shear Strength: ASTM C273 310 kPa.
 - .4 Flexural Strength: ASTM C203 585 kPa.

-
- .5 Water Absorption: ASTM D2842 less than 0.7% by volume.
 - .6 Thermal resistance RSI: ASTM C518: 0.87/25mm
 - .7 Blowing Agent Formulation: Zero ozone depleting.
 - .8 Surface Burning Characteristics (ASTM E 84): Flame spread less than 25, smoke developed less than 450, certified by independent third party such as Underwriters Laboratories (UL).
 - .9 Acceptable Product:
 - .1 Styrofoam Hi Load-40 Insulation, as manufactured by DuPont de Nemours Inc.
 - .2 Celfortec Foamular 400 as manufactured by Owens Corning.
 - .2 Rigid insulation at perimeter of ground floor slab and below grade: extruded expanded polystyrene to ULC S701.1 TYPE 4. Thickness as detailed, 400 x 2440 mm boards with butt edges. Material shall have the following characteristics when tested to the reference standards:
 - .1 Compressive Strength: ASTM D1621: 207 kPa.
 - .2 Water Absorption: ASTM D2842: maximum 0.7% by volume.
 - .3 Water Absorption: ASTM C272: maximum 0.3% by volume.
 - .4 Water Vapour Permeance, ASTM E96: 90 ng/Pa•s•m²
 - .5 Coefficient of Linear Thermal Expansion, ASTM D696: 6.3 x 10⁻² mm/m•°C
 - .6 Thermal resistance RSI: ASTM C518: 0.87/25 mm
 - .1 Styrofoam SM Insulation as manufactured by DuPont de Nemours Inc

2.2 Accessories

- .1 Vapour Retardant/Slip Sheet: As specified in Section 07 26 00.
- .2 Adhesives: As recommended by material manufacturer, compatible with insulation and substrate membrane, waterproof, conforming to CGSB 71-GP-24M.
- .3 Primer for concrete and masonry surfaces recommended by the adhesive manufacturer for the materials to be adhered.

Part 3 Execution

3.1 Installation, General

- .1 Install insulation in accordance with the requirements of the reference standards.

- .2 Install insulation after building substrate materials are dry.
- .3 Cut and trim insulation neatly to fit spaces. Butt joints tightly; offset vertical joints. Use only insulation board materials free from chipped or broken edges.
- .4 Do not enclose or conceal insulation until it has been inspected by the Consultant.

3.2 Installation of Insulation Below Rink Slab

- .1 Prior to installation, examine base course of sand fill specified in Section 31 23 10 and remove any large or sharp materials which may damage the insulation.
- .2 Commence installation of insulation at one end of the slab, working sequentially across the extent of the rink.
- .3 Install insulation in two layers. Offset joints by one half the board dimension in each direction. Bring each sheet of insulation into continuous contact with adjacent sheets all around the perimeter of each sheet.
- .4 Set and maintain insulation exactly level with the underside of the concrete slab, to the tolerances specified below.
- .5 Place insulation to a tolerance of 4.5 mm +/-.
- .6 Bring each sheet of insulation into continuous contact with adjacent sheets all around the perimeter of each sheet.
- .7 Place perimeter insulation as specified on drawings around the rink slab.
- .8 Provide high density rigid insulation over all header piping in the trench back to the refrigeration room. Coordinate installation with refrigeration subcontractor.

3.3 Perimeter Insulation

- .1 Do not proceed with installation until concrete surfaces are dry and cured, and water proofing membranes have been inspected and approved.
- .2 Install perimeter insulation vertically just prior to backfilling.
- .3 Prime porous concrete surfaces.

- .4 Apply adhesive in gobs or pads to the back of the insulation board in accordance with manufacturer's instructions. Joints shall be left dry with joints brought into tight contact. Apply insulation to the wall with a slight sliding motion to ensure good contact.
- .5 Protect insulation from damage until time for backfilling.
- .6 Following backfilling and prior to placement of underslab vapour barriers, install horizontal insulation. Install rigid insulation at perimeter of all exterior walls and for extent as indicated. Tightly butt joints.

3.4 Survey

- .1 Use a surveyor's level or laser system to check and maintain the required elevation and provide a surveyed record of elevations on a 5'-0" x 5'-0" grid at the completion of the work and prior to placement of rink slab piping and reinforcement.
- .2 Submit to the Consultant, elevation survey of insulation surface and correct areas that do not meet specifications, before proceeding with construction of the rink slab.
- .3 The refrigeration contractor will be required to review the survey and accept the elevations prior to placing the refrigeration piping.

3.5 Cleaning

- .1 Proceed in accordance with Section 01 74 10 – Cleaning.

End of Section



**BARRY BRYAN
ASSOCIATES**

Architects
Engineers
Project Managers



250 Water Street,
Suite 201
Whitby, Ontario
Canada
L1N 0G5

Tele: 905-666-5252
Fax: 905-666-5256
Email: bba@bba-archeng.com
www.bba-archeng.com

Addendum No. 2

Page 1 of 3

Project No.: 22119B

Date: January 16, 2024

Tender No.: CL2023-41

Project: **MUNICIPALITY OF CLARINGTON**
Newcastle Memorial Arena & Orono Arena & Community Centre

The following information supplements and/or supersedes the bid documents issued to Tender by the Municipality of Clarington.

This Addendum forms part of the contract documents and is to be read, interpreted, and coordinated with all other parts. The cost of all contained herein is to be included in the contract sum. The following revisions supersede the information contained in the original drawings and specifications issued for the above-named project to the extent referenced and shall become part thereof. Acknowledge receipt of this Addendum by inserting its number and date on the Tender Form. Failure to do so may subject bidder to disqualification.

QUESTIONS AND ANSWERS

2.1 Question: Section 13 18 00 2.7.2 calls for Quick Release Supports which are typically used in facilities that do multiple changeovers and not in community rinks which may need to remove glass for events only occasionally. These supports are much more expensive than standard fastened face plate supports. Would standard fastened supports be acceptable for this project?

Answer: Quick release is required.

2.2 Question: Drawing A201-1. Demolition plan legend (10) Remove and replace existing rubber skate tile, extent to be confirmed. Can you please confirm the extent of the rubber replacement on this side of the rink?

Answer: See past addendum responses.

2.3 Question: Section 13 18 30 item 1.5.6 says to re-use ammonia, item 1.5.10 says to charge new ammonia. Please confirm that new ammonia shall be charged.

Answer: See past addendum responses.

2.4 Question: Section 13 18 30 items 1.5.10 and 3.3 say to supply a new brine charge, item 2.8.2 says to re-use the brine charge. Please confirm if the existing brine charge shall remain, or be replaced.

Answer: See past addendum responses.

2.5 Question: Section 13 18 30 item 1.5.12 says to install new ammonia and brine insulation. Please confirm that only piping replaced as part of this project requires new insulation, all other existing insulation on existing piping to remain.

Answer: Correct as noted.

2.6 Question: Section 13 18 30 item 1.4.1 says to remove cold brine pump, condenser water pump, condenser water tank, and cold brine expansion tank. These 'removed' equipment are not detailed for installation of new. Please confirm if those equipment are to remain or to be replaced.

Answer: See attached past addendum clarifications for this scope of work.

2.7 Question: Please confirm that ammonia piping replacement extent shall follow section 13 18 30 item 2.5.4 and 2.5.5, and not that of section 13 18 30 item 1.5.6.

Answer: See past addendum clarifications.

2.8 Question: Please confirm that brine/water piping replacement extent shall follow section 13 18 30 item 2.6, and not that of section 13 18 30 item 1.5.6.

Answer: Correct as noted.

2.9 Question: Please confirm that refrigeration equipment electrical reconnection extent shall follow section 13 18 30 item 1.5.9, and not that of section 13 18 30 item 2.9.1.

Answer: Correct as noted.

2.10 Question: Please confirm the extent of the Skate Tile to be removed and replaced on the apron slab. (Note 10 A201)

Answer: See past addendum responses.

2.11 Question: Please confirm if there is any painting required in the rink area (RM 127).

Answer: The only painting would be around the areas effected by the renovation work, however, the base building superstructure (i.e. purlins, rigid frames, and walls etc.) are not being painted as part of the project scope of work.

2.12 Question: Please confirm if the west elevation needs to be painted. If yes please provide elevations for reference.

Answer: No the exterior west elevation is not in the project scope.

2.13 Question: When does the ice plant need to start up for ice making.

Answer: See past addendum responses.

End of Addendum No. 2

Barry Bryan Associates
Architects, Engineers, Project Managers



Doug McLaughlin, P. Eng.

DM/al



**BARRY BRYAN
ASSOCIATES**

Architects
Engineers
Project Managers



250 Water Street,
Suite 201
Whitby, Ontario
Canada
L1N 0G5

Tele: 905-666-5252
Fax: 905-666-5256
Email: bba@bba-archeng.com
www.bba-archeng.com

Addendum No. 3

Page 1 of 3

Project No.: 22119B
Date: January 16, 2024
Tender No.: CL2023-41
Project: **MUNICIPALITY OF CLARINGTON**
Newcastle Memorial Arena & Orono Arena & Community Centre

The following information supplements and/or supersedes the bid documents issued to Tender by the Municipality of Clarington.

This Addendum forms part of the contract documents and is to be read, interpreted, and coordinated with all other parts. The cost of all contained herein is to be included in the contract sum. The following revisions supersede the information contained in the original drawings and specifications issued for the above-named project to the extent referenced and shall become part thereof. Acknowledge receipt of this Addendum by inserting its number and date on the Tender Form. Failure to do so may subject bidder to disqualification.

GENERAL

3.1 Clarification that existing brine shall be disposed and entirely replaced with new brine.

QUESTIONS AND ANSWERS

3.2 **Question:** **Many trees are in the way on the west elevation. What is the plan to make it accessible for painting.**

Answer: Painting on the West elevation is not required, refer to past addendums.

3.3 **Question:** **Does the overhang above the bleachers on the eastern elevation get painted? If so, is it just the beams or the whole thing?**

Answer: The exterior covered overhang over the outdoor bleachers is to be completely painted, beams, purlins, and decking.

3.4 **Question:** **Are we only painting the red steel in Rink 127? What kind of surface prep is required? ?We recommend hand tool to keep the price down. Are we also to paint the hand / guardrails in Rink 127?**

Answer: See past addendum responses for clarified painting scope in the rink area.

3.5 **Question:** **There is a floor sealer section but can't find where it is to be applied. Please advise.**

Answer: The floor sealer should be applied to new concrete outside the rink slab, refer to the drawings.

3.6 **Question:** **Would Eaton and/or Siemens be considered equal to Square D for panel PP-E?**

Answer: The alternatives are acceptable but only where the lead times on the Square D panel is an issue and the Eaton or Siemens panels provides an improved project schedule.

3.7 **Question:** **The emergency light levels, please confirm this can be completed by a 3rd since the emergency lighting is already designed by an electrical consultant.**

Answer: The emergency light level report must be sealed we have had issues in other Municipalities requiring this at the time occupancy. This work must be completed by 3rd party engineer.

3 .8 Question: Please confirm that we as electrical subcontractors are not required to carry for the building inspections for fire alarm and emergency lighting. This is always a cost that the permit process and/or GC covers when they apply for the other necessary inspections.

Answer: The general contractor is responsible for determining the scope of work and how the building inspections are coordinated and completed on the site.

3 .9 Question: Demolition Note 6 on drawing A201 - Existing purlins and beams to be prepared for new paint. Is this scope still to be included?

Answer: See past addendum response and above related to the overhang above the outdoor bleachers.

3 .10 Question: Please can you clearly define the painting scope of work. Notes 1 - 7 on drawing A801 refer to interior painting and specifically note 6 states to refer to interior elevations for additional information which there does not appear to be. Are walls, metal and inside of siding panels to be painted? Do the concrete stands require repainting? Please clarify.

Answer: See past addendum responses for the painting scope of work. The concrete bleachers are not to be painted as part of the project scope of work.

3 .11 Question: Please confirm the extend of the rubber skate tile that is to be removed from the rink perimeter as per Demo Note 10 - Drawing A201.

Answer: The extents lines denoted on the plan for the applicable Note 10 shall be used to define the project scope of work.

3 .12 Question: Is the proprietary shelf and brackets fastened to the dasher boards in the time keeper box to be included in tender? Please provide details/dimensions if so.

Answer: The shelf and bracket shall be included in the tender and shall be a minimum of 18" long

3 .13 Question: Detail 1/S502 calls for 'New Maple Wood Slat Header' and Drawing A202 First Floor Plan scales these components presumably 2x8. Should these be standard SPF?

Answer: They can be standard pressure treated 2"x8" lumber.

3 .14 Question: Are stamped sprinkler drawings or hydraulic calculations required for this project? Normally we would only provide cut sheets for the sprinklers being installed since we are not changing the original system design. Please advise.

Answer: Sprinkler shop drawings and hydraulic calculations are not required for this project because the base building sprinkler system original design is not changing.

3 .15 Question: When will the rink be shut down and handed over for construction?

Answer: April 1st, 2024.



3.16 **Question:** When does the ice plant need to start up for ice making?

Answer: See pre-bid meeting minutes posted in past addendum.

End of Addendum No. 3

Barry Bryan Associates

Architects, Engineers, Project Managers



Doug McLaughlin, P. Eng.

DM/al

I/We hereby acknowledge receipt of this Addendum.

Signature (signing officer of firm)

Position

Name of Firm

One copy of the addendum must be signed and returned with the completed tender, or the tender submitted shall be rejected.



I/We hereby acknowledge receipt of this Addendum.

Signature (signing officer of firm)

Position

Name of Firm

One copy of the addendum must be signed and returned with the completed tender, or the tender submitted shall be rejected.

| | |
|---|----|
| Division 00 – Procurement and Contracting Requirements | |
| 00 01 11 Table of Contents | 4 |
| Division 01 – General Requirements | |
| 01 00 60 List of Drawings | 3 |
| 01 11 00 Summary of Work | 3 |
| 01 11 11 List of Consultants | 1 |
| 01 21 13 Cash Allowances | 2 |
| 01 26 15 Requests for Information | 3 |
| 01 29 83 Payment Procedures for Testing Laboratory Services | 2 |
| 01 31 00 Project Management and Coordination | 3 |
| 01 32 00 Construction Progress Documentation | 4 |
| 01 33 00 Submittal Procedures | 5 |
| 01 35 13.53 Special Project Procedures for Occupied Buildings | 4 |
| 01 35 43 Environmental Procedures | 3 |
| 01 40 00 Quality Requirements | 4 |
| 01 41 00 Regulatory Requirements | 4 |
| 01 45 00 Quality Control | 4 |
| 01 51 00 Temporary Utilities | 3 |
| 01 52 00 Construction Facilities | 3 |
| 01 56 00 Temporary Barriers and Enclosures | 3 |
| 01 61 00 Common Product Requirements | 5 |
| 01 70 03 Safety Requirements | 5 |
| 01 71 00 Examination and Preparation | 3 |
| 01 73 00 Execution Requirements | 4 |
| 01 74 11 Cleaning | 3 |
| 01 74 19 Construction Waste Management and Disposal | 6 |
| 01 77 00 Closeout Procedures | 2 |
| 01 78 00 Closeout Submittals | 8 |
| 01 79 00 Demonstration and Training | 2 |
| Division 02 – Existing Conditions | |
| 02 41 19.13 Selective Building Demolition | 13 |
| Division 03 – Concrete | |
| 03 10 00 Concrete Forming and Accessories | 6 |
| 03 20 00 Concrete Reinforcing | 6 |
| 03 30 00 Cast in Place Concrete | 17 |
| 03 35 00 Concrete Finishing | 5 |
| Division 05 – Metals | |
| 05 50 00 Metal Fabrications | 8 |
| Division 06 – Wood, Plastics, and Composites | |
| 06 10 00 Rough Carpentry | 6 |

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Table of Contents
- Section 00 01 11

| | | |
|---|---|----|
| 06 20 00 | Finish Carpentry | 7 |
| 06 40 00 | Architectural Woodwork | 8 |
| Division 07 – Thermal and Moisture Protection | | |
| 07 92 00 | Joint Sealants | 6 |
| Division 08 – Openings | | |
| 08 11 00 | Metal Doors and Frames | 11 |
| 08 71 10 | Door Hardware | 7 |
| 08 71 13 | Automatic Door Operators | 6 |
| 08 80 05 | Glazing | 10 |
| Division 09 – Finishes | | |
| 09 21 16 | Gypsum Board | 10 |
| 09 22 16 | Non-Structural Metal Framing | 8 |
| 09 30 13 | Ceramic Tiling | 11 |
| 09 51 13 | Acoustic Panel Ceilings | 5 |
| 09 53 00 | Acoustical Suspension | 6 |
| 09 65 66.13 | Resilient Athletic Flooring | 7 |
| 09 67 72 | Concrete Floor Sealer | 4 |
| 09 91 13 | Exterior Painting | 12 |
| 09 91 23 | Interior Painting | 12 |
| Division 10 – Specialties | | |
| 10 28 10 | Toilet and Bath Accessories | 6 |
| Division 13 – Specialties | | |
| 13 18 00 | Dasherboards | 16 |
| 13 18 30 | Ice Rink Piping | 11 |
| Division 26 – Electrical | | |
| 26 05 00 | General Conditions | 7 |
| 26 05 01 | Common Work Results – Electrical Systems | 3 |
| 26 05 20 | Wire and box Connectors (0-1000V) | 1 |
| 26 05 21 | Wire and Cables | 3 |
| 26 05 27 | Grounding | 2 |
| 26 05 29 | Hangers and Supports for Electrical Systems | 2 |
| 26 05 31 | Splitter, Junction Boxes, Pull Boxes and Cabinets | 2 |
| 26 05 32 | Outlet and Conduit Boxes and Fittings | 2 |
| 26 05 34 | Conduits, Conduit Fastenings and Conduit Fittings | 3 |
| 26 27 26 | Wiring Devices | 2 |
| 26 28 13.01 | Fuses – Low Voltage | 2 |
| 26 28 23 | Disconnect Switches – Fused and Non Fused | 1 |
| 26 51 00 | Interior Lighting | 2 |
| 26 60 01 | Electrical Identification | 3 |

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Table of Contents
- Section 00 01 11

| | | |
|--|---|----|
| 26 60 02 | Testing and Commissioning of Electrical Systems | 5 |
| 28 13 00 | Access Control | 1 |
| 28 31 00.01 | Multiplex Fire Alarm System – Base Building | 1 |
| Division 28 – Electronic Safety and Security | | |
| Division 31 – Earthwork | | |
| 31 23 10 | Excavating, Trenching and Backfilling | 11 |

End of Section

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

List of Drawings
Section 01 00 60

Part 1 General

| Dwg. No. | Title | Issue No. | Rev. No. | Issue Date |
|----------------------|--|-----------|----------|-------------------------|
| A000 | List of Drawings, Site Location and OBC Matrix | 2 | | Issued for Construction |
| ARCHITECTURAL | | | | |
| A201 | First Floor Demolition Plan | 2 | | Issued for Construction |
| A202 | First Floor Plan | 2 | | Issued for Construction |
| A203 | Enlarged Part Floor & Reflected Ceiling Plan | 2 | | Issued for Construction |
| A301 | Exterior Sections | 1 | | Issued for Construction |
| A401 | Building Sections | 2 | | Issued for Construction |
| A501 | Typical Arena Details | 1 | | Issued for Construction |
| A502 | Typical Arena Details | 1 | | Issued for Construction |
| A701 | Interior Elevations | 2 | | Issued for Construction |
| A702 | Millworks | 2 | | Issued for Construction |
| A801 | Room Finish, Door and Frame Schedule | 2 | | Issued for Construction |
| STRUCTURAL | | | | |
| S101 | General Notes & Typical Details | 2 | | Issued for Construction |
| S201 | Foundation/Rink Slab Demolition Plan | 2 | | Issued for Construction |
| S202 | Rink Foundation Plan & Part Roof Framing Plan | 2 | | Issued for Construction |
| S501 | Sections | 2 | | Issued for Construction |

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

List of Drawings
Section 01 00 60

| Dwg. No. | Title | Issue No. | Rev. No. | Issue Date |
|-------------------|--|-----------|----------|-------------------------|
| S502 | Sections | 2 | | Issued for Construction |
| S503 | Sections | 2 | | Issued for Construction |
| Electrical | | | | |
| E-1.1 | Electrical Legend and Details | 2 | | Issued for Construction |
| E-1.2 | Electrical Details | 2 | | Issued for Construction |
| E-2.0 | Electrical Facility Plan | 2 | | Issued for Construction |
| E-2.1 | Electrical Plan | 2 | | Issued for Construction |
| E-3.1 | Reflected Ceiling Plan | 2 | | Issued for Construction |
| E-5.1 | Electrical Demolition Plan | 2 | | Issued for Construction |
| E-6.1 | Reflected Ceiling Demolition Plan | 2 | | Issued for Construction |
| E-7.1 | Electrical Single Line Diagram | 2 | | Issued for Construction |
| Mechanical | | | | |
| M-0 | Title Sheet | 2 | | Issued for Construction |
| M-1.1 | Mechanical Specifications | 2 | | Issued for Construction |
| M-1.2 | Mechanical Legend Schedules and Details | 2 | | Issued for Construction |
| M-2.1 | Part Floor Plan – HVAC Demolition | 2 | | Issued for Construction |
| M-2.2 | Part Floor Plan – HVAC New | 2 | | Issued for Construction |
| M-3.1 | Part Floor Plan – Plumbing & Drainage Demolition | 2 | | Issued for Construction |

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

List of Drawings
Section 01 00 60

| | | | | |
|-------|--|---|--|-------------------------|
| M-3.2 | Part Floor Plan - Plumbing & Drainage New | 2 | | Issued for Construction |
| M-4.1 | Part Floor Plan – Fire Protection Demolition | 2 | | Issued for Construction |
| M-4.2 | Part Floor Plan – Fire Protection New | 2 | | Issued for Construction |

End of Section

Part 1 General

1.1 Section Includes

- .1 Work covered by contract documents
- .2 Owner
- .3 Location of the site
- .4 Site access
- .5 Work sequence
- .6 Contractor use of premises
- .7 References and codes
- .8 Protection of work
- .9 Engineer design
- .10 Hazardous material discovery
- .11 Special conditions
- .12 Site security
- .13 "By Others"
- .14 Protection of Drawings

1.2 Work Covered by Contract Documents

- .1 Work of this Contract comprises the construction of the Orono Rink and Community Centre Rink Replacement and Dressing Room Improvements at 2 Princess Street in Orono Ontario for the Municipality of Clarington, and as indicated on the drawings and specifications.

1.3 Owner

- .1 Municipality of Clarington

1.4 Location of Site

- .1 The Work of this Contract is located at 2 Princess Street in Orono, Ontario

1.5 Site Access

- .1 Access to the site and work areas to be arranged by the Owner.
- .2 Coordinate any require shutdowns or service interruptions with the Municipality. Do not initiate shutdowns or service interruptions without written approval.
- .3 Provide all necessary protection, including access routes for the public, to existing facilities at all times.

.4 Maintain clear exiting and fire routes at all times. Provide flagmen where required.

.5 Access and use of the fair grounds will continue throughout construction.

1.6 Work Sequence

.1 Construct Work continuously in accordance with local facility and by-law restrictions.

.2 It is the Arena's preference for all work to be conducted during normal hours of operation, whenever possible. Allow for extended hours as required to maintain the project schedule, or when work cannot proceed due to previously scheduled programs and events.

.3 The City's Noise By-Law governs hours of operation for construction equipment.

1.7 Contractors Use of Premises

.1 Works areas are indicated on the drawings.

.2 Contractor has unrestricted use of defined work areas until Substantial Performance. For access to areas of the existing building beyond the work area limits, refer to Section 01 35 13.53 – Special Project Procedures for Occupied Buildings.

1.8 References and Codes

.1 Perform Work in accordance with Ontario Building Code (OBC), National Fire Code of Canada (NFC), the Canadian Electrical Code CSA C22.1-15, and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.9 Protection of Work

.1 In carrying out the Work from their inception and until the final acceptance of the same, the Contractor must be careful not to cause any injury or damage to any adjacent property or any other structures, works or things on or near the line, or in the vicinity of the Works or elsewhere and must make good the same at the Contractor's own expense, in the manner directed by, and to the satisfaction of Ontario Tech University.

1.10 Engineer Design

- .1 Where specifications require work to be designed by an engineer, engage an engineer licensed in the Province of Ontario to design such work.

1.11 Hazardous Material Discovery

- .1 Refer to Section 01 41 00 – Regulatory Requirements.

1.12 Special Conditions

- .1 The following general and special conditions apply:
 - .1 All existing surfaces and finishes are to be repaired and refinished wherever damaged during the course of the Work.
 - .2 The existing facility will remain partially operational during construction.

1.13 Site Security

- .1 Daily Inspection: Provide inspection of the building and site daily while the work is in progress and shall take whatever measures are necessary to secure the building from theft, vandalism and unauthorized entry.

1.14 "By Others"

- .1 The term "by others" where it is used in the contract documents means that work shown or described in the contract documents and labeled with this designation is not included in the specific sub-trade's scope of work but will be required to be done within the General Contractor's contract.

1.15 Protection of Drawings

- .1 Copyright of electronic document belongs to the Consultant. Electronic documents may not be forwarded to others, transmitted, downloaded or reproduced in any format, whether print or electronic, without the express, written permission of the copyright owner.
- .2 Drawings, specifications and other contract related documents which are posted on Contractor controlled websites for access by sub-trades and suppliers, shall be posted only on password protected and secure websites approved by the Consultant to limit access to those with an expressed interest in the Project.
- .3 Provide Consultant and owner with access to such websites as noted above.

End of Section

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

List of Consultants
- Section 01 11 11

Part 1 General

1.1 Consultants

.1 ARCHITECT:

Barry Bryan Associates
201 - 250 Water Street
Whitby, Ontario L1N 0G5
Tel: (905) 666-5252
Attention: Mr. Nick Swerdfeger, OAA, MRAIC, M.Arch., B.Arch., Sci

.2 STRUCTURAL ENGINEER:

Barry Bryan Associates
201 - 250 Water Street
Whitby, Ontario L1N 0G5
Tel: (905) 666-5252
Attention: Mr. Doug McLaughlin, P. Eng.

.3 MECHANICAL ENGINEER:

Giallonardo Engineering Inc.
220-4550 Highway 7
Woodbridge, Ontario L4L 4Y7
Tel: (905) 265-1052
Attention: Mr. Jeremy Hogan, P. Eng.

.4 ELECTRICAL ENGINEER:

HCC Engineering Limited
40 Eglinton Avenue East, Suite 600
Toronto, Ontario M4P 3A2
Tel: (416) 932-2423
Attention: Mr. Phoenix Chen, P. Eng.

End of Section

Part 1 General

1.1 Section Includes

.1 Cash Allowances

1.2 References

.1 Canadian Construction Documents Committee CCDC2-2020, Stipulated Price Contract including the Supplementary Conditions.

1.3 Cash Allowances

.1 Refer to General Conditions, GC4.1.

.2 Unless otherwise specified, Cash Allowances shall cover the cost of the materials and equipment delivered F.O.B. job site, and all applicable taxes, except Harmonized Sales Tax. The Contractor's handling costs on the site, labour, installation costs, overhead and profit and other expenses shall be included separately in the Stipulated Price and not in the Cash Allowance.

.3 Where it is specified that a Cash Allowances is to include both supply and installation costs, such allowances shall cover the cost of the materials and equipment delivered and unloaded at the site, all applicable taxes and the contractor's handling costs on the site, labour and installation costs and other expenses, except overhead and profit which shall be included separately in the Stipulated Price.

.4 If the cost of the Work covered by Cash Allowances, when determined, is more or less than the allowance, the Contract Sum shall be adjusted accordingly.

.5 In the event that the cost of the work covered by Cash Allowances should exceed the cash allowance, while the contract sum will be adjusted in conformity therewith, there shall be no adjustment to the Contractor's fee or other expenses such as overhead or profit, it being understood and agreed that the contract sum includes the Contractor's expenses and profit for all Cash Allowances whether or not they are exceeded.

.6 Progress payments on accounts of work authorized under Cash Allowances shall be included in monthly certificate for payment.

.7 Expenditures from Cash Allowances shall be authorized by Supplementary Instruction.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Cash Allowances
Section 01 21 13

- .8 Cash Allowance for independent inspection and testing shall cover the cost of such services as provided by independent testing agency only. The Contractor's cost for labour, overhead and other expenses related to independent inspection and testing shall be included separately in the Stipulated Price and not in the Cash Allowance.
- .9 Cause the work covered by Cash Allowances to be performed for such amounts and by such persons as the Consultant may select and direct or as required by the project drawings and specifications.
- .10 Refer to Instructions to Bidders, for list of Cash Allowances.

End of Section

Part 1 General

1.1 Section Includes

- .1 Requests for Information
- .2 Submittal procedures
- .3 Screening of RFI's
- .4 Response to RFI's
- .5 Response Timing

1.2 Related Sections

- .1 Section 01 31 00 Project Management and Coordination
- .2 Section 01 33 00 Submittal Procedures

1.3 Request for Information (RFI)

- .1 A request for information (RFI) is a formal process used during the Work to obtain an interpretation of the Contract Documents or to obtain additional information.
 - .1 An RFI shall not constitute notice of claim for a delay.

1.4 Submittal Procedures

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Number RFI's consecutively in one sequence in order submitted, in numbering system as established by the Contractor.
- .2 Submit one distinct subject per RFI form. Do not combine unrelated items on one form.
- .3 RFI form:
 - .1 Submit a draft "Request for Information" form to be approved by the Owner and Consultant.
 - .2 Submit RFI's to the Consultant on approved "Request for Information" form. The Consultant shall not respond to an RFI except as submitted on this form.
 - .3 Where RFI form does not have sufficient space to provide complete thereon, attach additional sheets as required.
 - .4 Submit with RFI form all necessary supporting documentation.
- .4 RFI log:
 - .1 Maintain log of RFI's sent to and responses received from the Consultant, complete with corresponding dates.

- .2 Submit updated log of RFI's at each construction meeting and with each application for payment submission.
 - .5 Submit RFI's 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 so will not be paid by the Owner.
 - .6 Only the Contractor shall submit RFI's to the Consultant.
 - .7 RFI's submitted by Subcontractors or Suppliers directly to the Consultant will not be accepted.
- 1.5 Screening of RFI's
- .1 Contractor shall satisfy itself that an RFI is warranted by undertaking a thorough review of the Contract Documents to determine that the claim, dispute, or other matters in question relating to the performance of the Work or the Interpretation of the Contract Documents cannot be resolved by direct reference to the Contract Documents. Contractor shall describe in detail this review on the RFI form as part of the RFI submission. RFI submittals that lack such detailed review description, or where the detail provided is, in the opinion of the Consultant, insufficient, shall not be reviewed by the Consultant and shall be rejected.
- 1.6 Response to RFI's
- .1 Consultant shall review RFI's 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 RFI's. Responses to RFI's received from entities other than the Consultant shall not be considered.
- 1.7 Response Timing
- .1 Allow 5 Working Days for review of each RFI by the Consultant.
 - .2 Consultant's review of RFI commences on date of receipt of RFI submission by the Consultant from Contractor and extends to date RFI returned by Consultant.
 - .3 When the RFI submission 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.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Requests for Information
Section 01 26 15

- .4 If, at any time, the Contractor submits a large enough number of RFI's or the Consultant considers the RFI to be of such complexity that the Consultant cannot process these RFI's within 5 Working Days, the Consultant will confer with the Contractor within 3 Working Days of receipt of such RFI's, and the Consultant and the Contractor will jointly prepare an estimate of the time necessary for processing same as well as an order of priority among the RFI's submitted. The Contractor shall accommodate such necessary time at no increase in the Contract Time and at no additional cost to the Owner.

End of Section

Part 1 General

1.1 Section Includes

- .1 Related requirements
- .2 Appointment and Payment
- .3 Contractor's Responsibilities

1.2 Related Requirements

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory are specified under various sections.

1.3 Appointment and Payment

- .1 The Owner will appoint an independent inspection and testing agency to provide Quality Assurance (QA) testing.
- .2 Contactor will pay the independent inspection/testing agency from the Cash Allowance, including costs for equipment, facilities, and labour to, except follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .3 Mill tests and certificates of compliance.
 - .4 Tests specified to be carried out by Contractor under the supervision of Consultant.
 - .5 Additional tests specified in the following paragraph.
- .3 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Consultant or Consultant to verify acceptability of corrected work.

1.4 Contractor's Responsibilities

- .1 The contractor shall be responsible for his own Quality Control and shall appoint and pay for independent inspection/testing agency, equipment, facilities, and labour to provide Quality Control (QC) testing where necessary to satisfy the contractor's quality control plan. Such inspection and testing services will not be paid out of the Cash Allowance.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Payment Procedures for
Testing Laboratory
Procedures
Section 01 29 83

- .2 Where independent inspection and testing has been appointed by the Consultant or Owner for Quality Assurance, the contractor shall provide labour, equipment and facilities to assist in the independent inspection and testing agency and their representatives by:
 - .1 Providing access to Work to be inspected and tested.
 - .2 Facilitating inspections and tests.
 - .3 Making good Work disturbed by inspection and testing.
- .3 Notify Owner and Consultant sufficiently in advance of testing & inspection operations (24hrs minimum).
- .4 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .5 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed.
- .6 The costs for contractor's ink slab surveys specified in Sections 03 30 00 and 07 21 13 are to be carried by the Contractor and are not included in the Cash Allowances.

End of Section

Part 1 General

1.1 Section Includes

- .1 Preconstruction Conference
- .2 Project Meetings
- .3 On Site Documents
- .4 Schedules
- .5 Requests for Information (RFI's)
- .6 Closeout Procedures
- .7 Cost Breakdown

1.2 Preconstruction Conference

- .1 The Consultant will call for and administer Preconstruction Conference at time and place to be announced.
- .2 Contractor, all major Subcontractors, and major suppliers shall attend the Preconstruction Conference.
- .3 Agenda will include, but not be limited to, the following items.
 - .1 Lines of communication and contact information
 - .2 Schedules
 - .3 Personnel and vehicle permit procedures
 - .4 Use of premises
 - .5 Location of any Contractor on-Site facilities
 - .6 Security
 - .7 Housekeeping
 - .8 Submittal and RFI procedures
 - .9 Inspection and testing procedures, on-Site and off-Site
 - .10 Control and reference point survey procedures
 - .11 Health and Safety
 - .12 Contractor's Schedule of Values if applicable.
 - .13 Contractor's Schedule of Submittals
- .4 The Consultant will distribute copies of minutes to attendees. Attendees shall have seven (7) days to submit comments or additions to minutes. Minutes will constitute final documentation of results of Preconstruction Conference.

1.3 Project Meetings

- .1 The Consultant will arrange project meetings and assume responsibility for setting times of meetings and for recording and distributing minutes.

.2 Project meetings will be held minimum bi-weekly.

1.4 On-Site Documents

- .1 Maintain copies of the following documents on site at all times
 - .1 Contract drawings.
 - .2 Permit Drawings
 - .3 Specifications.
 - .4 Addenda.
 - .5 Reviewed Submittals
 - .6 Approved Samples
 - .7 Colour Schedules
 - .8 Requests for Information (RFI's)
 - .9 Change orders.
 - .10 Supplemental Instructions
 - .11 Other modifications to Contract.
 - .12 Inspection and Test Reports, including designated substance reports
 - .13 Copy of approved Work schedule.
 - .14 Manufacturers' installation and application instructions.
 - .15 Safety data sheets for all products to be used or stored on site
 - .16 Company's site-specific safety plan
 - .17 Company's site-specific fire safety plan
 - .18 Site Meeting Minutes
 - .19 All as-built record documents related to the building site and work including drawings provided by the City.
 - .20 Other documents as specified.

1.5 Schedules

- .1 Submit a construction progress schedule to Consultant within 10 working days of the Contract award and at least 10 working days prior to the submission of the first progress claim. The construction progress schedule must show anticipated progress stages and final completion of the work within the time periods required by the Contract documents.
- .2 During progress of Work revise and resubmit as directed by Consultant.
- .3 The current project schedule shall be tabled at each regular site meeting.

1.6 Requests for Information (RFI's)

- .1 Refer to Section 01 26 15 – Requests for Information

1.7 Closeout Procedures

- .1 Notify Consultant when Work is considered ready for Substantial Performance.
- .2 Accompany Consultant on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Consultant's instructions for correction of items of Work listed in executed certificate of Substantial Performance.
- .4 Notify Consultant of instructions for completion of items of Work determined in Consultant's final inspection.

1.8 Cost Breakdown

- .1 Submit a detailed cost breakdown to Consultant at least ten (10) working days prior to the submission of the first progress claim. After approval by Consultant the cost breakdown will be used as basis for progress payment.

End of Section

Part 1 General

1.1 Section Includes

- .1 Submittals
- .2 Schedules Required
- .3 Format
- .4 Submission
- .5 Critical Path Scheduling
- .6 Submittals Schedule

1.2 Related Sections

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 77 00 Closeout Procedures

1.3 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4 Schedules Required

- .1 Submit schedules as follows:
 - .1 Construction Progress Schedule.
 - .2 Submittal Schedule for Shop Drawings and Product Data.
 - .3 Submittal Schedule for Samples.
 - .4 Product Delivery Schedule.
 - .5 Cash Allowance Schedule for purchasing Products.
 - .6 Shutdown or closure activity.

1.5 Format

- .1 Prepare schedule in form of a horizontal bar chart using Microsoft Project 2010 or later.
- .2 Provide a separate bar for each major item of work, trade or operation.
- .3 Split horizontally for projected and actual performance.
- .4 Provide horizontal time scale identifying first work day of each week.
- .5 Format for listings: chronological order of start of each item of work.

- .6 Identification of listings: By Systems description.

1.6 Submission

- .1 Submit initial format of schedules within 15 working days after award of Contract.
- .2 Submit schedules in electronic format, by email as PDF files.
- .3 Consultant will review schedule and return review copy within 10 days after receipt.
- .4 Resubmit finalized schedule within 7 days after return of review copy.
- .5 Submit revised progress schedule with each application for payment.
- .6 Distribute copies of revised schedule to:
 - .1 Job site office.
 - .2 Subcontractors.
 - .3 Other concerned parties.
 - .4 Instruct recipients to report to Contractor within 10 days, any problems anticipated by timetable shown in schedule.
- .7 Table current and up to date schedule at each regular site meeting.

1.7 Critical Patch Scheduling

- .1 Include complete sequence of construction activities.
- .2 Schedules shall represent a practical plan to complete the work within the Contract period, and shall convey the plan to execute the work. Schedules as developed shall show the sequence and interdependencies of activities required for complete performance of the work.
- .3 The submittal of schedules shall be understood to be the Contractor's representation that the schedule meets the requirements of the Contract Documents and that the work will be executed in the sequence and duration indicated in the schedule.
- .4 Failure to include any element of work required for performance of the Contract or failure to properly sequence the work shall not excuse the Contractor from completing all work within the Contract Time.

- .5 All schedules shall be developed utilizing industry standard 'best practices' including, but not limited to:
 - .1 No open-ended activities.
 - .2 No use of constraints other than those defined in the Contract Documents without the prior approval of the Consultant.
 - .3 No negative leads or lags.
 - .4 No excessive leads or lags without prior justification and approval from the Consultant.
 - .5 For individual schedule construction activities, do not exceed 14 days in duration without prior approval of the Consultant. Subdivide activities exceeding 14 days in duration to an appropriate level.
 - .6 Sufficiently describe schedule activities to include what is to be accomplished in each work area. Express activity durations in whole days. Clearly define work that is to be performed by subcontract.
 - .7 Create the schedule in conformance with the work-hours and constraints set forth in these Contract Documents.
- .6 Include dates for commencement and completion of each major element of construction as follows.
 - .1 Demolition.
 - .2 Foundation Work.
 - .3 Refrigeration system.
 - .4 Rink slab construction.
 - .5 Dasherboards
 - .6 Special Subcontractor Work.
 - .7 Equipment Installations.
 - .8 Flooring replacement
- .7 Show projected percentage of completion of each item as of first day of month.
- .8 Indicate progress of each activity to date of submission schedule.
- .9 Show changes occurring since previous submission of schedule:
 - .1 Major changes in scope.
 - .2 Activities modified since previous submission.
 - .3 Revised projections of progress and completion.
 - .4 Other identifiable changes.
- .10 Provide a narrative report to define:
 - .1 Problem areas, anticipated delays, and impact on schedule.
 - .2 Corrective action recommended and its effect.
 - .3 Effect of changes on schedules of other prime contractors.

1.8 Submittals Schedule

- .1 Include schedule for submitting shop drawings, product data, and samples. Indicate manufacture and delivery lead times into the shop drawing submittal schedule.
- .2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.

End of Section

Part 1 General

1.1 Section Includes

- .1 Administrative
- .2 Requests for Information (RFI's)
- .3 Shop Drawings and Product Data
- .4 Interference Drawings
- .5 Progress Photographs
- .6 Samples
- .7 Mock-Ups
- .8 Certificates and Transcripts

1.2 Related Sections

- .1 Section 01 26 15 Requests for Information
- .2 Section 01 31 00 Project Management and Coordination

1.3 Administrative

- .1 Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in Imperial units.
- .4 Where items or information is not produced in Imperial units converted values are acceptable.
- .5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Consultant in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent work are coordinated.

- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant's review.
- .10 Keep one reviewed copy of each submission on site.

1.4 Requests for Information (RFI's)

- .1 Refer to Section 01 26 15 – Requests for Information

1.5 Shop Drawings and Product Data\

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided to illustrate details of a portion of Work.
- .2 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .3 Submit shop drawings bearing stamp and signature of qualified professional Engineer registered or licensed in the Province of Ontario where required by the individual specification sections. Each submittal and each resubmittal must bear the stamp of the Engineer
- .4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow ten (10) days for Consultant's review of each submission.
- .6 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .7 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.

- .8 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .9 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Performance characteristics.
 - .5 Standards.
 - .6 Operating weight.
 - .7 Relationship to adjacent work.
- .10 After Consultant's review, distribute copies.
- .11 Submit 3 prints plus one electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .12 Submit electronic copy in PDF format of product data sheets or brochures for requirements requested in Specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Delete information not applicable to project.
- .14 Supplement standard information to provide details applicable to project.
- .15 If upon review by Consultant, no errors or omissions are discovered or if only minor

corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

- .16 The review of shop drawings by the Consultant is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that the Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.6 Interference Drawings

- .1 Prepare interference drawings to coordinate the installation of the work of all sections, within available space. Conflicts between trades which could be determined beforehand, by the careful coordination and preparation of interference drawings, shall be corrected at no expense to the Owner.
- .2 Prepare interference drawings of all buried services as necessary to avoid conflicts with new or existing structures, foundations or services.
- .3 Submit interference and equipment placing drawings as specified in Section 01 71 00, when requested by the Consultant.

1.7 Progress Photographs

- .1 Progress photograph to be electronically formatted and labelled as to location and view.

1.8 Samples

- .1 Submit for review samples as requested in respective specification Sections. Label samples with origin, manufacturer, product information, applicable specification section, and intended use.

- .2 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .3 Where colour, pattern or texture is criterion, submit full range of manufacturer's samples.
- .4 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .5 Make changes in samples which Consultant may require, consistent with Contract Documents.
- .6 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.9 Mock-Ups

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.10 Certificates and Transcripts

- .1 Submit Workers' Compensation Board status.

End of Section

Part 1 General

1.1 Section Includes

- .1 Special project procedures for occupied buildings.
- .2 Contractor Use of Premises
- .3 Owner's use of Existing Buildings
- .4 Dust Control
- .5 Protection
- .6 Emergency and Fire Protection
- .7 Temporary Exhaust
- .8 Hoisting of Materials and Equipment.

1.2 Contractor Use of Premises

- .1 Limit access of construction personnel to existing building only at locations approved by the Owner, and only when necessary to perform work within the existing building. Any other access by contractors is strictly prohibited. Refer to the location plan for approved staging area.
- .2 Ensure that construction personnel perform work in existing building only as required under the Contract; and that they do not use it as access to work areas, except for work in existing building, or for other purposes.
- .3 Use of washroom and services in existing building by construction personnel is strictly prohibited.
- .4 Construction personnel shall use areas of the existing building for their purposes only as designated by the Owner and only while Work is in progress. Prohibit lounging. Keep assigned areas clean and return them to an "as was" condition at completion of construction.
- .5 Smoking is strictly prohibited on the Owner's property.
- .6 Do not take meal and coffee breaks in the existing building. Provide space in site trailer for workers' breaks.
- .7 Keep traffic through existing occupied areas to an absolute minimum in executing the Work.
- .8 Minimize noise, dust, and odours to ensure staff and students in areas adjacent to the construction area are disturbed as little as possible. Implement immediate

corrective action to cease or limit disagreeable annoyances to staff and public upon notification by Owner.

- .9 Make good damage to building, fixtures, and fittings caused during use by construction personnel by replacement with new work. Include cost of installation and making good of other work thereby affected in replacement.
- .10 Assume total responsibility for security of construction areas within the existing building upon commencement of Work, particularly where construction areas are exposed to the exterior. Secure construction areas by methods compatible with the total security established for building.
- .11 Construction personnel shall use areas of the existing buildings only in a manner as determined by the Work.
- .12 Arrange with the Owner for appropriate times for doing cutting and coring operations.

1.3 Owner's Use of Existing Building

- .1 The existing building will remain in use throughout the duration of construction of the new building. The Owner will maintain control over operation of building systems during construction. All building systems including alarms and sensors within the rink replacement area must be isolated and protected through the construction work.
- .2 Maintain fire department access to existing building.
- .3 Maintain existing exits and provide proper and safe means of egress from all parts of existing building to open spaces at all times to the approval of jurisdictional authorities. Identify, provide exit lights, and illuminate temporary means of egress.
- .4 Execute work in existing building at times approved by Owner, so not to inconvenience their occupation or in any manner hinder their use of building.
- .5 Give Owner minimum 14 working days of notice of intention to commence work in a room or area of existing building.
- .6 Execute work as quietly as possible in and around existing building at all times Owner is occupying it. Schedule noisy operations with Owner to achieve least disturbance to ongoing activities and programming.

1.4 Dust Control

- .1 Prior to any work being done or removal of ceiling tiles or opening of ceiling access hatches, erect a floor to ceiling dust tight partition which completely encloses the area of work;
 - .1 Maintain barriers throughout the work and repair or replace as required or instructed.
 - .2 Completely remove barrier when work is finished and remove any marks left by tape or studs.
- .2 Post "Construction Zone" signage outside barrier and entrance to all work areas.
- .3 Take precautions when working on existing ceilings, ducts and piping systems.
- .4 Protect workers with the following minimum requirements:
 - .1 Carefully remove acoustical ceiling panels keeping horizontal if possible, and vacuum and clean the panels immediately upon removal.
 - .2 Clean air ducts, conduits and space above the ceiling with a HEPA filter equipped vacuum cleaner prior to start of any work.
- .5 Throughout the work period, ensure that:
 - .1 Plastic barrier flaps or doors to construction area remain closed.
 - .2 Place adhesive floor strips or walk-off mats outside the door to the construction area.
 - .3 Clean and vacuum construction and surrounding areas frequently with vacuum cleaners Equipped with HEPA filters.
 - .4 Remove dust from body and clothing when traversing Owner occupied areas.
 - .5 Carts, tools and equipment entering the construction area should remain there until the work is complete. Clean thoroughly prior to removal from the construction area.

1.5 Protection

- .1 Protect staff and visitors from any danger arising from his work. Supply, erect, maintain and remove signs, barricades, barriers, etc. as required. Sharp tools and dangerous objects must not be left unattended.
- .2 The job site shall remain clean and tidy at all times. Only those materials required each day are to be brought to the job Site.
- .3 Remove all garbage and scrap from work site on a daily basis, or more often if required. Owners recycle containers and garbage bins shall not be used.

- .4 Fire routes or personnel thoroughfares must not be obstructed. Fire doors must not be wedged open or latches disengaged.
- .5 Safety clearances are required before any cutting, welding, core drilling, open flame work or dust work is done. A request in writing to the Owner must be made and approved a minimum of 72 hours before this work is anticipated.
- .6 Provide dust tight partitions to prevent dust and dirt migrating from the work area. Remove when no longer required.

1.6 Emergency and Fire Protection

- .1 Provide and maintain at all times, ready access to fire lighting equipment
- .2 While work is proceeding in existing building, existing fire hoses and fire extinguishers shall be used as required. Recharge fire extinguishers if used and re-rack hoses.
- .3 Provide temporary portable fire extinguishers throughout the work and at every work area.
- .4 Prior to execution of any work which may possibly start a fire, provide proper and suitable precautions and fire extinguishers. Provide fire-watch during and for minimum 6 hours after all welding operations.

1.7 Hoisting of Materials and Equipment

- .1 Movement of materials and equipment that requires hoisting above, or movement through, occupied grounds beyond hoarding lines shall not be performed without prior knowledge and approval from the Owner. Schedule such activity to coincide with Owner's scheduling so as not to be performed when staff are on parking lots and areas of site within close proximity to areas of work.

End of Section

Part 1 General

1.1 Section Includes

- .1 Administrative
- .2 Fires
- .3 Disposal of Wastes
- .4 Drainage
- .5 Pollution Control
- .6 Unanticipated Soil Contamination

1.2 Related Sections

- .1 Section 01 41 00 Regulatory Requirements
- .2 Section 01 51 00 Temporary Utilities
- .3 Section 01 56 00 Temporary Barriers and Enclosures

1.3 References

- .1 Statutes of Canada 1999 Chapter 33. Canadian Environmental Protection Act 1999.
 - .1 SOR/2003-289. Federal Halocarbon Regulations, 2003.
 - .2 Transportation of Dangerous Goods Act, 1992 (1992, c. 34)
- .2 OPSS 805 "Construction Specification for Temporary Erosion and Sediment Control Measures".

1.4 Administrative

- .1 Comply with all federal, provincial, and municipal regulatory requirements and guidelines for environmental protection and natural resource conservation, including those referenced above.
- .2 The Work Site is subject to inspection by the Consultant, without prior notice.
- .3 Failure to comply with environmental requirements may result in a stop work order or assessment of damages commensurate with repair of damage.
- .4 It is the Contractor's responsibility to be aware of environmental requirements and the best management practices and pollution control measures necessary to meet them.
- .5 It is the Contractor's responsibility to obtain and abide by permits, licenses and compliance certificates at appropriate times and frequencies as required by the authorities having jurisdiction.

.6 All hazardous materials are to be stored with secondary containment.

1.5 Fires

.1 Fires and burning of rubbish on site not permitted.

1.6 Disposal of Wastes

.1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.7 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing deleterious substances into waterways, sewer or drainage systems.

.3 Protect storm drains against entry by sediment, debris, oil, or chemicals.

.4 Control disposal or runoff of water containing deleterious substances or other harmful substances in accordance with local authority requirements.

1.8 Pollution Control

.1 Maintain, inspect, and repair temporary erosion and pollution control features installed under this contract on a weekly basis. Submit inspection logs to the Owner when requested.

.2 Control emissions from equipment and plant to conform to federal, provincial, and municipal requirements.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.4 Take all measures necessary to prevent material and mud tracking on adjacent roads and streets.

.5 Use mechanical sweepers as often as necessary to keep adjacent roads and streets clean of material and mud that is deposited from this project.

.6 On site disposal or clean out of concrete trucks is not permitted. Any spillage of concrete onto asphalt or other surfaces must be cleaned up before spillage sets.

1.9 Unanticipated Soil Contamination

- .1 Should unanticipated soil contamination be discovered:
 - .1 Stop work, and assess the situation for safety.
 - .2 If situation does not appear to be safe, evacuate workers from area.
 - .3 If safe to do so, take immediate steps to control any spread of contamination, in accordance with Contractor's spill prevention and response plan.
 - .4 Immediately contact the Consultant.

End of Section

Part 1 General

1.1 Section Includes

- .1 Requirements for quality of work.
- .2 Requirements for material inspection and testing.
- .3 Requirements for determination of defective materials and work.

1.2 Related Work

- .1 Section 01 45 00 Quality Control

1.3 References

- .1 CSA A23.1 Concrete Materials and Methods of Concrete Construction.
- .2 CSA A23.2 Methods of Test for Concrete.
- .3 CSA S304.1-04 (R2010) - Design of Masonry Structures
- .4 CSA W47.1 Certification of Companies for Fusion Welding of Steel Structures.
- .5 CSA W59 Welded Steel Construction (Metal Arc Welding).
- .6 OPSS Ontario Provincial Standard Specifications.

1.4 Regulatory Requirements

- .1 Products and services provided to complete the Work shall meet or exceed requirements of specified standards, municipal by-laws, building codes and referenced documents.

1.5 Independent Inspection and Testing

- .1 Independent Inspection and Testing Consultants will be engaged on behalf of the Owner, for the purpose of inspecting and/or testing individual portions of the Work. The initial cost of such services will be included in the Contract Price, as allocated under Section 01 21 00, Allowances.

1.6 Responsibilities

- .1 Inspection and Testing Consultants
 - .1 Inspection and Testing Consultants shall;
 - .1 Provide inspection and testing specified,
 - .2 Inform the Contractor and Consultant immediately upon observance of materials, systems, or procedures not in compliance with the specifications, and

- .3 Submit complete reports to the Contractor and the Consultant in a timely manner.
- .2 Contractor
 - .1 Contractor shall:
 - .1 Ensure the quality control requirements of the Contract are implemented.
 - .2 Provide access to the Work for Inspection/Testing Consultants, and
 - .3 Inform the Inspection/Testing Consultants in advance of day and time required for inspection and tests.
 - .3 Consultant
 - .1 The Consultant will make final decisions on changes to the scope of work of inspection and testing that may affect the Contract Price.
 - .2 When informed of any material procedure or test result that does not meet or exceed the specifications, the Consultant will respond in an expedient manner to resolve the issue.
- 1.7 Access to Work
 - .1 Allow inspection & testing company's access to the Work, as well as off-site manufacturing and fabrication plants.
- 1.8 Work Subject to Inspection and Testing
 - .1 Refer to individual specification sections for requirements for inspection and testing.
 - .2 Provide additional inspection and testing beyond that listed in the specifications where directed by the Consultant.
- 1.9 Reports
 - .1 Submit inspection and test reports to the Consultant.
 - .2 Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.
 - .3 Submit one copy of inspection and test reports to the Building Official having jurisdiction, where required by that official.
 - .4 The cost of tests beyond those called for in the Contract Documents or beyond those required by the law of the Place of Work shall be appraised by the Consultant and may be authorized as recoverable.

1.10 Mock Ups

- .1 Refer to Section 01 45 00 – Quality Control.

1.11 Inspection and Testing – General

- .1 Furnish test results and mix designs as may be requested.
- .2 The cost of tests and mix designs beyond those called for in the Contract Documents or beyond those required by the law of the Place of Work shall be appraised by the Consultant and may be authorized as recoverable.

1.12 Inspection and Testing – Procedures

- .1 Notify the appropriate agency and Consultant in advance of the requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store, cure and inspect test samples.

1.13 Quality of Work

- .1 Quality of the Work shall be first class, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required work is such as to make it impractical to produce required results.
- .2 Do not employ any unfit person or anyone unskilled in their required duties. The Consultant reserves the right to require the dismissal from the site, of workers deemed incompetent, careless, insubordinate or otherwise objectionable.

1.14 Defective Materials and Work

- .1 Where evidence exists that defective work has occurred, or that work has been carried out incorporating defective products, the Consultant may have independent tests, inspections, or surveys performed in order to determine if work is defective.

- .2 Tests, inspections, or surveys carried out under these circumstances will be made at the Contractor's expense in the event of defective work, or at the Owner's expense where work is in conformance. Where tests incorporate a number of samples, payment will be assessed, by the Consultant, based on the ratio of conforming to non-conforming results. This does not include re-testing of soil compaction during placement, where evidence exists of non-conformance with the Contract documents, but rather only if re-testing is called for after completion of compaction.

End of Section

Part 1 General

1.1 Section Includes

- .1 References.
- .2 Owner's Regulations.
- .3 Standards and Definitions.
- .4 Designated Substances.
- .5 Hazardous Materials.
- .6 Spills Reporting.
- .7 Protection of Water Quality.
- .8 Potable Water Systems.
- .9 Access for Inspection and Testing.
- .10 Other Regulatory Requirements.

1.2 Related Sections

- .1 Section 01 70 03 Safety Requirements

1.3 References

- .1 Perform Work in accordance with the Ontario Building Code Act, O. Reg. 332/12, the Ontario Building Code (OBC) including all Supplements and other codes of provincial or local regulation provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Where a material is designated in the Contract Documents for a certain application, unless otherwise specified, that material shall conform to standards designated in the Code. Similarly, unless otherwise specified, installation methods and standards of workmanship shall also conform to standards invoked by the aforementioned Code.
- .3 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.
 - .3 Manufacturer's instructions.
- .4 Where requirements of Contract Documents exceed Code requirements provide such additional requirements.
- .5 Where the Building Code or the Contract Documents do not provide all information necessary for complete installation of an item, then the manufacturer's instructions for first quality workmanship shall be strictly complied with.

1.4 Owner's Regulations

- .1 Conform to requirements, regulations and procedures of the Owner.

1.5 Standards and Definitions

- .1 Where a reference is made to specification standards produced by various organizations, conform to latest edition of standards, as amended and revised to date of Contract.
- .2 Have a copy of each specified standard which relates to your work available on the site to be produced immediately on Consultant's request.
- .3 Where a standard designates authorities such as the "Engineer", the "Owner" (when used in a sense other than that defined in the General Conditions) the "Purchaser" or some other such designation, these designations shall be taken to mean the Consultant.
- .4 Wherever the words "acceptable", "approved", "satisfactory", "selected", "directed", "inspected", "instructed", "required", "submit", or similar words or phrases are used in standards or elsewhere in the Contract Documents, it shall be understood that they mean, unless the context provides otherwise, "acceptable to the Consultant", "approved by the Consultant", "satisfactory to the Consultant", "selected by the Consultant", "directed by the Consultant", "inspected by the Consultant", "instructed by the Consultant", "required by the Consultant" and "submit to the Consultant".

1.6 Designated Substances

- .1 Refer to the Designated Substance Report issued by the Municipality of Clarington.
- .2 All designated substances abatement, removal and disposal shall be completed in accordance with O. Reg 278/05 and all other applicable legislation.
- .3 Should any other material not identified in the above referenced reports resembling asbestos or other hazardous substances be encountered in course of demolition work, immediately stop work and notify the Owner's Representative. Refer to Section 01 41 00.
- .4 The Owner will arrange for independent testing of suspected designated substances encountered on the site during the course of the work which are not identified in the Designated Substance Report.

1.7 Hazardous Materials

- .1 Definition: "Hazardous Material" is material, in any form, which by its nature, may be flammable, explosive, irritating, corrosive, poisonous, or may react violently with other materials, if used, handled or stored improperly. Included are substances prohibited, restricted, designated or otherwise controlled by law.
- .2 Hazardous Materials will not be introduced for experimental or any other use prior to being evaluated for hazards.
- .3 Make known to the Consultant those hazardous materials or designated substances intended to be used in the workplace and receive permission to use before introducing to the Owner's property.
- .4 Provide MSDS for all materials brought to the Place of Work.
- .5 Many common construction materials such as asbestos pipe and various insulations are designated substances and shall not be used under any circumstances. Such materials are banned from the Owner's facilities.

1.8 Spills Reporting

- .1 Spills or discharges of pollutants or contaminants under the control of the Contractor, and spills or discharges of pollutants or contaminants that are a result of the Contractor's operations that cause or are likely to cause adverse effects shall forthwith be reported to the Consultant. Such spills or discharges and their adverse effects shall be as defined in the Environmental Protection Act R.S.O. 1999.
- .2 All spills or discharges of liquid, other than accumulated rain water, from luminaries, internally illuminated signs, lamps, and liquid type transformers under the control of the Contractor, and all spills or discharges from this equipment that are a result of the Contractor's operations shall, unless otherwise indicated in the Contract, be assumed to contain PCB's and shall forthwith be reported to the Consultant.
- .3 This reporting will not relieve the Contractor of his legislated responsibilities regarding such spills or discharges.

1.9 Protection of Water Quality

- .1 No waste or surplus organic material including topsoil is to be stored or disposed of within 30 metres of any watercourses. Run-off from excavation piles will not be permitted to drain directly into watercourses. Where this measure is not sufficient

or feasible to control sediment entering the watercourses, sedimentation traps or geo-textile coverage will be required.

- .2 If de-watering is required, the water shall be pumped into a sedimentation pond or diffused onto vegetated areas a minimum of 30 metres from any watercourses and not pumped directly into the watercourses.
- .3 Provide all de-watering and sedimentation control required to properly complete the work of this contract.

1.10 Potable Water Systems

- .1 Potable water systems in completed buildings must meet criteria and guidelines established by Provincial and Municipal authorities, prior to occupancy by the Owner.
- .2 Upon completion, submit testing certificates verifying water quality and water systems meets all applicable Provincial and Legislated Standards

1.11 Access for Inspection and Testing

- .1 Cooperate fully with and provide assistance to, all outside authorities including Building Inspectors, utilities, testing agencies and consultants, with the inspection of the Work.

1.12 Other Regulatory Requirements

- .1 Conform to the requirements of the Ontario Ministry of Transportation, Regional and Local authorities regarding transportation of materials.
- .2 Obtain required road occupancy permits.
- .3 Pay any required roadway damage deposits required by the local municipality.
- .4 Conform to the requirements of the Ontario Ministry of the Environment.
- .5 Conform to the requirements of the Ontario Ministry of Labour.
- .6 Conform to the requirements of the local Conservation Authority.
- .7 Conform to all applicable local by-laws, regulations and ordinances.

End of Section

Part 1 General

1.1 Section Includes

- .1 Inspection
- .2 Independent Inspection Agencies.
- .3 Access to Work
- .4 Procedures
- .5 Rejected Work
- .6 Reports
- .7 Contractors Responsibilities
- .8 Tests and Mix Designs
- .9 Mock-Ups
- .10 Equipment and Systems.

1.2 Related Sections

- .1 Section 01 21 13 Cash Allowances
- .2 Section 01 29 83 Payment Procedures for Testing Laboratory Services

1.3 Inspection

- .1 Contractor is responsible for Quality Control (QC).
- .2 Allow Owner and Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .5 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

1.4 Independent Inspection Agencies

- .1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Contractor and paid from the cash allowances specified in Section 01 21 13. Refer to Section 01 29 83.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Consultant. Pay costs for retesting and re-inspection.

1.5 Access to Work

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 Procedures

- .1 Notify Owner and Consultant 48 hours in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples

1.7 Rejected Work

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Consultant will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

1.8 Reports

- .1 Submit electronic pdf format inspection and test reports to Consultant.
- .2 Provide copies to Subcontractor of work being inspected or tested or manufacturer or fabricator of material being inspected or tested.

1.9 Contractors Responsibilities

- .1 Contractor is responsible for the execution of the Construction Quality Plan and is to pay all costs for the execution of the Construction Quality Plan. Designate an experienced site representative for carrying out the Construction Quality Plan.

1.10 Tests and Mix Designs

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Consultant and may be authorized as recoverable.

1.11 Mock Ups

- .1 Prepare mock-ups for Work specifically requested in specifications.
- .2 Construct in locations acceptable to Consultant.
- .3 Prepare mock-ups for Consultant's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 Mock-ups may remain as part of Work unless indicated otherwise.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Quality Control
Section 01 45 00

1.12 Equipment and Systems

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

End of Section

Part 1 General

1.1 Section Includes

- .1 Installation and Removal
- .2 Dewatering
- .3 Water Supply
- .4 Temporary Heating and Ventilation
- .5 Temporary Power and Light
- .6 Temporary Communication Facilities

1.2 Related Sections

- .1 Section 01 35 13.53 Special Project Procedures for Occupied Buildings
- .2 Section 01 52 00 Construction Facilities.
- .3 Section 01 56 00 Temporary Barriers and Enclosures

1.3 Installation and Removal

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 Dewatering

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.5 Water Supply

- .1 Existing sources of water can be made available to the Contractor at no charge, subject to operational requirements. Arrange for connection and pay all costs for installation, maintenance and removal. Conversions or alterations to existing sources of water to meet construction requirements are the responsibility of the Contractor.
- .2 The points of delivery and limits on amount available will be determined on site by the Owner whose written permission must be obtained before any connection is made.

1.6 Temporary Heating and Ventilation

- .1 Refer to Section 01 35 13.53- Special Project Procedures for Occupied Buildings for temporary exhaust of occupied spaces.

- .2 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .3 Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted, unless prior approval is given by the Consultant.
- .4 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .5 Maintain temperatures of minimum 10° C in areas where construction is in progress.
- .6 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .7 Permanent heating system of building, may not be used when available, unless there are savings to the contract price and Consultant's written permission is obtained stating conditions of use, provisions relating to guarantees on equipment and operation and maintenance of system. Be responsible for damage to heating system if use is permitted.
- .8 On completion of Work for which permanent heating system is used, replace filters.
- .9 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Consultant.

- .10 Pay costs for maintaining temporary heat, when using permanent heating system.
Owner will pay utility charges when temporary heat source is existing building equipment.
- .11 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform to applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct fired combustion units to outside.
- .12 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 Temporary Power and Light

- .1 Existing sources of electric power can be made available to the Contractor.
Conversions or alterations to existing sources of electric power to meet construction requirements are the responsibility of the Contractor.
- .2 The points of delivery and limits on amount available will be determined on site by the Owner whose written permission must be obtained before any connection is made.
- .3 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Consultant provided that guarantees are not affected.

1.8 Temporary Communication Facilities

- .1 Provide and pay for temporary telephone, fax, data hook up, lines and equipment necessary for own use.

End of Section

Part 1 General

1.1 Section Includes

- .1 Construction aids.
- .2 Site storage.
- .3 Parking
- .4 Offices
- .5 Equipment and Material Storage.
- .6 Sanitary facilities.
- .7 Signage.
- .8 Hoarding

1.2 References

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA Z321-96 (R2006), Signs and Symbols for the Workplace

1.3 Installation and Removal

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 Scaffolding

- .1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.

1.5 Hoisting

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
- .2 Hoists and cranes shall be operated by qualified operator.

1.6 Site Storage/Loading

- .1 Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.7 Construction Parking

- .1 Parking will be permitted on site at areas designated by the Owner provided it does not disrupt performance of Work or ongoing Owners operations.
- .2 Provide and maintain adequate access to project site.
- .3 Make good damage resulting from Contractors' use of roads and parking areas.

1.8 Offices

- .1 General Contractor and Subcontractors may utilize an existing change room as designated by the Township for the site office.

1.9 Equipment, Tool and Material Storage

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.10 Sanitary Facilities

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.11 Construction Signage

- .1 Direct requests for approval to erect a Contractor signboard to Owner. Subcontractor and supplier corporate signage is not permitted.
- .2 Signs and notices for safety and instruction shall be in English. Graphic symbols shall conform to CAN/CSA Z321-96 (R2006).
- .3 Post "Construction Zone" signage outside barrier and entrance to all work areas.
- .4 Install signage to direct site traffic and deliveries to the Construction work areas.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Construction Facilities
Section 01 52 00

- .5 Maintain approved signs and notices in good condition for duration of project and dispose of off-site on completion of project.

End of Section

Part 1 General

1.1 Section Includes

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

1.2 Related Sections

- .1 Section 01 35 13.53 Special Project Procedures for Occupied Buildings
- .2 Section 01 52 00 Construction Facilities.

1.3 Installation and Removal

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.4 Site Fencing

- .1 Contractor's lay-down area indicated on the drawings must be secure and there must be no access by unauthorized persons. Provide temporary fencing around whole work site. Use modular free-standing fencing: galvanized, minimum 1.8m high, chain link or welded steel mesh, pipe rail. Provide one lockable truck entrance gate and at least one pedestrian door as directed. Equip all gates with locks and keys. Maintain fence in good repair.

1.5 Hoarding

- .1 Erect temporary enclosures to separate work areas from occupied areas using dust tight hoarding. This will be required on both the ground second floor of the rink areas along with through corridors where the flooring replacement is designated. Provide gates as necessary to maintain access through spaces.

1.6 Guard Rails and Barricades

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2 Provide as required by governing authorities.

1.7 Weather Enclosures

- .1 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

1.8 Dust Tight Screens

- .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public. Refer to Section 01 35 13.53 - Special Project Procedures for Occupied Buildings
- .2 Provide dust tight screens at all access points between the construction work areas and existing building areas scheduled to remain in operation and wherever directed by Owner or Consultant.
-
- .3 Maintain and relocate protection until such work is complete.

1.9 Access to Site

- .1 Provide and maintain sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.10 Public Traffic Flow

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.11 Fire Routes

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.12 Protection for Off Site and Public Property

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred

1.13 Protection of Building Finishes

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Temporary Barriers
and Enclosures
Section 01 56 00

- .3 Confirm with Consultant locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

End of Section

Part 1 General

1.1 Section Includes

- .1 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.
- .4 Existing Utilities

1.2 Quality

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 Availability

- .1 Review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 Storage, Handling and Protection

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Consultant.
- .9 Touch up damaged factory finished surfaces to Consultant's satisfaction. Use touch up materials to match original. Do not paint over name plates.

1.5 Transportation

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Owner. Contractor shall be responsible for the unloading, handling and storage of such products.

1.6 Manufacturer's Instructions

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re installation at no increase in Contract Price or Contract Time.

1.7 Quality of Work

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.
- .2 Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .3 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .4 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.8 Coordination

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 Concealment

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

1.10 Remedial Work

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 Location of Fixtures

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Consultant of conflicting installation. Install as directed.

1.12 Fastenings

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 Fastenings – Equipment

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 Protection of Work in Progress

- .1 Adequately protect Work completed or in progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by Consultant, at no increase in Contract Price or Contract Time.
- .2 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Consultant.

1.15 Existing Utilities

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

1.16 Hazardous Materials

- .1 Report any found or suspected hazardous materials to the Owner.

End of Section

Part 1 General

1.1 Section Includes

- .1 Safety Requirements
- .2 Fire Protection
- .3 Accident Reporting
- .4 Records on Site

1.2 References

- .1 Federal regulations, latest edition including all amendments up to project date:
 - .1 Fire Commissioners of Canada, FC 301, Standard for Construction Operations.
 - .2 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Provincial regulations, latest edition including all amendments up to project date:
 - .1 Ontario Building Code.
 - .2 Occupational Health and Safety Act.
- .3 NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2013 Edition

1.3 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit to Owner and Consultant copies of the following documents, including updates issued:
 - .1 Notice of Project filed with Provincial Ministry of Labour or equivalent for Place of Work
 - .2 Site-specific Health and Safety Plan prior to commencement of work on the work site. Plan shall include but not be limited to the following:
 - .1 Name and contact info of Contractor's Health and Safety Representative for Work Site; including twenty-four (24) hour emergency contact phone numbers.
 - .2 Phone numbers of local fire, police, and ambulance outside of 911 services.
 - .3 Location of nearest medical facility and level of injury that each can service.
- .3 Submit to the Owner, Consultant and Municipal Fire Department, for review, a "Fire Safety Plan" conforming to Section 2.14 of the National Fire Code of Canada. Maintain a copy of the "Fire Safety Plan" on site.

- .4 Copies of certification for all employees on site of applicable safety training including, but not limited to:
 - .1 WHIMIS.
 - .2 Fall arrest and protection.
 - .3 Suspended Access Equipment.
 - .4 Erection of Scaffolding.
 - .5 License for powder actuated devices.
- .5 Material Safety Data Sheets (MSDS) of controlled products to be used.
- .6 On-site Contingency and Emergency Response Plan addressing:
 - .1 Standard procedures to be implemented during emergency situations.
 - .2 Preventative planning and protocols to address possible emergency situations.
- .3 Guidelines for handling, storing, and disposing of hazardous materials that maybe encountered on site, including measures to prevent damage or injury in case of an accidental spill.
- .4 Incident and accident reports, promptly if and upon occurrence
 - .1 Reports or directions issued by authorities having jurisdiction, immediately upon issuance from that authority.
 - .2 Accident or Incident Reports, within 24 hours of occurrence.
- .5 Submit other data, information and documentation upon request by the Consultant as stipulated elsewhere in this section.

1.4 Compliance Requirements

- .1 Comply with the latest edition of the Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act.

1.5 Constructor

- .1 The Contractor will be the "Constructor" as defined by the Occupational Health and Safety Act, will file a Notice of Project with the Ontario Ministry of Labour prior to commencement of the work and will pay all associated fees.
- .2 The "Constructor" will be solely responsible for the safety of all persons on the Site.

1.6 Safety Requirements

- .1 Observe and enforce all construction safety measures and comply with the latest edition and amending regulations of the following documents and in the event of any differences among those provisions, the most stringent shall apply:
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, August 1997, Ontario Regulation 213/91 including amendments.
 - .2 Hazardous Products Act and Canada Labour Code.
 - .3 The Workplace Safety and Insurance Board, O-Reg 454.
 - .4 Ontario Building Code Act, Ontario Regulation 332/12 including amendments.
 - .5 National Building Code of Canada, Part 8: Safety Measures on Construction and Demolition Sites.
 - .6 National Fire Code of Canada.
 - .7 NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2013 Edition
 - .8 Environmental Protection Act.
 - .9 The Power Commission Act.
 - .10 The Boiler and Pressure Vessels Act.
 - .11 The Elevators and Lifts Act.
 - .12 The Operating Engineer's Act.
 - .13 Municipal statutes.
- .2 Obey all Federal, Provincial and Municipal Laws, Acts, Statutes, Regulations, Ordinances and By-laws which could in any way, pertain to the work outlined in the Contract, or to any employees of the Contractor. Satisfy all statutory requirements imposed by the Occupational Health and Safety Act and Regulations made thereunder, on a Contractor, and Constructor and/or Employer with respect to or arising out of the performance of the Contractors obligations under this Contract.
- .3 Confined Space: Where applicable, provide the Consultant and all Regulatory Authorities with a copy of the Contractors' Confined Space Entry Procedure. In the event that defined procedures are not available, abide by the applicable requirements of the Occupational Health and Safety Act and all regulations made thereunder.
- .4 The supervisor of the project, will be responsible for his employees and subcontractors/suppliers maintaining standard safety practices, as well as the specific safety rules listed below, while working on the Owner's property.
- .5 The Owner reserves the right to order individuals to leave the site if the individual is in violation of any safety requirement or any Act, and any expense incurred will be the responsibility of the Contractor.

- .6 Notify the Owner should any hazardous condition become apparent.
- .7 Enforce the use of CSA approved hard hats and safety boots for all persons entering or working at the construction site. Refuse admission to those refusing to conform to this requirement.
- .8 Provide safeguard and protection against accident or injury to any person on the site, adjacent work areas and adjacent property.
- .9 Provide safeguard and protection against damage to adjacent structures, properties and services.

1.7 Safety Meetings

- .1 Site toolbox safety meetings will be held weekly for all Contractor employees and all sub trade contractors.
- .2 Where a Joint Health and Safety Committee(s) is required on a project, workers and supervisors, selected, as members of the committee must attend.

1.8 Workplace Hazardous Materials Information System (WHMIS)

- .1 Contractor to be familiar with WHMIS regulations and be responsible for compliance.
- .2 Contractor is responsible for all other requirements of regulations as applicable to Employers.
- .3 All controlled products to be properly labelled and stored.
- .4 Immediately inform Owner and Consultant if any unforeseen or peculiar safety-related factor, hazard, or condition becomes evident during performance of Work.

1.9 Fire Protection

- .1 Provide and maintain safeguard and protection against fire in accordance with current fire codes and regulations.
- .2 Provide temporary fire protection throughout the course of construction. Particular attention shall be paid to the elimination of fire hazards.

- .3 Comply with the requirements of FCC No. 301 Standards for Construction Operations issued by the Fire Commissioner of Canada and the National Building Code.
- .4 Provide and maintain portable fire extinguishers during construction, in accordance with Part 6 of the National Fire Code of Canada and NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2013 Edition.
- .5 Maintain unobstructed access for firefighting at all areas in accordance with the National Building Code of Canada.

1.10 Accident Reporting

- .1 Investigate and report incidents and accidents as required by Occupational Safety and Health Act, and the Regulations made pursuant to the Act.
- .2 For the purpose of this contract immediately investigate and provide a report to the Consultant on incidents and accidents that involve:
 - .1 A resulting injury that may or may not require medical aid but involves lost time at work by the injured person(s).
 - .2 Exposure to toxic chemicals or substances.
 - .3 Property damage.
 - .4 Interruption to adjacent and/or integral infrastructure operations with potential loss implications.

1.11 Records on Site

- .1 Maintain on site a copy of the safety documentation as specified in this section and any other safety related reports and documents issued to or received from the authorities having jurisdiction.
- .2 Upon request, make copies available to the Consultant.

End of Section

Part 1 General

1.1 Section Includes

- .1 Field Engineering survey services to measure and stake site.
- .2 Survey services to establish and confirm inverts for Work.
- .3 Recording of subsurface conditions found.

1.2 Qualifications of Surveyor

- .1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Consultant.

1.3 Survey Reference Points

- .1 Existing control points are designated on drawings.
- .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Consultant.
- .4 Report to Consultant when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.4 Survey Requirements

- .1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Establish foundation and floor elevations.
- .4 Survey rink slab elevations including sand base, top of insulation and top of rink slab as specified.

1.5 Existing Services

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings. The Contractor is responsible for coordination of all utility locates.
- .2 Cap or otherwise seal service lines at cut off points as directed by Consultant.
- .3 Where Work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to building occupants, pedestrian and vehicular traffic.
- .4 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .5 Install temporary drain plugs to prevent construction debris from blocking pipes downstream of the work.

1.6 Records

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 Record locations of maintained, re-routed and abandoned service lines.

1.7 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit name and address of Surveyor to Consultant.
- .3 On request of Consultant, submit documentation to verify accuracy of field engineering work.
- .4 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform to Contract Documents.

1.8 Subsurface Conditions

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Examination and
Preparation
Section 01 71 00

- .2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in work.

End of Section

Part 1 General

1.1 Section Includes

- .1 Requirements and limitations for cutting and patching the Work.

1.2 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit written request and obtain Consultant's approval in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of Project.
 - .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

1.3 Materials

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Requests for change in materials shall include documentation indicating conformance to project requirements and intent.

1.4 Definitions

- .1 Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- .2 Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.5 Preparation

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

1.6 Execution

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide cutting and patching of all openings in non-structural elements of Work as necessary to complete installation of mechanical and electrical Work. Include complete removal and replacement of such elements as necessary to provide construction access.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools are not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with "ULC approved firestopping material, full thickness of the construction element. Include any openings in existing building elements created by removal of existing services or equipment.

- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

Part 2 Products

2.1 Materials

- .1 General: Comply with requirements specified in other Sections.
- .2 In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
- .3 If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Consultant for the visual and functional performance of in-place materials.

Part 3 Execution

3.1 Cutting and Patching

- .1 General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - .1 Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- .2 Temporary Support: Provide temporary support of work to be cut.
- .3 Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- .4 Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 - Summary of Work.
- .5 Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - .1 In general, use hand or small power tools designed for sawing and grinding, not

- hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- .2 Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - .3 Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - .4 Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - .5 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - .6 Proceed with patching after construction operations requiring cutting are complete.
- .6 Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
- .1 Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - .2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - .3 Floors: Where floor finishes that are removed extend one finished area into another, patch and repair floor and wall base surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and replace with new materials, if necessary, to achieve uniform color and appearance.
- .7 Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

End of Section

Part 1 General

1.1 Section Includes

- .1 Progressive Cleaning
- .2 Final Cleaning

1.2 Project Cleanliness

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Owner. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use clearly marked separate bins for recycling.
- .7 Remove debris daily. The work site must be left clean and tidy upon completion, to the satisfaction of the Consultant.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

Part 2 Products

2.1 Products

- .1 All cleaning materials and products shall be low VOC type. Submit list of cleaning products including MSDS for approval prior to commencement of cleaning operations.
- .2 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

Part 3 Execution

3.1 Final Cleaning

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove stains, spots, marks and dirt from walls, floors and ceilings.
- .5 Clean lighting reflectors, lenses, and other lighting surfaces.
- .6 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .7 Inspect finishes, fitments and equipment and ensure specified workmanship.
- .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .9 Remove dirt and other disfiguration from exterior surfaces.
- .10 Clean and sweep roofs. Clear all drains.
- .11 Sweep and wash clean paved areas affected by work.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Cleaning
Section 01 74 11

- .12 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .13 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

End of Section

Part 1 General

1.1 Section Includes

- .1 References.
- .2 Submittals.
- .3 Definitions.
- .4 Waste Management Goals for the Project.
- .5 Documents.
- .6 Waste Management Plan.
- .7 Waste Audit.
- .8 Waste Reduction Work Plan.
- .9 Materials Source Separation Program.
- .10 Disposal of Wastes.
- .11 Scheduling.
- .12 Storage, Handling and Protection.
- .13 Application.
- .14 Diversion of Materials.

1.2 Related Sections

- .1 Section 01 33 00 Submittal Procedures
- .2 Section 01 35 43 Environmental Procedures
- .3 Section 01 74 11 Cleaning

1.3 References

- .1 O. Reg. 102/94, Waste Audits and Waste Reduction Work Plans.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit 2 copies of completed Waste Management Plan (WMP) including Waste Reduction Workplan (WRW) and Materials Source Separation Program description prior to project start-up.

1.5 Definitions

- .1 Waste Management Plan (WMP): Contractor's approved overall strategy for waste management including waste audit, waste reduction workplan and materials source separation program.

- .2 Waste Audit (WA): Relates to projected waste generation. Involves measuring and estimating quantity and composition of waste, reasons for waste generation, and operational factors which contribute to waste.
- .3 Waste Reduction Work Plan (WRW): Written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.
- .4 Materials Source Separation Program (MSSP): Consists of a series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .5 Waste Management Coordinator (WMC): Designate individual who is in attendance on-site, full-time. Designate, or have designated, individuals from each Subcontractor to be responsible for waste management related to their trade and for coordinating activities with WMC.
- .6 Separate Condition: Refers to waste sorted into individual types.

1.6 Waste Management Goals for the Project

- .1 The Owner has established that this Project shall generate the least amount of waste possible and that processes shall be employed that ensure the generation of as little waste as possible including prevention of damage due to mishandling, improper storage, contamination, inadequate protection or other factors as well as minimizing over packaging and poor quantity estimating.
- .2 Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling. Waste disposal in landfills or incinerators shall be minimized. On new construction projects this means careful recycling of job site waste.

1.7 Documents

- .1 Maintain at job site, one copy of following documents:
 - .1 Waste Audit
 - .2 Waste Reduction Workplan
 - .3 Material Source Separation Plan

1.8 Waste Management Plan

- .1 Waste Management Plan: Subsequent to the tender opening upon request, provide to the City for evaluation a Waste Management Plan that can include but is not limited to:
 - .1 Procedures for educating workers and sub-contractors in order to ensure adherence to the Waste Management Plan;
 - .2 Methods for reducing waste such as ordering material only as required, using up excess material on site where possible, or prefabricating sections off site;
 - .3 Methods and techniques for collecting, separating, and recycling waste materials and packaging, including a list of materials to be recycled and percentage expected to be recycled or sent to landfills;
 - .4 Provisions for dealing with hazardous waste, including procedures for handling, clean-up and disposal;
 - .5 A list of carriers and disposal destinations for each material to be disposed of or recycled. The list should be provided initially or at least before the final payment is made. This will ensure that all materials are being recycled and waste is legally disposed of;
 - .6 Alternative options for recovering higher percentages of materials and related costs; and
 - .7 The cost associated with the recovery of the material and the anticipated revenues from the sale of such material.
- .2 Post WMP or summary where workers at site are able to review its content.

1.9 Waste Audit

- .1 Prepare Waste Audit prior to project start-up.
- .2 Record, on Waste Audit, extent to which materials or products used consist of recycled or reused materials or products

1.10 Waste Reduction Work Plan

- .1 Prepare WRW prior to project start-up.
- .2 Reduce construction and demolition waste in compliance with O. Reg. 102/94.
- .3 Reduction will involve action to minimize quantity of waste at source. Reuse products which would become waste where practical. Recycling will involve collection and source separation at the site, of materials for use as feedstock in manufacturing of new products.

- .4 Conform to local Municipal and Regional Landfill Solid waste management requirements. Consider reduction, reuse and recycling of waste generated during construction such as dimensional lumber, clean drywall, concrete, brick, scrap metal and corrugated cardboard.

1.11 Materials Source Separation Program

- .1 The Waste Management Plan shall include a Source Separation Program for recyclable waste, and shall be in accordance with the established policies currently in place at the local Municipality, and the requirements of O. Reg. 102/94.
- .2 Prepare MSSP and have ready for use prior to project start-up.
- .3 Implement MSSP for waste generated on project in compliance with approved methods and as approved by Consultant.
- .4 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and/or recyclable materials.
- .5 Provide containers to deposit reusable and/or recyclable materials.
- .6 Locate containers to facilitate deposit of materials without hindering daily operations.
- .7 Locate separated materials in areas which minimize material damage.
- .8 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

1.12 Disposal of Wastes

- .1 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .2 Provide appropriate on-site containers for collection of waste materials and debris.
- .3 Provide and use clearly marked separate bins for recycling.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site.

- .5 Remove waste material and debris from site at end of each working day.
- .6 Do not permit waste to accumulate onsite.
- .7 Burying of rubbish and waste materials is prohibited.
- .8 Disposal of waste into waterways, storm, or sanitary sewers is prohibited.

1.13 Scheduling

- .1 Coordinate work with other activities at site to ensure timely and orderly progress of the Work.

1.14 Storage, Handling and Protection

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Owner.
- .2 Materials from building demolition to be salvaged or re-used are to be removed and salvaged.
- .3 Unless specified otherwise, materials for removal become Contractor's property.

Part 2 Products

2.1 Not Used

- .1 Not used

Part 3 Execution

3.1 Application

- .1 Do work in compliance with Waste Management Plan.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.2 Designated Substances

- .1 All designated substances abatement, removal and disposal shall be completed in accordance with O. Reg 278/05 and all other applicable legislation.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Construction Waste
Management and Disposal
Section 01 74 19

3.3 Diversion of Materials

- .1 Separate materials from general waste stream and stockpile in separate piles or containers, to approval of Owner, and consistent with applicable fire regulations. Mark containers or stockpile areas. Provide instruction on disposal practices.
- .2 On-site sale of materials is not permitted.

End of Section

Part 1 - General

1.1 Section Includes

- .1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 Related Work

- .1 Section 01 78 00 Closeout Submittals

1.3 References

- .1 Canadian Construction Documents Committee CCDC 2-2020, Stipulated Price Contract including Supplementary Conditions.
- .2 OAA/OGCA Document 100 - Recommended procedures regarding Substantial Performance of Construction Contracts and Completion Takeover of Projects.
- .3 The Construction Lien Act.

1.4 Inspection and Declaration

- .1 Contractor's Inspection: The Contractor and all Sub-contractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents. Submit duplicate copies of the deficiency list to the Owner and Consultant.
 - .1 Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Consultant's review.
- .2 Consultant's Review: Consultant and Contractor will perform review of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Boiler Inspection Branch, Fire Commissioner, Utility companies, TSSA and other regulatory agencies have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for Final Review by the Consultant.

- .4 Final Inspection: when items noted above are completed, request final review of Work by Consultant, and Contractor. If Work is deemed incomplete by the Consultant, complete outstanding items and request re-review.
- .5 Declaration of Substantial Performance: when Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance. Refer to CCDC 2, General Conditions Article GC 5.4 - Substantial Performance of Work and the Construction Lien Act for specifics to application.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment: When Consultant considers final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. Refer to CCDC 2, General Conditions Article GC 5.7 for specifics to application.
- .8 Payment of Holdback: After issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with CCDC 2, General Conditions Article 5.5

End of Section

Part 1 - General

1.1 Section Includes

- .1 As built, samples, and specifications.
- .2 Equipment and systems.
- .3 Product data, materials and finishes, and related information.
- .4 Operation and maintenance data.
- .5 Spare parts, special tools and maintenance materials.
- .6 Warranties and bonds.
- .7 Final survey.

1.2 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.3 Submission

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 At least 2 weeks prior to commencement of scheduled commissioning activities, submit 2 copies of the DRAFT Operating and Maintenance Manuals, for Consultants review and use during the commissioning activities. After the completion of the commissioning activities, the Consultant will return to the Contractor 1 DRAFT copy, with review comments, for revision. Submit 1 copy of the revised Operating and Maintenance for approval prior to the production of FINAL copies. Prior to the Issuance of the Final Certificate of Completion, and within 10 working days after Substantial Performance, submit 2 copies of the FINAL Operating and Maintenance Manuals.
- .3 Building will not be deemed ready for use unless the draft copies of the Operating and Maintenance Manuals and the "As-built" Record Documents have been submitted and reviewed by the Consultant.
- .4 Building will not be deemed ready for use unless the completed and submitted Operating and Maintenance Manuals and "As-built" Record Documents have been accepted by the Consultant.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.4 Format

- .1 Organize data in the form as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in .dwg format on CD.

1.5 Contents Each Volume

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control

1.6 Occupant Manual

- .1 Submit Occupant Manual to Consultant's requirements.
- .2 Occupant Manual to include:
 - .1 General building information.
 - .2 Building management.
 - .3 Building operations.
 - .4 Safety.
 - .5 Security.
 - .6 Environmental considerations.
 - .7 Communications.
 - .8 Contact List.
 - .9 Other/Miscellaneous.

1.7 As Builts and Samples

- .1 In addition to requirements in General Conditions, maintain at the site for Consultant one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in

neat, large, printed letters.

- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

1.8 Recording Actual Site Conditions

- .1 Record information on set of drawings, provided by Consultant.
- .2 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .4 Submit following drawings:
 - .1 Record changes in red. Mark on one set of prints and at completion of project prior to final inspection, produce electronic "as-built" records on disk using latest version of AutoCad. Annotate "AS-BUILT RECORD" in each drawing title block.
 - .2 All changes shall be shown on a separate drawing layer named "as-built".
 - .3 At least 2 weeks prior to commencement of scheduled commissioning activities, submit one copy of the DRAFT "As-built" Project Record Documents for Consultants review and use during the commissioning activities. After the completion of the commissioning activities, the Consultant will return to the Contractor the DRAFT copy, with review comments, for revision. Prior to the Issuance of the Final Certificate of Completion, and within 10 working days after Substantial Performance, submit 2 copies of the FINAL "As-built" Project Record Documents and disk of "as-built" record drawings.

- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections

1.9 Final Survey

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.10 Equipment and Systems

- .1 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.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 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.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control
- .15 Additional requirements: as specified in individual specification sections.

1.11 Materials and Finishes

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.12 Spare Parts

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Spare parts as identified in individual sections are to be delivered to the Owner prior to the Contractor's application for Substantial Performance.
- .4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

- .5 Obtain receipt for delivered products and submit prior to final payment.

1.13 Maintenance Materials

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Maintenance materials are to be delivered to the Owner prior to the Contractor's application for Substantial Performance.
- .4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.14 Special Tools

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Special tools are to be delivered to the Owner prior to the application for Substantial Performance.
- .4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

1.15 Storage, Handling and Protection

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

1.16 Warranties and Guarantees

- .1 Separate each warranty or guarantee with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and guarantees, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and guarantees until time specified for submittal.

1.17 Independent Specialty Engineers Sign-Off

- .1 Prior to Substantial Performance, provide copies of signed and stamped engineers review and sign-off letters stating that the work has been built in accordance with their drawings and designs. Conditional or vague letters of sign-off will not be accepted. All specialty design engineers for all sub-contractors and suppliers will be required to review the work in progress at appropriate intervals to ensure compliance with their designs and drawings and shall provide final sign-off letters. Provide copies of all field reports issued by specialty engineers. Carry all costs associated with full compliance with this requirement.

End of Section

Part 1 - General

1.1 Section Includes

- .1 Procedures for demonstration and instruction of equipment and systems to Owner's personnel.

1.2 Description

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two (2) weeks prior to date of Substantial Performance.
- .2 Owner will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed-upon times.

1.3 Quality Control

- .1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Owner's approval.
- .3 Submit reports within one (1) after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.

1.5 Conditions for Demonstrations

- .1 Equipment has been inspected and put into operation.
- .2 Testing, adjusting, and balancing have been performed and equipment and systems are fully operational.
- .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.6 Preparation

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

1.7 Demonstrations and Instructions

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

End of Section

Part 1 - General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 01 35 43 Environmental Procedures
- .2 Section 01 56 00 Temporary Barriers and Enclosures
- .3 Section 01 74 11 Cleaning
- .4 Section 01 74 19 Construction Waste Management and Disposal
- .5 Section 31 23 10 Excavating, Trenching and Backfilling

1.3 References

- .1 The National Building Code of Canada, Part 8-Safety Measures on Construction and Demolition Sites.
- .2 ASTM International (ASTM)
 - .1 ASTM F710-11 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- .3 Ontario Regulation 102/94, Waste Audits and Waste Reduction Work Plans.
- .4 Ontario Regulation 103/94, Environmental Protection Act.
- .5 Ontario Regulation 213/07 -The Fire Code.
- .6 Ontario Regulation 232/98 - Landfilling Sites.
- .7 Ontario Regulation 278/05 -Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.
- .8 Ontario Regulation 347- Environmental Protection Act, General — Waste Management.
- .9 Ontario Regulation 332/12 - The Building Code.
- .10 The Workplace Health and Safety Act, and Regulations for Construction Projects.
- .11 The Contractors Health and Safety Policy.
- .12 Laws, rules and regulations of other authorities having jurisdiction.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit detailed written schedule, methodology and proposed procedures for demolition, including a Safe Work Plan to Consultant and Owner for review prior to commencement of demolition.

- .3 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details clearly showing sequence of disassembly work or supporting structures.
- .4 Submit a construction waste management plan including demolition and removal procedures under provisions of Section 01 74 19.
- .5 Submit proposed dust-control measures.
- .6 Submit proposed noise-control measures.
- .7 Submit schedule of demolition activities indicating the following:
 - .1 Detailed sequence of demolition and removal work, including start and end dates for each activity.
 - .2 Dates for shutoff, capping, and continuation of utility services.
 - .3 If hazardous materials are encountered and disposed of, landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- .8 At Project Closeout: Submit record drawings in accordance with Section 01 78 00. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.5 Permits

- .1 Obtain and pay for all permits and comply with all laws, rules, ordinances, and regulations relating to Demolition of Building and preservation of Public Health and Safety.
- .2 The Consultant will complete General Review during demolition in accordance with the Ontario Building Code. All other engineering required for shoring design and for other structural elements of the demolition work will be completed by the Contractor's own engineer and paid for by the Contractor.

1.6 Waste Management Plan

- .1 All work of this section shall be completed in accordance with the contractors approved Waste Management Plan specified in Section 01 74 19.

1.7 Definitions

- .1 Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.
- .2 Demolition Waste: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, plastic pipe, and steel. The materials may include rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.
- .3 Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human or animal life; affect other species of importance to humanity; or degrade the utility of the environment for aesthetic, cultural or historical purposes.
- .4 Inert Fill: A permitted facility that accepts inert waste such as asphalt and concrete exclusively for the purpose of disposal.
- .5 Inert Solids/Inert Waste: Non-liquid solid waste including, but not limited to, soil and concrete that does not contain hazardous substances or soluble pollutants at concentrations in excess of water-quality standards established by a regional water board and does not contain significant quantities of decomposable solid waste.
- .6 Landfill: A landfill that accepts non-hazardous materials such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A landfill must have a solid waste facilities permit from the Ministry of the Environment and be in conformance to O.Reg 232/98.
- .7 Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- .8 Remove: Remove and legally dispose of items, except those identified for use in recycling, re-use, and salvage programs.

- .9 Reuse: The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- .10 Solid Waste: All putrescible and non-putrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by law.

1.8 Quality Assurance

- .1 Demolition Firm Qualifications: Demolition contractor shall be an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.
- .2 Regulatory Requirements: Comply with governing regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Obtain and pay for all permits required.
- .3 Pre-demolition Conference: Conduct a conference at Project site.
 - .1 Review the environmental goals of this Project and make a proactive effort to increase awareness of these goals among all labor forces on site.
 - .2 Review schedule and scheduling procedures.
 - .3 Review health and safety procedures.
 - .4 Review of Project conditions including review of record photographs.

1.9 Project Site Conditions

- .1 Construct safety barriers, barricades, fencing and hoarding to separate public from work areas as described in Section 01 56 00.
- .2 The Owner assumes no responsibility for the actual condition of the structures to be demolished.
- .3 Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. Variations within the structures may occur by the Owner's salvage operations prior to start of demolition.

1.10 Designated Substances

- .1 Refer to the Designated Substance Report issued by the Municipality of Clarington.
- .2 Should any other material not identified in the above referenced reports resembling asbestos or other hazardous substances be encountered in course of demolition work, immediately stop work and notify the Owner's Representative. Refer to Section 01 41 00.
- .3 All designated substances abatement, removal and disposal shall be completed in accordance with O. Reg 278/05 and all other applicable legislation.

Part 2 Products

2.1 Materials

- .1 Conform to requirements of Division 1, in particular, articles on Design and Safety Requirements for Temporary Work. Provide all materials necessary for temporary shoring. On completion, remove temporary materials from site.
- .2 All building materials removed from the building shall become the property of the Contractor unless specified otherwise and shall be reused in new construction or removed from the Site.
- .3 All concrete, masonry, asphalt and similar materials shall be crushed prior to disposal.

2.2 Salvage

- .1 Existing ice re-surfacer room door shall be salvaged and retro-fitted to accommodate the new re-surfacer approach.
- .2 Provide a schedule of items to be salvaged and clearly indicate which items are to be retained by Owner. Clearly identify and tag each salvageable item.
- .3 Transport salvaged items from the site as they are removed.
- .4 Items of salvageable value to the Contractor may be removed from the structure as the work progresses, if such items are not claimed by the Owner.
- .5 Salvage materials and hand over to Owner, as indicated on the drawings and as noted below.

2.3 Recycle

- .1 All materials from demolition and land clearing which can be recycled through local municipal programs and which is not scheduled for salvage shall be sorted and separated in accordance with Regional, Provincial and Municipal standards and regulations.
- .2 Provide recycling receptacles for the duration of construction activities at the building site.

Part 3 Execution

3.1 Examination

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of demolition, salvage and recycling required.
- .2 Verify that utilities have been disconnected and capped.
- .3 Survey condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
- .4 Perform surveys and tests as the Work progresses to detect hazards resulting from demolition activities.
- .5 Preliminary Survey:
 - .1 The Demolition Plans indicate the general extent of existing conditions based upon drawings provided by the Owner and existing site conditions. Review all areas of work to determine full extent of areas to be demolished, altered or renovated and become familiar with actual conditions and extent of work required.
 - .2 Before commencing demolition operations, examine Site and provide engineering survey to determine type of construction, condition of structure, and Site conditions. Assess strength and stability of damaged or deteriorated structures.
 - .3 Assess potential effect of removal of any part or parts on the remainder of structure before such part(s) are removed.
 - .4 Assess effects of demolition at adjacent structures and consider need for underpinning, shoring and/or bracing.
 - .5 Investigate for following conditions:
 - .1 load bearing walls and floors

- .2 effects of soils, water, lateral pressures on retaining or foundations walls
 - .3 presence of tanks, wells, other piping systems
 - .4 presence of designated substances and hazardous materials.
- .6 After determining demolition methods, determine area of possible vibration. Carefully inspect beyond those adjacent areas. List potential damage areas and photograph each for record purposes before starting work.

3.2 Utilities

- .1 Contact authorities or utility companies for assistance in locating and marking services passing under, through, overhead or adjacent to structure to be demolished. Such services include:
 - .1 Electrical power lines
 - .2 Communication cables
 - .3 Fibre optic cables
 - .4 Water lines.
 - .5 Drainage piping (storm and sanitary).
- .2 Before disconnecting, removing, plugging or abandoning any existing utilities serving the building:
 - .1 Notify the Owner, applicable utility companies, and local authorities having jurisdiction.
 - .2 Cut off and cap utilities at the mains on the property or in the street as required by the Owner and responsible utility company. Maintain fire protection to the existing buildings at all times.
 - .3 Remove, cut off and plug, or cap all utilities within the existing building areas to be demolished, except those designated to remain

3.3 Protection

- .1 Erect and maintain temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Maintain such areas free of snow, ice, water and debris. Lighting levels shall be equal to that prior to erection.
- .2 Provide safe access and egress from working areas using entrances, hallways, stairways or ladder runs, protected to safeguard personnel using them from falling debris.
- .3 Do not interfere with use and activities of buildings and site. Maintain free and safe passage to and from buildings.

- .4 Where demolition operations prevent normal access to adjacent properties, provide and maintain suitable alternative access.
- .5 Provide flagmen where necessary or appropriate, to provide effective and safe access to site to vehicular traffic and protection to Owner's personnel. Refer to Division 1 for safety requirements.
- .6 Ensure that all necessary controls are in place at the beginning of each work period which will prevent the spread of contaminated material beyond the work area limits. Stop work immediately if there exists any possibility of the spread of contaminated materials.
- .7 Keep dust from entering existing facilities and areas of building not affected by the Work. Comply with Ministry of Health requirements regarding debris control.
- .8 Ensure scaffolds, ladders, equipment and other such equipment are not accessible to public. Protect with adequate fencing or remove and dismantle at end of each day or when no longer required.
- .9 Take precautions to guard against movement, settlement or collapse of adjacent structures or services. Be liable for such movement, settlement or collapse caused by failure to take necessary precautions. Repair promptly such damage when ordered.
- .10 If Owner considers additional bracing and shoring necessary to safeguard and prevent such movement or settlement, install bracing or shoring upon Owner's orders.
- .11 Particular attention shall be paid to prevention of fire and elimination of fire hazards which would endanger new work or existing premises.
- .12 Protect existing adjacent work against damages which might occur from falling debris or other causes due to work of this Section.
- .13 At all times protect the structure from overloading.
- .14 Provide protection around floor and/or roof openings.
- .15 Protect from weather, parts of adjoining structures not previously exposed.
- .16 Protect interiors of building parts not to be demolished from exterior elements at all times.

- .17 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling.

3.4 Preparation

- .1 Before commencing demolition, verify that existing water, gas, electrical and other services in areas being demolished are cut off, capped diverted or removed as required. Post warning signs on electrical lines and equipment which must remain energized to serve adjacent areas during period of demolition.
- .2 Conduct demolition operations and remove materials from demolition to ensure minimum interference with roads, streets, walks, and other adjacent occupied and utilized facilities.
- .3 Do not close or obstruct streets, walks, or other adjacent occupied or utilized facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

3.5 Temporary Ventilation

- .1 Provide all required temporary ventilation for demolition work.

3.6 Environmental Controls

- .1 Comply with provincial and municipal regulations pertaining to water, air, solid waste, recycling, chemical waste, sanitary waste, sediment and noise pollution.
- .2 Protection of Natural Resources:
 - .1 Preserve the natural resources.
 - .2 Confine demolition activities to areas defined by public roads, easements, and work area limits indicated on the drawings.
 - .3 Water Resources: Comply with applicable regulations concerning the direct or indirect discharge of pollutants to underground and natural surface waters. Provide sedimentation control where necessary.
 - .4 Store and service construction equipment at areas designated for collection of oil wastes.
 - .5 Oily Substances: Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water in such quantities as to affect normal use, aesthetics, or produce a measurable ecological impact on the area.

- .3 Dust Control, Air Pollution, and Odour Control: Prevent creation of dust, air pollution and odors.
 - .1 Use temporary enclosures and other appropriate methods to limit dust and dirt rising and scattering in air to lowest practical level.
 - .2 Store volatile liquids, including fuels and solvents, in closed containers.
 - .3 Properly maintain equipment to reduce gaseous pollutant emissions.
- .4 Noise Control: Perform demolition operations to minimize noise.
 - .1 Provide equipment, sound deadening devices, and take noise abatement measures that are necessary to comply with municipal regulations.
- .5 Salvage, Re-Use, and Recycling Procedures:
 - .1 Identify re-use, salvage, and recycling facilities.
 - .2 Develop and implement procedures to re-use, salvage, and recycle demolition materials.
 - .3 Identify materials that are feasible for salvage, determine requirements for site storage, and transportation of materials to a salvage facility.
 - .4 Source-separate clean and uncontaminated demolition materials including, but not limited to the following types:
 - .1 Concrete, Concrete Block, Concrete Masonry Units (CMU).
 - .2 Metal (ferrous and non-ferrous).
 - .3 Wood.
 - .4 Glass.
 - .5 Plastics and Insulation.
 - .6 Gypsum Board.
 - .7 Porcelain Plumbing Fixtures.
 - .8 Fluorescent Light Tubes.
 - .9 Paper: Bond, Newsprint, Cardboard, Paper, Packaging Materials.
 - .10 Other materials as appropriate.

3.7 Performance

- .1 Ensure demolition work is supervised by competent foreman at all times.
- .2 Demolition shall proceed safely in systematic manner. Work on each floor level shall be complete before commencing work on supporting structure and safety of its supports are impaired. Parts of building which would otherwise collapse prematurely shall be securely shored. Walls and piers shall not be undermined.
- .3 Until acceptance, maintain and preserve active utilities traversing premises.

- .4 Maintain safety of site by shoring below-grade-structures and excavations resulting from demolition against collapse.

3.8 Demolition

- .1 Review demolition procedures to ensure no personnel or equipment are located or working without additional safe working platforms or working surface adequate to support the operations.
- .2 Any damage caused to the adjacent buildings or properties by the neglect of the Contractor or any of his forces shall be made good at the expense of the Contractor including all costs and charges which may be claimed by the Owner for damages suffered.
- .3 Demolish in a manner to minimize dusting. Keep dusty materials wetted at all times.
- .4 Prevent movement, settlement or damage of adjacent structures, services, adjacent grades, and existing building to remain. Make good damage caused by demolition.
- .5 Demolition: Use methods required to complete Work within limitations of governing regulations and as follows:
 - .1 Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - .2 Demolish concrete and masonry in sizes that will be suitable for acceptance at recycling or disposal facilities.
 - .3 Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - .4 Sawcut, break up and remove concrete slabs on grade in small sizes, suitable for acceptance at recycling or disposal facilities, unless otherwise shown to remain.
 - .5 Complete sawcutting, removal and disposal of refrigerated rink slab and apron slabs and rink refrigeration piping in accordance with regulatory requirements.
 - .6 Remove all disconnected, abandoned utilities.
 - .7 Clean all surfaces effected by the new scope of work including cleaning of header trench of dirt and debris.
 - .8 Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.9 Selective Demolition

- .1 Carefully dismantle and remove all items in as shown and as necessary to complete the work.
- .2 Salvage items scheduled for reuse or to be handed over to the Owner.
- .3 Particular attention shall be paid to prevention of fire and elimination of fire hazards which would endanger the existing buildings.
- .4 Erect and maintain dustproof and weatherproof partitions as required to prevent spread of dust, fumes and smoke to other parts of building. Maintain fire exits. On completion, remove partitions and make good surfaces to match adjacent surfaces of building.
- .5 Where existing flooring is to be removed from floor slabs to remain, including vinyl composite and rubber flooring, carefully remove flooring, adhesives, waterproofing membranes and the like down to the base slab. Patch and repair slab where damaged with concrete or acceptable leveling compound in accordance with new flooring manufacturer's instructions, TTMAC standards and ASTM F710-11.
- .6 Return areas to condition existing prior to the start of the work unless indicated otherwise.

3.10 Handling of Demolished Materials

- .1 Conform to the approved Waste Management Plan.
- .2 Do not allow demolished materials to accumulate or be stored on-site for more than 5 days.
- .3 Do not burn, bury or otherwise dispose of rubbish and waste materials on project site.
- .4 Pallet and shrink-wrap materials scheduled for re-use and stockpile where directed on site.
- .5 Disposal: Transport demolished materials off Owner's property and legally reuse, salvage, recycle, or dispose of materials. Legally transport and dispose of materials that cannot be delivered to a source separated or mixed recycling

facility to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.

- .6 Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.

3.11 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Clean adjacent streets and driveways of dust, dirt and materials caused by demolition operations.
- .3 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work.
- .4 Upon completion of demolition work, remove debris, trim surfaces and leave work site clean.
- .5 Video storm and sanitary sewers and jet clean where debris may have accumulated.

End of Section

Part 1: General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 20 00 Concrete Reinforcing
- .2 Section 03 30 00 Cast-in-Place Concrete
- .3 Section 31 23 10 Excavating, Trenching and Backfilling

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM D1751-04(2013)e1 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - .2 ASTM D1752-04a(2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
- .2 American Concrete Institute (ACI)
 - .1 ACI 117-10, Standard Specifications for Tolerances for Concrete Construction and Materials.
 - .2 ACI 347R-14 Guide to Formwork for Concrete
- .3 Canadian Standards Association (CSA)
 - .1 CSA A23.1-14/A23.2-14 Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
 - .2 CAN/CSA S269.3-M92 (R2013) Concrete Formwork.
 - .3 CSA O86-14 Engineering Design in Wood

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings showing type, extent and locations of items to be built into concrete.
 - .2 Sleeving Drawings: Submit drawings showing sleeves required through floors, roof and other structural members.
 - .3 Submit drawings showing size and spacing of conduits and piping, if requested by Consultant.
 - .4 Coordinate with other Divisions prior to submittal.

- .5 Prior to submission to Consultant, review all submitted drawings. By this review, Contractor represents to have determined and verified field measurements, site conditions, materials, catalogue number and similar data and to have checked and coordinated each drawing with the requirements of Work and of Contract Documents. Contractor's review of each drawing shall be indicated by stamp, date and signature of a responsible person.
 - .6 At time of submission, notify Consultant in writing of any deviations in drawings from requirements of Contract Documents.
 - .7 Consultant will review and return submitted drawings in accordance with an agreed schedule. Consultant's review will be for conformity to design concept and for general arrangement, and shall not relieve Contractor of responsibility for errors or omissions in submitted drawings or of responsibility for meeting requirements of Contract Documents.
 - .8 Make any changes in submitted drawings which Consultant may require, consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, notify Consultant in writing of any revisions other than those requested by Consultant.
 - .9 Do not commence placing sleeves, conduits, or piping before drawings have been reviewed and Consultant's comments incorporated on drawings issued to site.
 - .10 Assume responsibility for accuracy of Work. Review of submitted shop drawings does not relieve Contractor from compliance with requirements of Contract Documents.
- .3 Submit shop drawings as follows:
- .1 4 copies for review before any Work commences.
 - .2 1 additional copy for distribution as directed by Consultant.
 - .3 1 copy to Inspection and Testing Company.
- .4 Required by Regulatory Agencies: Submit shop drawings bearing signature and seal of Professional Engineer responsible for formwork design, as may be required by regulatory Agencies. Proceed with construction of formwork only with their approval.
- 1.5 Requirements of Regulatory Agencies
- .1 Conform to local and provincial regulations, including construction safety regulations.
- 1.6 Quality Assurance
- .1 Obtain a copy of CSA-A23.1-09 and maintain on site

- .2 Design of Formwork: Assume full responsibility for complete structural design and construction of formwork in accordance with CAN/CSA S269.3-M92 (R2008) and CAN/CSA O86.1-94, Engineering Design in Wood (Limit States Design) as applicable.

1.7 Shipping, Handling and Storage

- .1 Refer to Section 01 16 00 – Common Product Requirements.
- .2 Protect formwork to prevent functional damage and damage to faces affecting appearance of concrete surfaces exposed to view.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 11 – Cleaning.

Part 2 Products

2.1 Materials

- .1 All materials shall be new, in accordance with referenced standards.
- .2 Plywood: Douglas Fir, conforming to CSA O121-08. Sound undamaged sheets finished one side, fabricated especially for use as concrete form panels, with sealed edges. Minimum 11/16" thickness.
- .3 Lumber: Conforming to CSA O141-05 (R2009), with grade stamp clearly visible.
- .4 Chamfers: Cut from $\frac{3}{4}$ " x $\frac{3}{4}$ " wood, smooth with no open defects.
- .5 Form Ties: snap ties, with spreader washer and 1" break back.
- .6 Joint Tape: non-staining, water impermeable, self-release.
- .7 Nails, Spikes and Staples: Galvanized, conforming to CSA B111-1974 (R2003).
- .8 Form Release Agent: Colourless mineral oil which will not stain concrete.
- .9 For concrete surfaces exposed to view, provide panels smooth and free of defects which would be reproduced as concrete blemishes.

Part 3 Execution

3.1 Examination

- .1 Before starting this work, examine work done by others which affects this work.
- .2 Notify the Consultant of any conditions which would prevent proper completion of this work.
- .3 Commencement of work implies acceptance of existing conditions.

3.2 Erection

- .1 Verify lines, levels and centres before proceeding with formwork. Ensure dimensions agree with drawings.
- .2 Align joints and make watertight, to prevent leakage of cement paste and disfiguration of concrete.
- .3 Construct formwork to produce concrete with dimensions, lines and levels within tolerances specified in ACI 347R-14.
- .4 Provide formed openings where required for pipes, conduits, sleeves and other work to be embedded in and passing through concrete members.
- .5 Install chamfers at all external corners exposed to view.
- .6 Bed mud sills on sand, gravel or crushed stone placed on unfrozen, dry, solid and stable subgrade.
- .7 Adequately brace and shore formwork to sustain loads (both concrete and working loads) applied during construction.
- .8 Be responsible for safety of the structure both before and after the removal of forms, until the concrete has reached its specified 28 day strength.

3.3 Built-In Work

- .1 Form openings and build in anchors, inserts, sub-frames, key-ways, sleeves, miscellaneous metal items, reglets and similar items furnished under Work of other Sections, which are indicated on Drawings and on shop drawings of other trades, and as required for proper completion of Work.
- .2 Do not embed wood in concrete.

- .3 Anchor Bolts: Tie anchor bolts securely in position to prevent movement during concrete placing. Use template to locate bolts. Verify that bolts have specified projection above concrete.
- .4 Openings or Sleeves Not Shown on Structural Drawings:
 - .1 Obtain Consultant's written approval before forming openings of sleeves through columns and beams, or through slabs within 6'-0" of their supports.
 - .2 Obtain Consultant's written approval before forming openings or sleeves larger than 8" square in any location.
- .5 Embedded Pipe or Conduit not Shown or Detailed on Structural Drawings:
 - .1 Obtain Consultant's written approval before placing conduit or pipe which would be embedded in finished structure.

3.4 Construction Joints

- .1 Form construction and expansion joints with bulkheads to ensure straight lines. Immediately before subsequent pour at construction joint, remove bulkhead and tighten forms so that concrete surfaces will be on same plane with no overlapping of concrete.
- .2 Review with Consultant proposed location and details of construction joints in walls, columns, beams and slabs.
 - .1 Construction joints shall present appearance of normal form panel joint.
 - .2 Install continuous shear key in construction joints in walls which are 6" or more thick.
 - .3 Provide vertical construction joints in walls at not more than 60'-0" centre to centre.

3.5 Treatment of Formwork Surfaces

- .1 Form Release Agent:
 - .1 Coat formwork with form release agent before reinforcement, anchors, accessories, and other built in items are installed.
 - .2 Do not coat plywood forms pre-treated with release agent.
 - .3 On surfaces to receive finish materials, adhesives, sealers, paint or other coatings or materials, use a compatible release agent.

3.6 Stripping of Formwork

- .1 Strip formwork on vertical surfaces when concrete has hardened sufficiently that no damage will result from stripping operations.
- .2 Do not remove plywood formwork by jerking loose or by metal pinch bars. Use

wood wedges and gradually force panels loose. Leave plywood forms in place as long as possible to permit maximum shrinkage away from concrete.

- .3 Take particular care not to damage external corners when stripping formwork.
- .4 When forms are stripped during curing period, cure and protect exposed concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete.

3.7 Defective Work

- .1 Movement and displacement of formwork during construction, variations in excess of specified tolerances, marked and disfigured surfaces, and failure of materials or workmanship to meet requirements of this specification, and which cannot be repaired by approved methods, will be considered defective work.
- .2 Replace defective work, as directed by Consultant.
- .3 Pay for additional inspection and testing, redesign, corrective measures, and related expenses, if work has proven to be deficient.
- .4 Reconstruct defective formwork and replace concrete and reinforcement placed in defective formwork at no additional cost.

3.8 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 30 00 Cast-in-Place Concrete
- .3 Section 13 18 30 Ice Rink Piping
- .4 Section 31 23 10 Excavating, Trenching and Backfilling

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A143/A143M-07(2014) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
 - .2 ASTM A1064/A1064M-15 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - .3 ASTM A775/A775M-07b(2014) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
- .2 American Concrete Institute (ACI)
 - .1 ACI SP-66 (04) ACI Detailing Manual.
- .3 Canadian Standards Association (CSA)
 - .1 CSA A23.1-14/A23.2-14 Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
 - .2 CSA A23.3-14, Design of Concrete Structures.
 - .3 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20-13/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186-M1990 (R2012) Welding of Reinforcing Bars in Reinforced Concrete Construction
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC Reinforcing Steel Manual of Standard Practice.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings, including placing drawings and bar lists.

- .2 Prepare placing drawings and bar lists in accordance with the American Concrete Institute (ACI) Detailing Manual, the Reinforcing Steel Institute of Canada (RSIC) Reinforcing Steel Manual of Standard Practice and the typical details included with Contract Documents.
 - .3 Prepare placing drawings to minimum scale of 1:50.
 - .4 Submit placing drawings and bar lists sufficiently detailed and dimensioned to permit correct placement of reinforcement and accessories without reference to architectural or structural Drawings.
 - .5 Show reinforcement, including dowels, in elevation on placing drawings for concrete and wall reinforcement.
 - .6 Show concrete cover to reinforcement.
 - .7 Show location of construction joints.
 - .8 Prior to submission to Consultant, review all shop drawings. By this review, Contractor represents to have determined and verified field measurements, site conditions, materials, catalogue number and similar data and to have checked and coordinated each shop drawing with the requirements of Work and Contract Documents.
 - .9 Contractor's review of each shop drawing shall be indicated by stamp, date, and signature of a responsible person.
 - .10 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.
 - .11 Consultant will review and return shop drawings in accordance with an agreed schedule. Consultant's review will be for conformity to design concept and for general arrangement, and shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of Contract Documents.
 - .12 Make any changes in shop drawings which Consultant may require consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, notify Consultant in writing of any revisions other than those requested by Consultant.
 - .13 Do not commence fabrication of reinforcement before drawings have been reviewed and Consultant's comments incorporated on drawings issued to fabricating shop.
 - .14 In addition to the requirements of Section 01 33 00, submit one copy of reviewed shop drawings to the Inspection and Testing Company.
- .3 Samples: Submit sample of reinforcing chair supports for rink slab reinforcing.
- .4 Inspection Reports: Inspection and Testing Company shall submit and distribute inspection reports as follows:
- .1 2 copies to Consultant.
 - .2 1 copy to Contractor.

.5 Quality Assurance Submittals:

- .1 Mill Test Report: upon request, provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request submit in writing to Consultant proposed source of reinforcement material to be supplied.

1.5 Quality Assurance

- .1 Obtain a copy of CSA A23.1-09, and maintain on site.
- .2 Qualifications:
 - .1 Welding: Undertake welding of reinforcement only by a fabricator or Subcontractor approved by Canadian Welding Bureau to requirements of CSA Standard W186.
- .3 Source Quality Control:
 - .1 Source Quality Control may be performed by an Inspection and Testing Company appointed by Consultant.
- .4 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.
- .5 Identify and correlate reinforcing steel from Canadian mills with test reports for compliance with requirements specified.
- .6 Test unidentified reinforcing steel at expense of Contractor. Perform testing for each 1 tonne or part thereof supplied for incorporation in Work.
- .7 Payment for specified Work performed by Inspection and Testing Company will be made from a Cash Allowance specified in the Instructions to Bidders.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 16 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.7 Waste Management and Disposal

- .1 Refer to Section 01 74 10 – Cleaning.

Part 2 Products

2.1 Materials

- .1 In accordance with reference standards.
- .2 Substitute different size bars only if permitted in writing by Consultant.
- .3 Bar Reinforcing Steel:
 - .1 Bars which are to be welded by arc-welding process: to CSA-G30.18 Grade 400W.
 - .2 Other bars: to CSA-G30.18 Grade 400R.
- .4 Plain round bars: to CSA G40.20-04/G40.21-04 (R2009).
- .5 Welded Wire Fabric: to ASTM A1064/A1064M-15 and in flat sheets, not rolls. Use only 4" WWM at rink slabs as indicated on drawings. 6" mesh is not acceptable.
- .6 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M-15. Tire wires for rink piping to chairs shall be coloured epoxy coated.
- .7 Chairs, Bolsters, Bar Supports and Spacers: to CSA A23.1-09.
 - .1 M-Type top loading reinforcing support chairs are acceptable at the ice rink slab to support rink slab piping and reinforcing steel provided that the tying of the mesh is completed at increased intervals acceptable to the Owner and Consultant to prevent movement of the chair racks during pours. Rink support chairs are specified in Section 13 18 30.
 - .2 Pipe/Rebar Chairs shall space the cooling rink floor piping on 100 mm centres and shall be placed in rows on 610 mm centres down the length of the rink. Overlap chairs by one (1) pipe at the end of each chair.
 - .3 Minimum 400 mm unsupported pipe length at return bends.
- .8 Mechanical splices: subject to approval of Consultant.

2.2 Fabrication

- .1 Fabricate reinforcing steel only in permanent fabricating shop unless otherwise approved by Consultant.
- .2 Fabricate reinforcing steel in accordance with shop drawings.

- .3 Tag reinforcing bars to indicate placement as designated on shop drawings.
- .4 Splices:
 - .1 Provide splices only where specifically indicated on Drawings.
 - .2 Stagger alternate mechanical splices 30" apart.
 - .3 Stagger alternate end bearing splices 30" apart.
 - .4 Install on threaded splices, plastic internal coupler thread protector and plastic bar end thread protector.

Part 3 Execution

3.1 Examination

- .1 Before starting this work, examine work done by others which effects this work.
- .2 Examine formwork to verify that it has been completed, and adequately braced in place.
- .3 Notify the Consultant of any conditions which would prejudice proper completion of this work.
- .4 Commencement of work implies acceptance of existing conditions.

3.2 Installation

- .1 Place reinforcing steel and welded wire fabric in accordance with reviewed placing drawings, typical details, and CSA A23.3.
- .2 Reinforcing for rink slab: Coordinate placement of rink slab reinforcing with all other applicable sections of the work. Refer to Section 13 18 30 – Ice Rink Piping. Install to meet tolerances required. Do not damage or displace sub-slab insulation during placement of reinforcing.
- .3 Welded wire mesh at rink slab shall be terminated 1" from face of apron slab insulation and be cut to fit around dasherboard inserts.
- .4 Adequately support reinforcing and secure against displacement within tolerances permitted.
- .5 Place reinforcing steel to provide concrete cover as noted on drawings.
- .6 Do not cut reinforcement to incorporate other Work.
- .7 Relocate or rebend bars only on written instructions of Consultant.

- .8 Tie reinforcement in place. Do not weld. Ties for wire mesh must be tied to both the top of the pipe chairs and lower mat of steel to not exceed 410mm c/c. Additional ties shall be added to areas where mesh laps occur.
- .9 Cut away mesh laps to not create more than two (2) stacked mesh laps at any time to avoid encroaching into the clear cover.

3.3 Adjusting and Cleaning

- .1 Adjust and secure reinforcement in correct position immediately before concrete is placed.
- .2 Remove contaminants which lessen bond between concrete and reinforcement.

3.4 Field Quality Control

- .1 Provide competent supervisor, with at least three years of experience in reinforcement placement, to direct placement of reinforcement.
- .2 Inspect placement of reinforcement for conformance with Drawings and Specifications, before each concrete placement, and correct as necessary.
- .3 Consultant's periodic review of selected areas of reinforcement are for verification of conformity to design concept and general arrangement only, and shall not relieve Contractor of responsibility for quality control, errors, or omissions, or conformance with requirements of Contract Documents.

3.5 Defective Work

- .1 Replace or adjust defective reinforcement before concrete is placed as directed by Consultant.
- .2 Replace or strengthen concrete work which is deficient as a result of incorrectly fabricated, misplaced, or omitted reinforcement, which was not corrected before concrete was placed.
- .3 Pay for additional inspection and testing, redesign, corrective measures, and related expenses, if Work has proven to be deficient.

3.6 Cleaning

- .1 Proceed in accordance with Section 01 74 10 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 03 30 00 Cast-in-Place Concrete
- .4 Section 07 21 13 Building Insulation
- .5 Section 07 26 00 Vapour Retarders
- .6 Section 31 23 10 Excavating, Trenching and Backfilling

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C150/C150M-15 Standard Specification for Portland Cement
 - .2 ASTM C260/C260M-10a Standard Specification for Air Entraining Admixtures for Concrete
 - .3 ASTM C309-11 Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
 - .4 ASTM C330/C330M-14 Standard Specification for Lightweight Aggregates for Structural Concrete
 - .5 ASTM C494/C494M-15a Standard Specification for Chemical Admixtures for Concrete
 - .6 ASTM C881/C881M-14 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
 - .7 ASTM C1017/C1017M-13e1 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
 - .8 ASTM C1107/C1107M-14a Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
 - .9 ASTM D412-06a(2013) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
 - .10 ASTM D624-00(2012) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - .11 ASTM D1751-04(2013)e1 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - .12 ASTM D1752-04a(2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

- .13 ASTM D2240-05(2010) Standard Test Method for Rubber Property - Durometer Hardness
- .14 ASTM E1486-14 Standard Test Method for Determining Floor Tolerances Using Waviness, Wheel Path and Levelness Criteria
- .2 American Concrete Institute (ACI)
 - .1 ACI 117-10, Standard Specifications for Tolerances for Concrete Construction and Materials.
 - .2 ACI 232.1R-12, Use of Raw or Processed Natural Pozzolans in Concrete
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A3000-13 Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014)
 - .2 CSA A23.1-14 -14 Concrete Materials and Methods of Concrete Construction
 - .3 CSA A23.2-14 Test Methods and Standard Practices for Concrete.
 - .4 CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1212, Material Specification for Hot-Poured Rubberized Asphalt Joint Sealing Compound.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Samples: Submit for inspection, material samples of specified mix designs
- .3 Concrete Mix Designs:
 - .1 Submit concrete mix designs for review; when optimum bulk density of aggregates is specified, provide supporting evidence of compliance with requirements.
 - .2 Review of mix design does not relieve Contractor from responsibility for compliance with Contract Documents.
- .4 Inspection Reports:
 - .1 Inspection and Testing Company shall prepare and distribute written reports of inspections and tests as follows:
 - .1 2 copies to Consultant
 - .2 1 copy to Contractor
 - .2 On concrete cylinder test reports, include:
 - .1 Specific location of concrete represented by sample
 - .2 Design strength
 - .3 Unit weight of sample
 - .4 Class of exposure
 - .5 Aggregate size and mixtures incorporated

- .6 Date, hour and temperature at time sample taken
 - .7 Percentage air content
 - .8 Test strength of cylinder
 - .9 Type of failure if test fails to meet specification.
- .5 Joint Location Drawings: Submit drawings showing proposed locations of control joints in slab-on-grade, where not shown on Drawings.

1.5 Quality Assurance

- .1 Concrete supplier to have a valid "Certificate of Ready Mixed Concrete Production Facilities" as issued by the Ready Mixed Concrete Association of Ontario.
- .2 Source Quality Control:
 - .1 Both source quality control, and field quality control specified in Article 1.04 B., may be performed by an Inspection and Testing Company appointed by Consultant.
 - .2 Review provided by Inspection and Testing Company does not relieve the Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.
 - .3 Inspection and Testing Company shall be certified under CSA A283-06 (R2011), Qualification Code for Concrete Testing Laboratories, for Category 1 Certification.
 - .4 Payment for specified Work performed by Inspection and Testing Company will be made from Cash Allowance.
 - .5 Payment for additional tests (including testing of structure and its performance and load testing) required by changes of materials or mix design requested by Contractor, and failure of completed Work to meet specified requirements, shall be made at Contractor's expense.
 - .6 Perform Work of source quality control in accordance with CSA A23.2-14 and to include:
 - .1 Verification that ready-mix supplier is qualified to supply concrete in accordance with Specification.
 - .2 Review of proposed concrete mix designs.
 - .3 Sampling, inspection, and testing of materials as may be required.
- .3 Field Quality Control:
 - .1 Inspection and Testing Company, when appointed as specified for Source Quality Control in Article 1.04 A, shall perform sampling, inspection and testing of concrete work at site.

-
- .2 Perform sampling, inspection and testing in accordance with CSA A23.2-14, and to include:
 - .1 Making of standard slump tests.
 - .2 Obtaining of three standard specimens for strength tests from each 100 m³ of concrete, or fraction thereof, of each mix design of concrete placed in any one day. In addition, for slabs-on-grade, obtain beam specimens for determination of modulus of rupture.
 - .3 Verification that test specimens are stored within an enclosure, maintained at specified temperatures.
 - .4 Making compression tests of each set of three specimens, one at 7 days and two at 28 days; modulus of rupture tests at 90 days.
 - .3 Inspection for Tolerances:
 - .1 Confirm that concrete work meets specified tolerance requirements.
 - .2 Use the elevation survey records of elevations of soffit form surfaces and finished concrete surfaces specified in Section 03 10 00 and this section as basis for judging compliance.
 - .3 Use approved aluminum straightedge to judge compliance with specified slab tolerances, except use dipstick equipment where F-number tolerance is specified
 - .4 Slabs-on-Grade:
 - .1 Observe application of curing compound to sample slab, recording rate of application.
 - .2 Monitor on a random basis acceptable to the Consultant, that slab is being saw cut before slab temperature starts to fall.
 - .4 Single source floor assembly: The following work shall be carried out by a single competent source, to be responsible to provide the complete concrete floor assembly as specified herein including the supply and installation of concrete materials and all workmanship. The following specialty work shall be performed using the single source approach:
 - .1 Ice rink slabs.
 - .2 Bonded concrete toppings/sealers.
 - .5 Qualifications: Floor finishing shall be undertaken only by contractors with at least 10 years of experience finishing Class "B", "C" and "D" floors. Concrete finishing contractor to have a minimum of 10 years of experience in ice rink construction.
 - .6 Sample of Finish Flooring:
 - .1 Finish an area of floor slab where directed by Consultant to provide sample of finish and colour for approval.
 - .2 Protect new sample area until finish is approved.

- .3 If liquid membrane curing compound is to be used on Project, determine and apply correct quantity required to meet rate of coverage recommended by manufacturer for measured test area.
- .4 Approved sample will provide standard by which subsequent finishing will be judged and will be incorporated into Work.
- .7 Pre-Construction Conference:
 - .1 At least 35 days prior to the start of concrete construction schedule, conduct a meeting to review proposed mix designs and to discuss detailed requirements of the proposed concrete operations. Review requirements for submittals, coordination, and availability of materials. Establish work progress and sequencing schedules and procedures for material testing, inspection and certifications.
 - .2 Arrange a rink slab pre-installation conference with the Owner, Consultant, Structural Engineer, General Contractor, reinforcing installer, floor finishing contractor, concrete supplier, manufacturer of admixture products, refrigeration contractor, and independent testing agency, to establish correct procedures and methods for placing concrete rink slabs. The meeting will be held within seven days prior to the start of placement of the underslab sand layer.

1.6 Tolerances

- .1 In accordance with ACI 117 and CAN/CSA A23.1-14, Article 22, Table 19.
- .2 F Number surface tolerances shall be made in accordance with CSA A23.1-14 and shall be measured within 72 hours of each floor placement.
- .3 Difference between elevation of high point and low point in specified area not to exceed:
 - .1 In any bay up to 100 m²: 12 mm.
 - .2 In any bay up to 400 m²: 25 mm.
- .4 Straightedge method: Finish floor slabs to meet following tolerances when measured at 72 +/- 12 hours after completion of floor finishing, before shores are removed from formed slabs, by placing a freestanding unlevelled straight edge anywhere on slab and allowing it to rest on two high points. Gap between straightedge placed on two high points and slab not to exceed:
 - .1 3 metre straightedge: 8 mm (Class A).
 - .2 2 metre straightedge: 4 mm.

- .5 Acceptable tolerances for flatness of rink slab shall be as defined in CSA-A23.1-14, for a Class "C" floor finishing tolerance classification of F-number system, in accordance with CAN/CSA-A23.1-14, clause 22.1.3 and table 19. Alternatively, a maximum depression of 3 mm along a 3-metre straightedge, with an overall maximum elevation variance of ± 5 mm from design elevation can be utilized. The Contractor will be required to grind all high areas of concrete as necessary to achieve these tolerances and will not be allowed to fill low areas.

1.7 Project Records

- .1 Maintain record of all concrete pour related to time, date, delivery slip serial number and location of each concrete pour and identify related test cylinders. Keep records on site until project is completed.
- .2 Delivery Records: File duplicate copies of concrete delivery slips on which shall be recorded: supplier, serial number of slip, date, truck number, contractor, Project, Class of exposure, cementing materials content, air content, volume in load, and time of first mixing of aggregate, cementing materials and water.
- .3 Record Drawings:
 - .1 Record on a set of Drawings:
 - .1 time and date of each pour
 - .2 high and low ambient air temperatures during each pour
 - .3 date of removal of forms in each area
 - .4 founding elevations of all footings
 - .5 variations of foundation Work from that indicated on Drawings
 - .2 Make record drawings available for Consultant's inspection at all times.

1.8 Job Conditions

- .1 Protect floor slabs, and concrete surfaces exposed to view or on which finishes are to be applied, from grease, oil, and other soil which will affect the appearance of the concrete, or impair the bond of finish material.
- .2 Environmental Conditions: In addition to Cold Weather and Hot Weather Requirements of CSA Standard A23.1-14, the following shall apply to Work of this Section:
 - .1 Provide protection or heat, or both, so that temperature of concrete at surfaces is maintained at not less than 21°C for three days after placing, not less than 10°C for the next two days and above freezing for the next two days and above freezing for the next two days.
 - .2 Do not permit alternate freezing and thawing for fourteen days after placing.

- .3 Vent exhaust gases from combustion type heaters to atmosphere outside protection enclosures.
- .4 Provide protection to maintain concrete continuously moist during curing period.
- .5 For field cured cylinders representing strength development of in-situ concrete, provide same specified hot and cold weather protection for storage of each concrete compression specimen as for concrete from which it was taken, until it is sent to testing laboratory.
- .6 Do not place concrete when it is raining. Should rain commence during placing, cover freshly placed concrete.
- .7 Do not place bonded toppings on rough slabs that are less than 15°C.
- .8 Do not grout at ambient air temperatures or concrete surface temperatures less than 5°C, or when temperature is forecast to fall to less than 5°C within 24 hours of grouting.
- .9 Do not apply sealants at ambient air temperatures or concrete surface temperatures less than 5°C.

1.9 Shipping, Handling and Storage

- .1 Refer to Section 01 16 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.10 Waste Management and Disposal

- .1 Refer to Section 01 74 10 – Cleaning.

Part 2 Products

2.1 Materials

- .1 To meet specified requirements of referenced Standards.
- .2 Cement:
 - .1 Portland Cement: to ASTM C150/C150M-15
 - .2 Cementitious Hydraulic Slag: to ACI 232.1R-12
- .3 Fine Aggregate: For slabs-on-grade, fineness modulus of fine aggregate to be between 2.7 and 3.1.
- .4 Coarse Aggregates:
 - .1 20 mm to 5 mm (No. 4 sieve) except as specified below.

-
- .2 For slabs-on-grade 5" and thicker: 40 mm to 5 mm (No. 4 sieve); combine at least two of the single sizes specified in Table 11 Group II of CSA Standard A23.1-14, one of which is to be 40 mm, to obtain maximum bulk density (unit weight) and optimum grading, in accordance with an approved procedure.
 - .3 For slabs-on-grade: Abrasion loss not to exceed 35%. Petrographic number of aggregate not to exceed 125 when tested in accordance with ASTM C295, as conducted by Ministry of Transport of Ontario.
 - .4 For toppings 2" thick and less: 12 mm to 5 mm (No. 4 sieve).
 - .5 Admixtures:
 - .1 Conform to Reference Standards for chemical and air-entraining admixtures.
 - .2 Provide only admixtures that are free of chlorides.
 - .3 When requested, provide evidence acceptable to Consultant that superplasticizer does not increase shrinkage of concrete.
 - .6 Liquid Surface Densifier: The liquid surface densifier shall be the Ashford Formula or approved equivalent.
 - .7 Sealant:
 - .1 Hot-Poured Asphalt:
 - .1 For use with bituminous type joint filler: rubberized asphalt compound to OPSS 1212:
 - .1 Hi-Spec Hot Poured Joint Sealant, by W.R. Meadows of Canada Ltd.
 - .2 Sealz No. 6165 Hot Poured Joint Sealant, by Hydrotech Membrane Corporation.
 - .2 Cold Poured Liquid Neoprene: For use with non-bituminous joint filler:
 - .1 Gardox, by W.R. Meadows of Canada Limited.
 - .3 Elastomeric Sealant:
 - .1 For use with non-bituminous type joint filler.
 - .1 Two component polysulphides, or two component polyepoxide urethane, in colour selected by Consultant, to CGSB Specification CAN/CGSB-19.24.
 - .1 For horizontal joints: THC 900, by Tremco Ltd. or Eucolastic Pourable by Euclid Chemical Canada Inc.

2.2 Concrete Mixes

- .1 Ready Mix, with 28 day compressive strength as indicated on Drawings and in Specifications.
- .2 Design concrete mix in conformance with CSA Standard A23.1-14, Clause 4.1.2, Table 5 (Alternative 1) and Clause 4.1.1, Tables 1, 2 and 17, and as follows.
Provide concrete meeting water/cementing materials ratio and air content of Table

14 in accordance with Class of exposure specified in following sub-paragraphs, and minimum strength specified on Drawings. Note that concrete designed in accordance with water/cementing materials ratio of Table 14 may yield strength exceeding minimum strength specified on Drawings.

- .3 Concrete mix for rink slab shall conform to the following requirements:
 - .1 Use Cement Type 10. When mean daily temperature exceeds 18° C at time of placement, replace maximum 15% of Portland cement with cementitious hydraulic slag.
 - .2 Specified 28-day compressive strength: 30 Mpa
 - .3 Slump after addition of superplasticizer, at point of discharge: 180 mm ± 20 mm
 - .4 Maximum Aggregate Size: 14 mm
 - .5 Maximum water-to-cement ratio: 0.45
 - .6 Water Reducing Admixture: to ASTM C494/C494M
 - .7 Total Air Content: No entrained air, natural only
- .4 Submit evidence, and material samples, if requested, acceptable to the Inspection and Testing Company, to verify that the proposed concrete mix design will produce specified quality of concrete.
- .5 List all proposed admixtures in mix design submission. Do not change or add admixtures to approved design mixes without Consultants approval.
- .6 Concrete Weight: Air dry unit weight: minimum 2,300 kg/m³ adjusted proportionally for maximum air content listed in CSA A23.1-14 , Clause 4.1.1, Table 13.

2.3 Admixtures

- .1 Chemical Admixture: Incorporate water-reducing admixture, type WN, in all concrete.
- .2 Calcium Chloride: Do not use calcium chloride or admixtures containing chloride in concrete.

2.4 Premixed Grout

- .1 Non-Shrink Metallic: Non-catalyzed metallic grout to ASTM C1107/C1107M-11, Compressive strength at 28 days: 48 MPa.
- .2 Non-Shrink, Non Stain, Non-Metallic: to ASTM C1107/C1107M-1. Compressive strength at 28 days: 59 MPa.

- .3 Flowable Grout: High-tolerance Non-shrink, Non-metallic shrinkage compensating grout to ASTM C1107/C1107M-11. Compressive strength at 28 days: 59 MPa.

Part 3 Execution

3.1 Examination

- .1 Before starting this work, examine work done by others which effects this work.
- .2 Notify Consultant of any condition which would prejudice proper completion of this work.
- .3 Commencement of work implies acceptance of existing conditions.
- .4 Confirm that surfaces on which concrete is to be placed are free of frost and water before placing.
- .5 Confirm that reinforcement, dowels, control joints, inserts and all other built-in work are in place and secured.
- .6 Rink Slab: No concrete shall be placed until the Consultant, the Structural Engineer and the agency inspecting the refrigeration piping have been notified at least 24 hours before any concrete pour in order that respective work can be reviewed.

3.2 Preparation, Rink Slab

- .1 Place sand layer and insulation to a tolerance of 4.5 mm +/-
- .2 Be aware that variation in level of insulation will adversely affect the concrete cover over refrigeration piping and welded wire mesh, both of which are critical to the proper performance of the rink slab. Use laser levels to determine surface elevations while placing insulation and rink slab.
- .3 Submit to the Consultant, elevation survey of insulation surface and correct areas that do not meet specifications, before proceeding with rink slab. Refer to Section 07 21 13.

3.3 Treatment of Formed Surfaces

- .1 Conform to the requirements of CSA A23.1-14, Clauses 7.7.1 and 7.7.2 and as additionally specified herein.

- .2 Obtain Consultant's approval of finished exposed concrete and grind or otherwise correct to the satisfaction of the Consultant.

3.4 Inserts

- .1 Install inserts for goal posts and thermal sensors in accordance with Architectural Drawings, shop drawings and manufacturer's requirements. Final elevations of tops of inserts must be absolutely flush with finished slab elevation.

3.5 Placement of Concrete

- .1 Place concrete in accordance with requirements CAN/CSA-A23.1-14.
- .2 Notify Consultant and inspection and testing firm at least 24 hours prior to commencement of concrete placing operation and 24 hours before wall forms are closed in.
- .3 Do not place concrete in water or open frozen surfaces.
- .4 Remove contaminants which lessen concrete bond to reinforcement before concrete is placed.
- .5 Maintain accurate records of cast-in-place concrete items. Record date, location of pour, quantity, air temperature and test samples taken.
- .6 Ensure that reinforcement, inserts, embedded items, formed expansion joints and the like, are not disturbed during concrete placement.
- .7 Provide construction joint as indicated on the drawings. Ensure dowels are adequately anchored and placed at right angles to the joint before placing concrete.
- .8 Place floor slabs to depth indicated on the drawings with 30 MPa minimum concrete unless otherwise noted on drawings but consistent with minimum cement content specified for exposed floors in this specification
- .9 Sloping Surfaces and Slabs: commence concrete placement at bottom of sloping surfaces.
- .10 Obtain Geotechnical Consultant's confirmation that thickness, elevation and compaction of sub-grade meets specifications before placing concrete.

.11 Rink Floor Slab:

- .1 Notify Structural Engineer and Testing Agency a minimum of five days prior to placing concrete. Obtain Structural Engineer's review and written verification at least three days prior to placement of concrete. Commencement of concrete placement must not occur prior to confirmation and acceptance of refrigeration piping.
- .2 Place rink slab only after building has been closed and made watertight.
- .3 The apron slab is to be thoroughly cleaned prior to concrete pour to prevent contamination of the rink slab pour.
- .4 Concrete to be supplied from a single batching plant to ensure uniformity and consistency of the mix. A backup plant must be on standby during the pour. Maximum travel time to the site is not to exceed 1 hour.
- .5 Additional superplasticizer to be available on site during concrete placement to permit additional dosage as necessary. Any addition of this admixture to be by personnel qualified to do so.
- .6 Wire slab bars to special chairs designed to support refrigeration piping and reinforcement using epoxy coated coloured tie wire.
- .7 After reinforcing bars have been placed, provide removable sheets of plywood over the chairs to act as working platforms for trades placing piping and welded wire mesh reinforcement.
- .8 Welded wire mesh reinforcement must be tied to the tops of chairs.
- .9 Take special care not to walk on or exert any forces on piping.
- .10 Take special care to maintain specified cover to welded wire mesh. Tie wires down and do not allow them to encroach into cover. Reverse alternate rows of sheets of mesh, so that at laps there are three thicknesses of wire. At corners of sheets of mesh, cut out extra layers of overlapping mesh so that only two sheets overlap.
- .11 Verify that all piping has been pressure tested for leaks before commencing placement of concrete.
- .12 Ensure a constant pressure of a minimum of 40 p.s.i. is maintained in refrigeration pipes during the placing of the concrete, water is NOT to be recirculated. Refrigeration Contractor to be present during concrete placement. Refrigeration Contractor to immediately repair any damage caused to the rink piping during the placement of reinforcing steel and concrete.
- .13 Provide concrete mix for rink slab as specified under paragraph 2.2 Concrete Mixes. A representative of the concrete supplier must be present during the rink slab pour.
- .14 Placement of each rink slab shall be in one continuous pour to joints indicated on drawings. Contractor to make all necessary provisions with respect to material supply and labour capacity. Provide two concrete pumps at all times in event of equipment breakdown, to ensure continuous operation.
- .15 Pump concrete for rink slabs.

-
- .16 The grout or concrete used to prime concrete pumps cannot be placed in the rink slab; additionally, the first cubic metre of concrete likewise cannot be used in the rink slab. Contractor to make provisions for disposal or alternate location for these materials. The Consultant and Testing Agency will verify when placement can commence.
 - .17 Consider first concrete from first truck as trial. Deposit in location within building other than rink slab, or in trial slab in prepared area outside building. If slump at end of pump line does not meet specifications, adjust superplasticizer dosage at truck. Remove trial slab from building site on completion.
 - .18 Do not displace or damage reinforcing or piping during placement of concrete. Support concrete pump hose on tires, cut barrels, plywood or similar to protect piping.
 - .19 Refrigeration Contractor and reinforcing placers to be present during concrete placement to repair any areas of displacement or damage, without loss of continuity of concrete placement.
 - .20 Do not add water to concrete mix on site.
 - .21 Place concrete in strips running transversely across the rink in accordance with details on the drawings. Width of strips as required to suit screeding methods and specified tolerances.
 - .22 After placement, screed concrete and compact with a high-frequency vibratory screed. Further level and compact the slab with a rotary steel trowel, used in as appropriate for the tolerance and final finish as specified.
 - .23 Use mechanical screed and screed rails unless other methods have been pre-approved. Set screeds to ensure an even level surface.
 - .24 Vibrate concrete with small pencil vibrators. Do not over vibrate (over vibration may cause floatation of pipes). Provide at least two spare vibrators for use in the event of equipment breakdown.
 - .25 Vibrate concrete in a manner consistent with the congested reinforcing and piping layout to ensure adequate compaction of concrete. Use appropriate size and quantity of vibration equipment for proper execution of this work.
 - .26 Immediately prior to casting each new strip, re-vibrate edges of adjacent previous strip.
 - .27 Apply liquid concrete surface densifier after concrete has set, in accordance with the manufacturer's written instructions.
 - .28 Seal expansion joint with elastomeric flexible joint sealant (Sikaflex 2C EZ or approved equivalent).

3.6 Finishing Concrete

- .1 Perform finishing operations on plastic concrete surfaces in accordance with CSA Standard A23.1-14, Clause 7.5, and as specified herein.
- .2 Refer to the drawings for floor finishes.

-
- .3 Screed the top of rough floor slabs to an even level or sloping surface at the proper elevation to receive the finish specified on the drawings.
 - .4 Provide a smooth steel trowel finish on all areas scheduled to receive a covering, or painted finish, except recessed floor.
 - .5 Exposed Floor Surfaces: Provide hard, smooth, dense, steel trowelled surface, free from blemishes, and of uniform appearance.
 - .6 Curb Edging: Finish external corners of curbs rounded and smooth.
 - .7 Rink Slab Finishing:
 - .1 Finish concrete slab in a continuous operation under review of the Testing Agency. Use mechanical means to ensure a true and level slab, free of voids and cracks.
 - .2 Acceptable tolerances for flatness of rink slab shall be as defined in CSA-A23.1-14, for a Class "C" floor finishing tolerance classification of F-number system, in accordance with CAN/CSA-A23.1-14, clause 22.1.3 and table 19. Alternatively, a maximum depression of 3 mm along a 3-metre straightedge, with an overall maximum elevation variance of ± 5 mm from design elevation can be utilized. The Contractor will be required to grind all high areas of concrete as necessary to achieve these tolerances and will not be allowed to fill low areas.
 - .3 Final surface finish for ice slab shall consist of two passes of a machine steel trowel.
 - .4 Finish surface to hard dense steel trowel finish free from blemishes and of uniform appearance.

3.7 Curing and Sealing

- .1 Cure concrete in accordance with CSA Standard A23.1-14, Clause 7.4 and as specified herein.
- .2 Rink Slab:
 - .1 Refrigerated slab shall be wet cured continuously for a minimum period as indicated below. Immediately after completion of the floor finishing, commence curing as below.
 - .2 The entire floor area is to be covered with clean potable water. Water cover is to be accomplished by use of perimeter diking (e.g. sandbags) and ponding with 10 mm minimum depth of water. Maintain the ponding for a minimum period of seven days if the ambient temperature is above 10° C, and for a minimum of fourteen days if the average ambient temperature falls below 10° C. Alternate curing methods to the described wet curing are not acceptable.

- .3 Lighter construction loads may be permitted on the refrigerated slabs only after the slab has gained at least 75% of the specified minimum compressive strength as determined by field cylinders, and only after approval of the Consultant. Vehicle wheel loading heavier than 900 Kg. (2000 lbs.) will not be permitted on the completed slab for a period of 28 days, or until concrete tests indicate that design strength of the concrete has been reached.
 - .4 Do not circulate refrigerant in the piping until the slab has cured for a minimum of 28 days.
 - .5 Protect the finished concrete surface at all times from abrasion, concentrated construction point loads and impact damage. Take special care to protect exposed non-armoured concrete edges from chipping and spalling. Provide construction ramps over all such edges.
 - .6 Make good any damage to the refrigerated slab caused by construction operations to the Consultant's approval and at no cost to the Owner.
- .3 Curing Compound Method:
- .1 Use curing and sealing compound specified in paragraph 2.1.8 except:
 - .1 On Rink slabs;
 - .2 On surfaces to which architectural finishes will be adhered, the adhesives for which are incompatible with the curing compound.
 - .2 Select acrylic water compound except that if ambient conditions extend drying time unduly and if area is well ventilated and unoccupied by other workers, solvent based compound may be used.
 - .3 Apply curing and sealing compound in accordance with manufacturer's instructions, increasing application rate as necessary to cover surface completely.
- .4 Cure finished concrete surface with an approved curing and sealing compound which will leave the surface with a uniform appearance and with a minimum of discolouration after drying. Ensure that the curing compound will be compatible with the architectural finishes or adhesives for architectural finishes to be applied later. Apply the compound in strict accordance with the manufacturer's instructions.

3.8 Joint Sealant

- .1 Provide sealant on top of joint filler with a polyethylene bond breaker between joint filler and joint sealant applied in accordance with manufacturer's direction. Sealant shall be light grey colour.
- .2 Apply sealant to thoroughly dry surfaces only, at ambient air temperatures above 5°C.

- .3 Confirm that preformed joint filler and backer rod are compatible with sealant.
- .4 Caulk joints in accordance with the following:
 - .1 Do not commence joint preparation until concrete is at least 28 days old.

3.9 Final Floor Survey and Adjustments

- .1 Within a maximum of 72 hours from the time of concrete placement, provide to the Consultant a survey of finished concrete elevations, taken on a 1.5 x 1.5 m grid, for the ice slab demonstrating compliance with accordance with ASTM E1486 and CAN/CSA-A23.1-14, Clause 7.5.1.3 and Table 22. Engage and pay for this compliance survey.
- .2 Make good any variations beyond specified tolerances of elevation and finish to the approval of the Consultant. High spots are to be ground level and low spots cannot be filled.

3.10 Defective Work

- .1 Variations in excess of specified tolerances and marked and disfigured surfaces that cannot be repaired by approved methods, will be considered defective work.
- .2 Replace or modify concrete that is out of place or does not conform to lines, detail or grade as directed by the Consultant.
- .3 Replace or repair defectively placed or finished concrete as directed by the Consultant.
- .4 Testing and Replacement of Deficient Concrete in Place:
 - .1 Pay for additional testing and related expenses if concrete has proven to be deficient.
 - .2 Replace or strengthen deficient concrete work as directed by the Consultant, and pay for all testing and related expenses for replaced work until approved by the Consultant.

3.11 Cleaning

- .1 Proceed in accordance with Section 01 74 10 – Cleaning.
- .2 Leave the premises in a condition acceptable to the Consultant before completion of the work.
- .3 Thoroughly clean the rink slab prior to ice making by the Owner.

3.12 Protection

- .1 The rink slab must be protected from contamination including dust, debris, paint, oil, tire tracks etc.
- .2 The rink slab shall not be overloaded with stored materials or equipment. Dasherboards and glass skids must be distributed over the rink slab surface to prevent concentrated loads.
- .3 Comply with refrigeration specifications for controlled pull-down of rink slab temperature.

End of Section

Part 1: General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 30 00 Cast-in-Place Concrete

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C779 / C779M - 12 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
 - .2 ASTM C805/C805M-13a Standard Test Method for Rebound Number of Hardened Concrete
 - .3 ASTM C1028 - 06 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
 - .4 ASTM D3359 – 17 Standard Test Methods for Measuring Adhesion by Tape Test.
- .2 CSA Group (CSA)
 - .1 CSA A23.1-14/CSA A23.2-14 Concrete Materials and Methods of Concrete Construction/ Test Methods and Standard Practices for Concrete.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit product data and application instructions for concrete floor treatments.
- .3 Certificates: Manufacturer's certification that the installer is acceptable.
- .4 Submit WHMIS MSDS - Material Safety Data Sheets.
- .5 Maintenance Data: Maintenance instructions, including precautions for avoiding staining after application.

1.5 Quality Assurance

- .1 Installer Qualifications: Acceptable to the manufacturer.

1.6 Performance Requirements

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.7 Environmental Requirements

- .1 Temperature: Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .2 Work area: Make the work area water tight protected against rain and detrimental weather conditions.
- .3 Moisture: Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .4 Ventilation:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .2 Provide continuous ventilation during and after coating application.

1.8 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

1.9 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal.
- .4 Dispose of surplus chemical and finishing materials in accordance with federal,

provincial and municipal regulations.

- .5 Dispose of waste from stripping of floors in a manner that will not have unfavourable effects on the environment.

Part 2 Products

2.1 Liquid Densifier/Sealer

- .1 Liquid densifier/sealer: VOC Compliant, high performance, deep penetrating concrete densifier; an odourless, colourless and non-yellowing blend of silicate and silicate designed to harden, dustproof and protect concrete floors.
- .2 Surface sealers may not be formulated with aromatic solvents, mercury, formaldehyde halogenated solvents, lead, cadmium, hexavalent chromium and their compounds.
- .3 Manufacturer: Curecrete Distribution, Inc. 1203 Spring Creek Place, Springville, UT 84663-0551; Telephone: (800) 998-5664, (801) 489-5663; Fax: (801) 489-3307; Email: info@ashfordformula.com; Website: www.ashfordformula.com
- .4 Basis of Design Product: Ashford Formula by Curecrete Distribution Inc.
 - .1 Acceptable Alternates subject to approval of the Consultant:
 - .1 Liqui-Hard by W.R. Meadows
 - .2 Sikafloor 3S by Sika Canada.
 - .3 Euco Diamond Hard by The Euclid Chemical Co
- .5 Cure-Seal-Hardener: water-based, chemically reactive penetrating sealer and hardener that densifies concrete to seal against water molecules, but allows air and water vapor to pass, so that concrete can achieve full compressive strength for minimized surface crazing and elimination of dusting.
 - .1 Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
 - .2 Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
 - .3 Hardening: As follows when tested in accordance with ASTM C39:
 - .1 After 7 Days: An increase of at least 40% over untreated samples.
 - .2 After 28 Days: An increase of at least 38% over untreated samples.
 - .4 Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C1028.
 - .5 Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.
 - .6 Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G23.

- .7 Test Method for Measuring Wet SCOF of Common Hard-Surface Floors in accordance with ANSI B101.1.
- .8 Test Method for Measuring Wet DCOF of Common Hard-Surface Floors in accordance with ANSI B101.3.
- .9 Certified as High Traction by the National Floor Safety Institute (NFSI), Phase 2 testing.
- .10 Certified Compliant according to California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017.

Part 3 Execution

3.1 Manufacturer's Instructions

- .1 Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 Examination

- .1 Examine concrete surfaces to receive sealer. Notify Consultant if surfaces are not acceptable.
- .2 Do not begin surface preparation or application until unacceptable conditions are corrected.

3.3 Preparation

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- .3 Do not use frozen material. Thaw and agitate prior to use.
- .4 If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid or other liquids.

3.4 Application

- .1 Apply sealer to concrete surfaces in accordance with manufacturer's instructions.
- .2 New Concrete: Apply cure-seal hardener to new concrete as soon as the concrete is firm enough to work on after troweling; with colored concrete, wait a minimum of 30 days before application.
 - .1 Spray on at rate of 5 m²/L.

- .2 Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30 minutes without allowing it to dry or become slippery. If slipperiness occurs before the 30 minute time period has elapsed, apply additional cure-seal-hardener, as needed, to keep the entire surface in a non-slippery state for the first 15 minutes; for the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. In hot weather conditions, follow manufacturer's special application procedures.
 - .3 When the treated surface becomes slippery after this period, lightly mist with water until slipperiness disappears.
 - .4 Wait for surface to become slippery again, and then flush entire surface with water to remove all cure-seal-hardener residue.
 - .5 Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
 - .6 Wet vacuum or scrubbing machines can be used in accordance with manufacturer's instructions to remove residue.
- .3 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.

3.5 Protection

- .1 Do not allow traffic on floors for 3 hours after application.
- .2 Do not allow parking of vehicles on concrete slab.
- .3 Do not allow pipe cutting using pipe cutting machinery on concrete slab.
- .4 Do not allow temporary placement and storage of steel members on concrete slabs.
- .5 Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.

3.6 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Clean sealant from adjacent surfaces.

3.7 Protection

- .1 Protect finished installation in accordance with manufacturer's instructions.
- .2 Protect horizontal surfaces from traffic until sealer has cured.

End of Section

PART 1 GENERAL

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 30 00 Cast-in-Place Concrete
- .2 Section 09 21 23 Painting
- .3 Section 13 18 00 Dasherboards

1.3 References

- .1 The Ontario Building Code.
 - .1 MMAH Supplementary Standard SB-8, September 14, 2012. Design, Construction and Installation of Anchorage Systems for Fixed Access Ladders.
- .2 ASTM International, (ASTM)
 - .1 ASTM A53/A53M-12 Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
 - .2 ASTM A123/A123M-12 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A153/A153M-09 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
 - .4 ASTM A307-10 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - .5 ASTM A325-10 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .6 ASTM A385/A385M-11 Standard Practice for Providing High Quality Zinc Coatings (Hot Dip).
 - .7 ASTM A570, Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
 - .8 ASTM A1008/A1008M-12 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High Strength Low Alloy, High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
 - .9 ASTM A1011/A1011M-12a Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - .10 ASTM D6386-10 Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA G40.20-04/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
 - .2 CSA-S16-09, Design of Steel Structures

- .3 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 CSA-W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
- .5 CSA W48-06 (R2011), Filler Metals and Allied Materials for Metal Arc Welding
- .6 CSA W59-13 Welded Steel Construction (Metal-Arc Welding)
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.40-97, Anticorrosive Structural Steel Alkyd Primer
 - .2 CAN/CGSB 1.108-M89, Bituminous Solvent Type Paint
 - .3 CAN/CGSB 1.181-99, Ready Mixed, Organic Zinc Rich Coating.
- .5 Steel Structures Painting Council, Systems and Specifications Manual.
 - .1 CISC/CPMA 1-73a, A Quick drying One-coat Paint for Use on Structural Steel.
 - .2 CISC/CPMA 2-75, A Quick drying Primer for Use on Structural Steel.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit Shop and Erection Drawings for review.
 - .2 Verify site dimensions before proceeding with shop fabrication and to suit field conditions and field openings.
 - .3 Show and describe in detail all the work of this Section including large scale detail of members and materials, of connection and jointing details, and of anchorage devices, dimensions, gauges, thicknesses, description of materials, metal finishing, as well as all other pertinent data and information, including type, size and description of all fasteners and anchors.

1.5 Qualifications

- .1 Work of this Section shall be executed by a firm thoroughly conversant with laws, bylaws and regulations which govern and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturers specializing in this work, and having a minimum ten (10) years proven experience in the fabrication of high quality metal fabrications. Use workmen skilled in work of this Section.
- .2 Welding shall be performed by trades persons certified by The Canadian Welding Bureau under CSA Standard W47.1.

1.6 Examination

- .1 All dimensions shall be taken from the drawings and checked against the building. Be responsible for the correctness of such measurements and report to the

Consultant in writing all discrepancies between measurements at building and those shown on drawings prior to commencing work. Verify location of anchor bolts and embedded steel and ensure that work prepared by other trades is at a proper elevation, on line, level and true.

1.7 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Label, tag or otherwise mark work supplied for installation by other Sections to indicate its function, location and shop drawing description.
- .3 Protect work from damage and deliver to a location at the site in order to meet the scheduling requirements.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 Materials

- .1 Architectural and Miscellaneous Mild Steel: CSA G40.20-04/G40.21-04 (R2009), Grade 300W.
- .2 Machine Bolts and Nuts: ASTM Standard A307-10 low carbon steel externally and internally threaded standard fasteners. Dimensions, sizes, thread, strength, quality and type of items shall be designed for the work intended. Exposed fasteners and anchors shall be same material, colour and finish as the metal to which they are applied.
- .3 Sheet Steel: (Commercial Quality) ASTM A1008/A1008M-12, stretcher leveled or temper rolled.
- .4 Welding Materials: CSA W59.
- .5 Welding Electrodes: CSA W48 Series.
- .6 Sulphur: Commercial Grade for setting of steel posts.
- .7 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.
- .8 Isolation Coating: alkali resistant bituminous paint to CAN/CGSB 1.108-M89.

- .9 Adhesive Anchors: HILTI or Rawl Epoxy Adhesive Anchors sized to suit loading conditions, suitable for substrate. Adhesive to be low VOC type (maximum 250 g/l) to SCAQMD Rule 1168-03, Adhesives and Sealants Applications.

2.2 Finishes

- .1 Galvanizing: hot dipped with zinc coating to CAN/CSA G164 or ASTM A153/A153M.
- .2 Galvanized coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips. Galvanized after all welding and grinding complete. No welding or grinding of galvanized products allowed.
- .3 Zinc Rich Primer: zinc rich, organic, ready mix to CAN/CGSB 1.181. Low VOC type.

Part 3 Execution

3.1 General

- .1 Fabricate to reviewed shop drawings and in general to details, sizes and materials indicated on drawings and specified herein.
- .2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .3 Fabricate work complete with all components required for anchoring; bolting or welding to structural frame; standing free or resting in frames or sockets; in a safe and sure manner.
- .4 Where possible fit and shop assemble various sections of the work and deliver to site in largest practicable sections. Where shop fabricating is not possible make trial assembly in shop.
- .5 Ensure exposed welds are continuous for length of each joint.
- .6 Grind and fill all welds after inspection and acceptance.
- .7 Fill all open joints, depressions, seams with metallic paste filler or by continuous brazing or welding and grind smooth to true sharp arises and profiles.
- .8 Fit joints and intersecting members accurately. Make work in true planes with adequate fastenings.

- .9 Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
- .10 Supply all fastenings, anchors, accessories required for fabrication and erection of work of this Section. Such items occurring on or in an exterior wall or rink apron slab shall be hot dip galvanized. Make thread dimensions such that nuts and bolts will fit without re-threading or chasing threads.
- .11 Make exposed metal fastenings and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum evenly spaced and neatly laid out. Make fastenings of permanent type unless otherwise indicated.
- .12 Welding shall be done by the shielded metal arc method in accordance with the requirements CSA W59. Welding operators shall be currently certified under CSA W47.1 for the work they are performing.
- .13 Surfaces to be welded shall be free from loose scale, rust, paint, or other foreign matter. Where weld material is deposited in two (2) or more layers, each layer shall be cleaned before the next layer is deposited. Care shall be taken to minimize stresses due to heat expansion, contraction and distortion by using proper sequence in welding and by approved methods.
- .14 Appearance, quality of welds made, methods of correcting defective work shall be in accordance with CSA W59.

3.2 Galvanizing

- .1 Steel members, fabrications, and assemblies shall be galvanized after fabrication by the hot dip process in accordance with CAN/CSA G164-M92 (R2003) or A123/A123M-12.
- .2 Galvanizing of architecturally exposed steel shall be completed by a company recognized in the application of High Quality galvanized finishes and in accordance with ASTM A385.
- .3 Prepare metals to be galvanized in accordance with requirements of ASTM D6386.
- .4 Coating Requirements:
 - .1 Weight: the weight of the galvanized coating shall conform to Table 1 of CAN/CSA G164, or paragraph 6.1 of A123/A123M-12 and Table 1 of ASTM A153/A153M (as appropriate).

- .2 Surface Finish: The galvanized coating shall be continuous, adherent, as smooth and evenly distributed as possible and free from any defect that is detrimental to the stated end use of the coated article. The integrity of the coating shall be determined by visual inspection and coating thickness measurements.
- .3 Adhesion: the galvanized coating shall be sufficiently adherent to withstand normal handling.

3.3 Steel Weld Plates and Angles

- .1 Provide steel weld plates and angles not specified in other Sections, for items supported from concrete or masonry construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete or masonry.

3.4 Fasteners and Anchors

- .1 Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
- .2 Securely anchor components in place. Unless otherwise indicated, anchor components as follows:
 - .1 To concrete and solid masonry with expansion or epoxy adhesive type anchors.
 - .2 To hollow construction with toggle bolts.
 - .3 To thin metal with screws or bolts.
 - .4 To thick metal with bolts or by welding.
 - .5 Fill space between railing members and sleeves with non-shrink grout.
- .3 Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
- .4 Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
- .5 Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
- .6 Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self-drilling and tapping screws or bolts.

3.5 Installation

- .1 Provide all bracing and shoring required to support the work of this Section during installation.
- .2 Work shall be fabricated and erected square, plumb and true, straight, level and accurately fitted to size detailed on reviewed Shop Drawings. All joints shall be welded unless otherwise indicated. Exposed welds shall be ground smooth and/or flush. Exposed work shall be finished smooth and even, close joints and neat connections. Exposed welds continuous for full length of joints.
- .3 Where anchors or fastenings, sleeves, have to be built in by other trades, supply all necessary templates, instructions and supervision to ensure satisfactory installation.
- .4 Do all drilling, cutting and fitting necessary to attach this work to adjoining work and make it complete.
- .5 Provide all components required for anchoring. Make anchoring in concealed manner where possible. Exposed anchors shall be approved by the Consultant, shall be neat, and of the same material, colour, texture and finish of base metal on which they occur. Exposed fastenings shall be evenly spaced.
- .6 Grind all field welds smooth.
- .7 Touch up shop coat of prime paint where damaged by field erection.
- .8 Touch up galvanized finishes with zinc rich paint.

3.6 Schedule

- .1 General:
 - .1 Supply and install all metal fabrications indicated on Drawings, and not included in the work of other Sections.
 - .2 Coordinate and sequence the work to ensure timely delivery to the site, of all items to be built in.
 - .3 Where items are required to be built into masonry, concrete or other work supply such items to respective Sections with all anchors and accessories for building in.
 - .4 All items shall be of sizes and as detailed on drawings.
 - .5 Review all coordination drawings prior to installation of materials, to ensure that no interferences with the work of other Sections will occur.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Metal Fabrications
Section 05 50 00

3.7 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 30 00 Cast-In-Place Concrete
- .3 Section 04 22 00 Concrete Unit Masonry
- .4 Section 04 27 00 Multiple Wythe Unit Masonry
- .5 Section 05 50 00 Metal Fabrications
- .6 Section 06 20 00 Finish Carpentry
- .7 Section 07 21 13 Building Insulation
- .8 Section 07 26 00 Vapour Retarders
- .9 Section 08 11 00 Metal Doors and Frames

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A123/A123M-17 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - .2 ASTM A653/A653M-20 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - .3 ASTM D2559 - 12a(2018) Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions
 - .4 ASTM F1667 – 18a Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2 CSA Group (CSA)
 - .1 CSA A247- M86 (R1996) Insulating Fiberboard.
 - .2 CSA B111-1974(R2003) Wire Nails, Spikes and Staples.
 - .3 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .4 CSA O80 SERIES-15 Wood Preservation
 - .5 CSA O86-14 Engineering Design in Wood
 - .6 CSA O121-17 Douglas Fir Plywood.
 - .7 CSA O141-05 (R2014) Softwood Lumber
 - .8 CSA O151-17 Canadian Softwood Plywood
 - .9 CSA O437 Series-93 (R2011) Standards on OSB and Waferboard
 - .10 CSA Z809-08 Sustainable Forest Management
- .3 Underwriters Laboratories Canada (ULC)
 - .1 ULC 102-2018 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

- .4 National Lumber Grading Authority (NGLA)
 - .1 Standard Grading Rules for Canadian Lumber, Latest Edition.
- .5 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004 FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004 Structure and Content of Forest Stewardship Standards V2-1
 - .3 FSC Accredited Certified Bodies.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 When required by authorities having jurisdiction, submit sequential erection drawings indicating all necessary false work, temporary construction bracing and hoisting.
- .3 Submit shop drawings for wood trusses stamped and signed by a Professional Engineer registered in the Province of Ontario. Include statement that manufactured wood trusses and beams are designed in accordance with the referenced standards.
- .4 Certified Wood: Submit listing of wood products and materials used, produced from wood obtained from forests certified by FSC Accredited Certification Body in accordance with FSC-STD-01-001.

1.5 Quality Assurance

- .1 Sawn lumber shall be identified by the grade stamp of an association or independent grading agency certified by the Canadian Lumber Standards Accreditation Board.
- .2 Provide Independent Specialty Engineer's letters of review and sign-off letters as specified in Section 01 78 00 for pre-engineered roof trusses and engineered lumber.

1.6 Shipping, Handling and Storage

- .1 Protect materials, under cover, both in transit and on the site.
- .2 Store materials to prevent deterioration or the loss or impairment of their structural and other essential properties. Do not store materials in areas subject to high humidity and areas where masonry and concrete work are not completely dried out.

1.7 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 Materials

- .1 Timber Material shall be 'Grade Stamped'.
- .2 CSA Z809 or FSC Certified.
- .3 Construction Lumber: To CSA O141 Softwood Lumber graded to NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority. All lumber shall bear grade stamps. Moisture content of softwood lumber not to exceed 19% at time of installation.
 - .1 Framing lumber, plates, furring, blocking, No. 1 SPF.
 - .2 Nailing strips, furring and strapping: No. 4 S-P-F.
 - .3 Fitment framing: No. 1 S-P-F.
- .4 Canadian Softwood Plywood: to CSA O151-M, standard construction, good one or both sides as required, thickness as shown or specified.
 - .1 Douglas Fir Plywood: To CSA O121-M, standard construction, good one side, thickness as shown on the drawings.
 - .2 Plywood used for exposed interior work shall have select grade veneer, one or both faces where exposed, with fire retardant finish. Fire retardant shall be in accordance with CAN/CSA-080.1, and all treated materials shall bear a ULC approval stamp.
 - .3 Poplar Plywood: to CSA 0153, standard construction.
 - .4 Mat formed structural panel board (oriented strand board): to CSA O437.0, square edge, 12.7 mm thickness.
- .5 Nails, Spikes and Staples: To ASTM F1667.
- .6 Bolts: 12.5 mm diameter, galvanized, complete with nuts and washers.
- .7 Proprietary Fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.
- .8 Nailing Discs: flat caps, minimum 25 mm diameter, minimum 0,627 mm thick, sheet metal, formed to prevent dishing.
- .9 Wood Preservative to CSA O80 SERIES.

- .10 Adhesive: Contractors gun grade cartridge loaded wood adhesive, general purpose, to ASTM D2559.
- .11 Building Paper: to CAN2-51.32-M, 15# asphalt impregnated paper.
- .12 Vapour Retardant: 0.152 mm polyethylene film to CGSB 51.34 Type 1.
- .13 Fibreglass Insulation: to CSA A101, loose batt type, minimum density of 24 kg/m³.
- .14 Connectors: Simpson Strong Tie galvanized steel connectors, brackets, gussets and the like as required, and as designed by the Truss Engineer.
- .15 Galvanizing: to CSA-G164. Use galvanized fasteners, and hardware for exterior work, preservative treated lumber, and materials in contact with concrete or masonry.
- .16 Fire Retardant Treatment
 - .1 Arch Wood Protection, Inc., "Dricon FRT" or equal by Chemical Specialties, Inc., D-Blaze", Hoover Treated Wood Products "Pyro-Guard" or Osmose Wood Preserving Co., Inc. "FirePRO" interior Type A fire-retardant wood treatment.
 - .2 Pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWWA C20 (lumber) and C27 (Plywood), respectively, for treatment type indicated; identify "fire-retardant-treated wood" with appropriate classification marking of Underwriters Laboratories, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - .1 Treated materials shall meet FR-S ratings of not more than 25 for flame spread, smoke developed and fuel contributed when tested in accordance with UL 723 or ASTM E84, with no increase in flame spread and evidence of significant progressive combustion upon continuation of test for additional 30 minutes.
 - .2 No increase in above ratings when subjected to standard ASTM D2898 rain test.
 - .3 For interior locations use fire-retardant chemical formulation that produces "Interior Type A" treated lumber and plywood with the following properties under conditions present after installation:
 - .1 No reduction takes place in bending strength, stiffness and fastener holding capacities below values published by manufacturer of chemical formulation that are based on tests by a qualified independent testing laboratory of treated wood products identical to those indicated for this Project under elevated temperature and humidity conditions simulating installed conditions.
 - .2 No other form of degradation occurs due to acid hydrolysis or other causes related to manufacture and treatment.

- .3 No corrosion of metal fasteners results from their contact with treated wood.
- .4 Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
- .5 Kiln-dry all lumber and plywood materials after treatment to maximum 15% moisture content.

Part 3 Execution

3.1 Installation

- .1 Workmanship
 - .1 Execute work using skilled mechanics according to best practice, as specified here.
 - .2 Lay out work carefully and to accommodate work of other trades. Accurately cut and fit; erect in proper position true to dimensions; align, level, square, plumb, adequately brace, and secure permanently in place. Join work only over solid backing.
- .2 Rough Hardware: Include rough hardware such as nails, bolts, nuts, washers, screws, clips, hangers, connectors, strap iron, and operating hardware for temporary enclosures.
- .3 Erection of Framing Members
 - .1 Install members true to line, levels and elevations. Space framing members and frame all openings as detailed on the drawings.
 - .2 Construct continuous members from pieces of longest practical length.
 - .3 Install spanning members with crown edge up.
 - .4 Anchor wood framing to supporting walls with galvanized metal strap ties.
- .4 Provide treated wood nailers, blocking, grounds, furring and similar members where shown and where required for screeding or attachment of other work and surface applied items. Attach to substrate as required to support applied loading.
- .5 Electrical Equipment Backboard: provide backboards for mounting electrical equipment as indicated. Use 19 mm thick fir face veneer fire retardant softwood plywood on 19 mm x 38 mm furring around perimeter and at maximum of 305 mm intermediate spacing.
 - .1 Install plywood backboards with countersunk screws.
- .6 Blocking: Provide solid wood backing to support millwork, cabinetwork, equipment, fixtures, railings and accessories and the like, as required. Coordinate with work of other Sections and install all required backing. Any such equipment mounted on

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Rough Carpentry
Section 06 10 00

gypsum wallboard assemblies or similar assemblies shall be adequately supported.

3.2 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 50 00 Metal Fabrications
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 07 92 00 Joint Sealants
- .4 Section 08 11 00 Metal Doors and Frames
- .5 Section 08 71 10 Door Hardware
- .6 Section 09 21 16 Gypsum Board
- .7 Section 09 91 23 Interior Painting
- .8 Section 10 28 10 Toilet and Bath Accessories

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM E1333-14 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.
 - .2 ASTM F1667-18a Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-2009 Particleboard.
 - .2 ANSI A208.2-2016 Medium Density Fibreboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-2016 Standard for Hardwood and Decorative Plywood.
 - .4 ANSI/NEMA LD 3-2005 High Pressure Decorative Laminates
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards Illustrated.
- .4 Canadian Plywood Association (CanPly)
 - .1 The Plywood Handbook 2005.
- .5 CSA Group (CSA)
 - .1 CSA B111-1974 (R2003) Wire Nails, Spikes and Staples.
 - .2 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O112 SERIES-M1977 (R2006) Standards for Wood Adhesives
 - .4 CSA O121-17 Douglas Fir Plywood.
 - .5 CSA O141-05 (R2014) Softwood Lumber
 - .6 CSA O151-17 Canadian Softwood Plywood
 - .7 CSA O153-13 (R2017) Poplar Plywood.
 - .8 CSA Z760-94 (R2001) Life Cycle Assessment

- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-V4-0 FSC Principle and Criteria for Forest Stewardship.
 - .2 FSC-STD-20-002-2004, Structure and Content of Forest Stewardship Standards V2-1
 - .3 FSC Accredited Certified Bodies.
- .7 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.
- .8 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2005.
- .9 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1168-03 Adhesives and Sealants Applications

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings.
 - .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .2 Indicate materials, thicknesses, finishes and hardware.
- .3 Submit duplicate 300 mm long samples of each type of solid wood or 300 x 300 mm square type of plywood to receive stain or natural finish.
- .4 Submit samples of plastic laminate materials.

1.5 Quality Assurance

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.
- .3 Wood materials certified by Forestry Stewardship Council.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Protect materials against dampness during and after delivery.
- .3 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

1.7 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 Lumber Materials

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC custom premium grade, moisture content as specified.
 - .4 Machine stress-rated lumber is acceptable.
- .2 Hardwood Lumber: To NHLA requirements, moisture content of 6% maximum, maple species, AWMA Custom Grade.
 - .1 Bench Slats: Select Grade Maple.

2.2 Panel Materials

- .1 Douglas Fir Plywood (DFP): to CSA O121, standard construction.
 - .1 Forestry Stewardship Council (FSC) certified.
 - .2 Urea-formaldehyde free.
- .2 Canadian Softwood Plywood (CSP): to CSA O151, standard construction.
 - .1 Forestry Stewardship Council (FSC) certified.
 - .2 Urea-formaldehyde free.
- .3 Hardwood Veneered Plywood: To CSA O115, of thickness indicated, Type II Select Grade Maple, where transparent finish is required and Solid Grade where paint finish is required. Good two sides for work with two sides exposed to view; good one side for work with one side exposed to view. Use particle board core with Type I bond.
- .4 Particleboard: to ANSI A208.1.
 - .1 Forestry Stewardship Council (FSC) certified.
 - .2 Urea-formaldehyde free.
- .5 Medium density fibreboard (MDF): to ANSI A208.2, density 640-800 kg/m³.
 - .1 Forestry Stewardship Council (FSC) certified.
 - .2 Urea-formaldehyde free.

2.3 Plastic Laminate

- .1 Plastic laminate facing sheet: ANSI/NEMA LD 3-2005 High-Pressure Decorative Laminates (HPDL) PF-S and GP-S;
 - .1 Backing sheet: BK Grade by manufacturer of facing sheet.
 - .2 Core: CSA O151
 - .3 Laminating adhesive: CSA O112.
 - .4 Core sealer: clear water resistant synthetic resin sealer.
 - .5 Colours, pattern, gloss and texture will be selected by Consultant from full range of products by one of the following:
 - .1 Formica,
 - .2 Arborite,
 - .3 Pionite,
 - .4 Nevamar
 - .5 Wilsonart.
 - .6 Up to three colours and patterns will be selected by the Consultant.

2.4 Accessories

- .1 Rough Hardware: Bolts, lag screws, anchors, nails and expansion shields required to secure this portion of work. Rough hardware hot dip galvanized conforming to latest edition of CSA G164. All fasteners used in damp or wet areas to be suitable for use in corrosive environment. Use hot dipped galvanized or other material approved by the Consultant.
- .2 Nails and staples: to ASTM F1667 galvanized.
- .3 Wood screws: to CSA B35.4 plain type and size to suit application.
- .4 Stainless Steel hardware: Type 316 Stainless steel for exposed or wet locations, tamper proof.
- .5 Splines: wood or metal to suit application.
- .6 Adhesive: recommended by manufacturer, waterproof type, maximum VOC limit 30 g/L SCAQMD Rule 1168 - Adhesives and Sealants Applications.

Part 3 Execution

3.1 Construction

- .1 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

- .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
- .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

- .2 Interior and exterior frames: Set frames with plumb sides, level heads and sills, and secure.

3.2 Fabrication

.1 General:

- .1 Field measure all dimensions.
- .2 Fabricate all finish carpentry items to AWMAC premium grade, and in accordance with the reviewed shop drawings.
- .3 Set nails and screws, apply stained plain wood filler to indentations, sand smooth and leave ready to receive finish.
- .4 Provide 10 mm thick solid matching wood strip on plywood and particle board edges 13 mm or thicker, exposed in final assembly.
- .5 Ease edges of solid lumber components to 1.6 mm radius.

.2 Plastic Laminate Components

- .1 Fabricate plastic laminate window stools as detailed. Stools shall be minimum 19 mm thick plastic laminate plywood, with edge banding on all exposed faces. Fabricate in one piece, without joins, wherever as possible. Where necessary, joins shall be centred on window mullions and tightly butted together with concealed splines.
- .2 Fabricate vanities and change room shelving units as detailed.
- .3 Unless otherwise specified herein, comply with requirements of ANSI/NEMA LD 3 Annex 'A'.
- .4 Assembly: Bond plastic laminate to core with adhesive, under pressure.
- .5 Core: unless otherwise indicated: 19 mm thick.
- .6 Balanced construction: plastic laminate covered components shall be of balanced construction, with plastic laminate on both faces of core. Seal core edges not covered with plastic laminate.
- .7 Use largest practicable plastic laminate sheet size.
- .8 Provide joints symmetrically; provide joints as corners and at changes in superficial areas; provide concealed draw bolt anchors and joints. All butt joints shall have a blind spine.
- .9 Openings and cutouts:
 - .1 Radius internal corners at least 3 mm and chamfer edges.
 - .2 Where core edge is to remain exposed, cover with plastic laminate edging.

.3 Where core edge is to be concealed, seal with sealer.

3.3 Installation

- .1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 All fastenings shall be concealed.
- .3 Provide heavy duty grounds as necessary for secure installation of finish carpentry work.
- .4 All wood surfaces shall be sanded smooth, ready to receive finish.
- .5 Scribe and cut as required, fit to abutting walls and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .6 Form joints to conceal shrinkage.
- .7 Set and secure materials and components in place, rigid plumb and square.
- .8 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .9 Set finishing nails to receive filler. Where screws are used to secure members, countersink screws in round, cleanly cut hole and plug with wood plug to match material being secured.
- .10 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- .11 Apply mildew resistant sealant to perimeter of all vanity tops and window stools as specified in Section 07 92 00.

3.4 Benches

- .1 Coordinate benches in dressing rooms and change cubicles with Section 05 50 00.
- .2 Install solid maple bench seats as detailed with countersunk stainless steel carriage bolts.

3.5 Door Installation

- .1 Install doors in accordance with instructions in Section 08 11 00 and Section 08 14 16 and manufacturer's printed instructions.

3.6 Finish Hardware Installation

- .1 Finish hardware will be supplied for installation under this Section.
- .2 Prepare doors and frames in accordance with manufacturer's instructions and templates. Install finish hardware complete in all respects, hang doors and make adjustments necessary.
- .3 Doors shall swing freely. Where thresholds are to be used, door bottom shall be finished to suit thresholds as required.
- .4 Where indicated on door schedules or drawings, under-cut doors.

3.7 Miscellaneous

- .1 Install Toilet and Bath Accessories as specified in Section 10 28 10, including accessories supplied by Owner.

3.8 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 50 00 Metal Fabrications
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 06 20 00 Finish Carpentry
- .4 Section 06 61 16 Solid Surfacing
- .5 Section 07 92 00 Joint Sealants

1.3 References

- .1 ANSI A208.1, Mat-Formed Wood Particleboard
- .2 CAN/CGSB-11.3-M, Hardboard
- .3 CSA O115-M, Hardwood and Decorative Plywood
- .4 CSA O121-M, Douglas Fir Plywood
- .5 CSA O151-M, Canadian Softwood Plywood
- .6 CSA O153-M, Poplar Plywood

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit detailed shop drawings for cabinetwork showing proposed assembly, connections, anchorage, materials, dimensions, thickness, and finishes.
- .3 Submit duplicate, 300 mm long samples of each type of solid wood and 300 x 300 mm samples of each type of plywood used in exposed work and scheduled to receive stained or natural finish, complete with specified finish, prior to fabrication of cabinetwork.
- .4 Submit sample of each type of cabinet hardware component used.

1.5 Quality Assurance

- .1 Unless otherwise specified, carry out finish carpentry work in accordance with the requirements of "Millwork Standards" (latest issue) of Architectural Woodwork Manufacturers' Association of Canada (AWMAC), Custom Grade

1.6 Definition

- .1 "Exposed" when referred to in this Section, shall mean all parts which can be viewed and shall include interiors of cabinets, backs of doors, shelving and gables.

1.7 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Protect against damage, including damage by excessive changes in moisture content, during delivery and storage. Maintain minimum storage temperature of 16° C, and relative humidity of 25% to 55%.
- .4 Cover plastic laminate faces at shop with heavy Kraft paper.
- .5 Do not deliver finish carpentry components to site before all wet trades are completed, the building is closed in and humidity conditions on site are acceptable. Do not deliver during rain or damp weather
- .6 Store materials on site in such a way as to prevent deterioration or loss or impairment of essential properties. Prevent excessive moisture gain of materials.

1.8 Protection

- .1 Provide coverings as necessary to protect finish carpentry components from damage of any kind during storage and after installation.

1.9 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.10 Warranty

- .1 At no cost Owner, remedy any defects in work of this Section due to delamination and warping of plastic laminated finish carpentry components for a period of two (2) years from date of Substantial Performance. Provide Owner with a written warranty to this effect.

Part 2 Products

2.1 Materials

- .1 Solid Wood:
 - .1 Unless otherwise indicated, provide AWMAC Custom Grade.
 - .2 All wood materials shall be new, straight and clean, free of sap, knots, pitch, and other defects, except as permitted by applicable grading rules.
 - .3 All wood shall be kiln dried to a maximum moisture content of 7%.
 - .4 Softwood: to CSA O141, dressed all sides used in concealed locations.
- .2 Veneers: As required by AWMAC's STANDARDS (NAAWS) for its use and Grade specified. Flat sliced maple veneers from architectural grade flitches to provide uniform grain pattern and colour throughout, free of dark streaks and blemishes. Sharp variation of grain patterns and colour between adjacent jointed pieces is not acceptable.
- .3 Plywood:
 - .1 Veneer core plywood: hardwood with a non-telegraphing grain manufactured with exterior glue. To ANSI/HPVA HP-1-09, minimum five (5) plies.
 - .2 Soft Plywood: to CSA O151-M Standard Grade, solid two sides. Use in concealed locations only, except as indicated.
 - .3 To ANSI/HPVA HP-1-09, Grade A face, book matched, flat cut wood veneer face and No. 3 edge.
- .4 Edgeband
 - .1 For wood veneer casework: Veneer of same species and cut as exposed surfaces.
 - .2 For Plastic Laminate Casework: [PVC] [High Pressure Decorative Laminate (HPDL)].
- .5 Hardboard: To CGSB 11-GP-3M, Type 2, 6 mm thick or as indicated.
- .6 Solid Surfacing Countertops: as specified in Section 06 61 16 and where indicated on drawings.
- .7 Stainless Steel Countertops:
 - .1 To ASTM A167 and ASTM A440, type 316 with AISI No. 4 finish, 1.80mm Thick.

- .2 Fabricate stainless steel counters with stainless steel sheeting bonded under pressure to exterior grade high density overlaid DFP plywood, 19 mm thick. Provide all returns and radii to present a clean neat finish. Provide splashbacks, 100 mm high at adjacent walls. Continuously weld all seams and grind smooth.
- .8 Plastic laminate facing sheet: ANSI/NEMA LD 3 High-Pressure Decorative Laminates (HPDL) PF-S and GP-S;
 - .1 Backing sheet: BK Grade by manufacturer of facing sheet.
 - .2 Core: CAN3-0188.1M, Grade R.
 - .3 Laminating adhesive: CAN3-O112 Series M.
 - .4 Core sealer: clear water resistant synthetic resin sealer.
 - .5 Colours, pattern, gloss and texture will be selected by Consultant from full range of products by one of the following:
 - .1 Formica,
 - .2 Arborite,
 - .3 Pionite,
 - .4 Nevamar
 - .5 Wilsonart.
 - .6 Up to three (3) colours and patterns will be selected by the Consultant.
- .9 Fasteners and Adhesive:
 - .1 Nails and staples: CSA B111, galvanized, spiral head nails.
 - .2 Screws: To CSA B35.4 zinc, cadmium or chrome plated steel.
 - .3 Splines: wood or metal, to suit application.
 - .4 Adhesive: To CSA 0112-M, type as appropriate for the intended application waterproof. Complying with ANSI/WDMA I.S-1 series. Contact bond not acceptable.
 - .5 Avoid the use of adhesives, preservatives, synthesizing agents and finish coatings that contain formaldehyde and high V.O.C. content.
- .10 Cabinet Hardware: Products listed are a standard of acceptance. Products by other manufacturers, of equal quality and similar appearance may also be accepted subject to review and approval by Consultant.
 - .1 Shelf Standards: Knape & Vogt KV80, Anochrome finish.
 - .2 Brackets: Knape & Vogt KV180, Anochrome finish.
 - .3 Hinges: Blum concealed hinges, 125° clip and 125° opening with self-closing spring. Full or half overlay. Nickel plated steel.
 - .4 Cabinet Pulls: Richelieu D-Pull No: 30134-170, 96 mm c.c. brushed stainless steel.
 - .5 Cabinet Locks: CCL 0737 pin tumbler MK & KA by room.
 - .6 Catches: Type optional with manufacturer.

- .7 Provide other hardware and hardware accessories as detailed or required.
- .8 All exposed hardware to have Platinum (Mica) finish by Teknion or equivalent unless noted otherwise.

2.1 Fabrication

- .1 Exposed joints and edges:
 - .1 Uniformly space exposed joints unless otherwise indicated.
 - .2 No edge grain shall be visible; mitre external corners, house internal fasteners. Glue mitred corners.
 - .3 All exposed edges of plywood and particle board shall have solid wood edging, pressure glued. AWMAC No. 3 edge.
 - .4 Ease edges of solid lumber components to 1.6 mm radius.
- .2 Mechanical Fasteners:
 - .1 Inconspicuously locate mechanical fasteners. Wherever possible, conceal fastenings.
 - .2 Countersink nail heads.
 - .3 Where exposed to view, countersink screw and bolt heads and fill holes with matching wood plugs.
 - .4 Cutting and fitting: make cut-outs in work of this Section as required to accommodate work of other Sections.
 - .5 Make provisions in cabinetwork to accept built-in appliances, provided by others.
- .3 Plastic Laminate Components:
 - .1 Unless otherwise specified herein, comply with requirements of CAN3-A172-M Appendix 'A'.
 - .2 Assembly: Bond plastic laminate to core with adhesive, under pressure.
 - .3 Core: unless otherwise indicated: 19 mm thick.
 - .4 Balanced construction: plastic laminate covered components shall be of balanced construction, with plastic laminate on both faces of core. Seal core edges not covered with plastic laminate.
 - .5 Use largest practicable plastic laminate sheet size.
 - .6 Provide joints symmetrically; provide joints as corners and at changes in superficial areas; provide concealed draw bolt anchors and joints. All butt joints shall have a blind spine.
- .4 Openings and cut-outs:
 - .1 Radius internal corners at least 3 mm and chamfer edges.
 - .2 Where core edge is to remain exposed, cover with plastic laminate edging.
 - .3 Where core edge is to be concealed, seal with sealer.

2.2 Cabinetwork

- .1 Except where otherwise detailed, use flush overlaid construction. Tenon, dado, dowel, or rabbet interior construction with all parts well glued. Shoulder mitre all exposed corners. Open ends or skeleton frames against walls are not permitted.
- .2 Construct cabinetwork components of plastic laminate faced particle board or maple veneer plywood as indicated and in accordance with AWMAC Custom grade.
- .3 Rout gables for pilaster strips where adjustable shelving is required.
- .4 Construct shelving as indicated with edge moulding to match.
- .5 Construct doors fronts of 19 mm plastic laminate faced plywood.
- .6 Construct doors 19 mm thick with sides tongued into front and back housed into sides.
- .7 Install cabinet hardware in accord with hardware manufacturer's directions. Unless otherwise indicated, provide each door with pull and with minimum two hinges. Provide locks where indicated.
- .8 Apply moisture repellent sealer to concealed backs of cabinetwork.
- .9 Countertops shall be solid surfacing as specified in Section 06 61 16. Coordinate installation and provide all necessary supports.

2.3 Finishes

- .1 All exposed exterior and interior surfaces: plastic laminate as indicated. Colours selected by the Consultant.
- .2 Wood Finish: 3 coats clear polyurethane finish on all sides as specified in Section 09 91 23. Factory finish wherever practical.
- .3 Cabinet and case backs unexposed to view shall be back primed with one coat of moisture repellent sealer.
- .4 Apply finishes in accordance with the AWMAC Manual and Section 09 91 23.

Part 3 Execution

3.1 Installation

- .1 Verify adequacy of backing and support framing. Advise Contractor of areas and surfaces requiring further modifications for plumb, level, even or square fitting.
- .2 Verify HVAC controls and systems are operating properly.
- .3 Install work in accordance with AWMAC Installation Manual, Premium grade.
- .4 Install cabinetwork components plumb, true and level and securely fasten in place.
- .5 Accurately scribe and closely fit components to irregularities of adjacent surfaces.
- .6 Accurately fit joints in true plane, locate joints overbearing or supporting surfaces.
- .7 Provide mechanical fastening devices such as nails, screws and bolts required for fastening wood components. Provide concealed fastening of components.
- .8 Where permitted, nail with small headed finishing nails. Countersink nail heads with nail setter.
- .9 Install plastic laminate components using concealed fastening devices.
- .10 Where components are fastened with screws or bolts, countersink screw and bolt heads and provide wood plugs matching surrounding wood.
- .11 Where cabinetwork abuts other building elements, provide trim matching cabinetwork except where otherwise detailed.
- .12 Where access is required to valves and other mechanical and electrical components, located behind cabinetwork, provide removable plywood access panels of size required and secure with four brass screws.
- .13 Coordinate installation of solid surfacing countertops with Section 06 61 16.
- .14 Apply mildew resistant silicone sealant to perimeter of all countertops as specified in Section 07 92 00.

3.2 Adjustment

- .1 Upon completion of installation, inspect work of this Section and touch-up, where required, minor or damaged surface finish to restore it to original condition.
- .2 Touch up exposed job made nail and screw holes, raw finishes resulting from job fitting, scratches and mars.
- .3 Check operation of all moveable parts and, if necessary, adjust to ensure proper and smooth function.
- .4 Replace damaged components which, in the opinion of the Consultant, cannot be satisfactorily repaired.

3.3 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 30 00 Cast-in-Place Concrete
- .2 Section 07 21 13 Building Insulation

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C834-14 Standard Specification for Latex Sealants
 - .2 ASTM C920-14a Standard Specification for Elastomeric Joint Sealants
 - .3 ASTM C1184-14 Standard Specification for Structural Silicone Sealants
 - .4 ASTM C1193-13 Standard Guide for Use of Joint Sealants
 - .5 ASTM C1311-14 Standard Specification for Solvent Release Sealants
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-SM, Sealing compound, one component, acrylic base, solvent curing.
 - .2 CGSB 19.13-M, Sealing compound, one component, elastomeric chemical curing.
 - .3 CGSB 19-GP-14M Sealing compound, one component, butyl-polyisobutylene, polymer base, solvent curing.
 - .4 CAN/CGSB-19.24-M90, Multi component, chemical curing sealing compound.
- .3 South Coast Air Quality Management District (SCAQMD) California State
 - .1 SCAQMD Rule 1168-03: Adhesives and Sealants.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit MSDS Data Sheets for review and acceptance by the Owner prior to delivery to the project site. Obtain written approval from the Owner and do not deliver any materials to the Owner's property, prior to receipt of such approval.

1.5 Quality Assurance

- .1 Installation of caulking shall be performed only by workmen thoroughly skilled and specially trained in the techniques of caulking.

- .2 Caulking work shall be carried out in strict accordance with manufacturer's printed directions.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Use all means necessary to protect caulking materials before, during and after installation and to protect the installed work and materials of all other trades.
- .4 In the event of damage, immediately make all repairs and replacements necessary to the approval of the Consultant and at no additional cost to the Owner.
- .5 Store all caulking materials and equipment under conditions recommended by its manufacturer.
- .6 Do not use materials stored for a period exceeding the maximum recommended shelf-life of the material.
- .7 Materials shall be delivered to the job in their original containers or wrapping with the manufacturer's seal and labels intact.

1.7 Environmental Considerations

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of material safety data sheets.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Ventilate area of work by use of approved portable supply and exhaust fans.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.9 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of three (3) years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

Part 2 Products

2.1 Manufacturer

- .1 Products of the following manufacturers are approved for use subject to meeting the specifications for the particular product listed below:
 - .1 Canadian General Electric
 - .2 Dow Corning
 - .3 Nuco Inc.
 - .4 Sika Canada Limited
 - .5 Tremco Manufacturing Company (Canada) Ltd.
 - .6 W.R. Grace and Company.
 - .7 CR Laurence.

2.2 Materials

- .1 Primers: Type recommended by sealant manufacturer. Low VOC type
- .2 Joint Fillers:
 - .1 General: Compatible with primers and sealants, outsized 30 to 50%.
 - .2 Vertical Joints: Polyethylene, Urethane, Neoprene or Vinyl:
 - .1 Extruded closed cell foam, Shore A hardness 20, tensile strength 140 to 200 kPa.
 - .2 Sealtight-Etha Foam Backer Rod, W. R. Meadows Canada Ltd.
 - .3 Horizontal Joints: Neoprene or Butyl Rubber (Horizontal Joints): Round solid rod, Shore A hardness 70.
- .3 Sealants:
 - .1 All sealants shall be Low VOC Type.
 - .2 Colour of sealants to be selected by Consultant.
 - .3 For Exterior Locations: To ASTM C920-14a, two component LP polysulphide base sealant Type 2 where subjected to foot traffic and Type 1 where not subjected to foot traffic (20-35 Shore A) Class B, bearing seal of approval of Thiokol Chemical Corporation:
 - .1 DOW Corning 790/795
 - .2 Tremco Dymeric 240FC

- .4 For Interior Locations:
 - .1 Moving joints:
 - .1 Low modulus, high performance, one-component, polyurethane-based, non-sag elastomeric sealant.
 - .1 Sikaflex 15LM
 - .2 Non-moving Joints
 - .1 To CAN3-11.13-M, one component polysulphide base sealant bearing seal of approval of Thiokol Chemical Corporation.
 - .1 Vulkem 116 – Tremco
 - .2 Mono 555
 - .3 Acrylic Latex: Siliconized acrylic latex to ASTM C834.
 - .1 Tremflex 834 - Tremco
 - .4 Mildew Resistant Sealant: Silicone to ASTM C920.
- .4 Bond Breaker Tape: Polyethylene bond breaker tape which will not bond to sealant.
- .5 Joint Cleaner: Xylol, methylethyleketon or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

Part 3 Execution

3.1 Inspection

- .1 Inspect conditions and substrates upon which work of this Section is dependent. Report to Consultant in writing any defects that may jeopardize the performance of this work.
- .2 Commencement of work implies acceptance of conditions.

3.2 Preparation

- .1 Remove dust, paint, loose mortar and other foreign matter. Ensure joint surfaces are dry and free of frost.
- .2 Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.
- .3 Remove oil, grease and other coatings from non-ferrous metals with joint cleaner.
- .4 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

- .5 Prepare concrete, masonry glazed and vitreous surfaces to sealant manufacturer's instructions.
- .6 Examine joint sizes and conditions to achieve correct depth ratio $\frac{1}{2}$ of joint width with minimum width and depth of 6 mm, maximum width 25 mm.
- .7 Install joint filler to achieve correct joint depth.
- .8 Where necessary to prevent staining, mask adjacent surface prior to priming and caulking.
- .9 Apply bond breaker tape where required to ensure performance of sealant.
- .10 Prime sides of joints when required and as recommended by sealant manufacturer to ensure performance of sealant immediately prior to caulking.

3.3 Application

- .1 Apply sealants in accordance with manufacturer's instructions, in continuous beads, to provide watertight joint. Apply sealant using gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.
- .2 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities. Neatly tool surface to a slight concave joint.
- .3 Clean adjacent surfaces immediately and leave work neat and clean. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after tooling of joints.
- .4 Apply sealant to joints between window or door frames to adjacent building components, around perimeter of every external opening, to control joints in masonry walls where shown.
- .5 Caulk joints in surfaces to be painted before surfaces are painted. Where surfaces to be caulked are primed in shop before caulking, check to make sure prime paint and caulking are compatible. If they are incompatible, inform Consultant and change caulking to compatible type approved by Consultant.

3.4 Schedule

- .1 Provide sealants at the following locations

- .1 Where required to protect interior from exterior air and water infiltration.
- .2 Joints between all dissimilar materials.
- .3 Construction and control joints.
- .4 Base of metal frames at resilient flooring.
- .5 Exterior thresholds (set in 2 full beads).
- .6 Caulk the entire perimeter of all mechanical and electrical material or piping extending through or occurring in masonry walls unless indicated to be firestopped.
- .7 Top of insulation between rink slab and apron slab.
- .8 Other locations where caulking or sealant is required to provide a neat clean junction

3.5 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 04 22 00 Concrete Unit Masonry
- .2 Section 04 27 00 Multiple Wythe Unit Masonry
- .3 Section 06 10 00 Rough Carpentry
- .4 Section 07 92 00 Joint Sealants
- .5 Section 08 71 10 Door Hardware
- .6 Section 08 71 13 Automatic Door Operators
- .7 Section 08 80 05 Glazing
- .8 Section 09 21 16 Gypsum Board
- .9 Section 09 91 13 Exterior Painting
- .10 Section 09 91 23 Interior Painting

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A653/A653M-20 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM C177-19 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
 - .3 ASTM C518-17 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - .4 ASTM C553-13 (2019) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - .5 ASTM C591-20 Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
 - .6 ASTM C1289-20 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - .7 ASTM D6386-22 Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
 - .8 ASTM D7396-14(2020) Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting
 - .9 ASTM E90-09 (2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - .10 ASTM E330/E330M-14 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air

- Pressure Difference.
- .11 ASTM E2074-00e1 Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies (Withdrawn 2007)
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99 Ready-Mixed Organic Zinc-Rich Coating.
 - .2 CGSB 41-GP-19M-84 Rigid Vinyl Extrusions for Windows and Doors.
 - .3 CSA Group (CSA)
 - .1 CSA-G40.20-13/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-18 Welded Steel Construction (Metal Arc Welding).
 - .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000
 - .2 CSDMA Recommended Specifications for Commercial Steel Doors and Frames, 2006.
 - .3 CSDMA Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009.
 - .5 Underwriters Laboratories Canada (ULC)
 - .1 ULC 104-2015 Standard Method for Fire Tests of Door Assemblies.
 - .2 ULC 105- 2016 Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.
 - .3 ULC 106-2015 Standard Method for Fire Tests of Window and Glass Block Assemblies
 - .4 ULC 701-2011 Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .5 ULC 702.1- 2014 Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .6 ULC 704-11 Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .6 Underwriters Laboratories (UL)
 - .1 UL10B Fire Tests of Door Assemblies.
 - .2 UL10C Standard for Positive Pressure Fire Tests of Door Assemblies.
 - .7 National Fire Protection Association (NFPA)
 - .1 NFPA 80-2019 Standard for Fire Doors and Other Opening Protectives.
 - .2 NFPA 252-2017 Fire Tests of Door Assemblies.
 - .8 American National Standards Institute (ANSI)
 - .1 ANSI 250.4-2018 Test Procedure and Acceptance Criteria for — Physical Endurance for Steel Doors, Frames and Frame Anchors
 - .2 ANSI 250.10-2011 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

- .2 Provide shop drawings
 - .1 Indicate each type of door, frame, steel, construction and core.
 - .2 Indicate fire ratings.
 - .3 Indicate material thicknesses, mortises, reinforcements, anchorages, location of exposed fasteners, openings, arrangement of hardware, and finishes.
 - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.5 System Description

- .1 Design exterior frame assembly to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35° C to 35° C.

1.6 Defining Opening Sizes

- .1 Width - Widths of openings shall be measured from inside to inside of frame jamb rabbets. (Referred to as "frame rabbet width" or "nominal door width")
- .2 Height - Heights of openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame. (Referred to as "frame rabbet height" or "nominal door height")
- .3 Door Sizes - Doors shall be sized so as to fit the above openings and allow a 3 mm nominal clearance at jambs and head of frame. A clearance of 13 mm maximum shall be allowed between the bottom of the door and the finished floor (exclusive of floor coverings).
- .4 Tolerances - Doors and frame product shall be manufactured and installed in accordance with the CSDMA's, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".

1.7 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.8 Requirements of Regulatory Agencies

- .1 Steel fire rated doors and frames: labeled and installed by an organization accredited by Standards Council of Canada in conformance with ULC 104 or NFPA 252 for ratings specified or indicated.

- .2 Provide fire labeled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with ULC 104, ASTM E2074 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.9 Testing and Performance

- .1 Fire labeled products shall be provided for those openings requiring fire protection ratings as scheduled on the drawings. Products shall be tested in strict conformance with ULC 104 and listed by Underwriters Laboratory of Canada Ltd. or Warnock Hersey under an active Factory Inspection Program.
- .2 Product quality shall meet the standards established by the Canadian Steel Door Manufacturer's Association.
- .3 Door construction shall meet acceptance criteria of ANSI A250.10 and shall be certified as meeting Level A (1,000,000 cycles) and Twist Test Acceptance Criteria deflection not to exceed 6.4 mm/13.6 kg force, total deflection at 136.1 kg force not to exceed 64 mm and permanent deflection not to exceed 3.0 mm when tested in strict conformance with ANSI A250.4. Test shall be conducted by an independent nationally recognized accredited laboratory.
- .4 Core materials for insulated doors shall attain a thermal resistance rating of RSI 2.17 when tested in accordance with ASTM C177 or ASTM C518.

1.10 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 Materials

- .1 Acceptable Materials
 - .1 Steel doors and frame product manufactured in accordance with this Specification by CSDMA members, are eligible for use on this project.
- .2 Steel: Commercial grade steel to ASTM A653, CS, Type B, Coating Designation ZF75 (A25) minimum. Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, Recommended Specifications for Commercial Steel Door and Frame Products unless noted otherwise.

- .3 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653, ZF75.

- .4 Door Core Materials

- .1 Interior Doors: Structural small cell, 24.5mm maximum kraft paper 'honeycomb'. Weight 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness. ULC approved.
- .2 Exterior Doors: Polyisocyanurate: Rigid, modified polyisocyanurate, closed cell board. Density; 32 kg/m³ minimum, thermal values; RSI 2.17 minimum, in accordance with ASTM C591 (un-faced) or ASTM C1289 (faced).
- .3 Temperature Rise Rated (TRR): Core composition to provide the fire-protection rating and limit the temperature rise on the unexposed side of door to 250°C at 30 or 60 minutes, as determined by governing building code requirements. Core to be tested as part of a complete door assembly, in accordance with ULC 104 and shall be listed by a nationally recognized testing agency having a factory inspection service.

- .5 Primers:

- .1 Touch-up prime CAN/CGSB-1.181, organic zinc rich, rust inhibitive.
- .1 Maximum VOC limit 50 g/L to GC-03.

2.2 Adhesives

- .1 Adhesive: maximum VOC content 50 g/L to SCAQMD Rule 1168.
- .2 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .3 Polyisocyanurate: heat resistant, epoxy resin based, low viscosity, contact cement.
- .4 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, low VOC sealant/adhesive or U.L.C. approved equivalent.

2.3 Accessories

- .1 Glazing Stops: Minimum 0.9 mm base thickness sheet steel with wipe zinc finish to ASTM A525. Fasteners to be #6 x 32 mm cadmium plated oval head scrulox self-drilling type screws. Tamper proof screws.
- .2 Exterior top caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

- .3 Frame Thermal Breaks: Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.
- .4 Door silencers: single stud rubber/neoprene type.
- .5 Fiberglass: to ULC 702, loose batt type, minimum density of 24 kg/m³.
- .6 Metallic paste filler: to manufacturer's standard.
- .7 Sealant: As specified in Section 07 92 00.

2.4 Fabrication - Frame Products

- .1 General
 - .1 Fabricate frames in accordance with CSDMA specifications.
 - .2 Fabricate frames to profiles and maximum face sizes as indicated.
 - .3 Exterior frame product shall be 1.60 mm welded type construction, thermally broken.
 - .4 Interior frame product shall be 1.60 mm. Interior frames, transoms, sidelights and window assemblies shall be welded type construction.
 - .5 Blank, reinforce, drill and tap frames for templated hardware and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
 - .6 Prepare frames to receive electrical conduit for door operators where indicated and required.
 - .7 Protect mortised cutouts with steel guard boxes.
 - .8 Provide anchorage appropriate to floor, wall and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm provide two (2) anchors, and an additional anchor for each additional 760 mm of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry or structural steel shall be provided with anchors located not more than 150 mm from the top and bottom of each jamb, and intermediate anchors at 660 mm on centre maximum. Fasteners for such anchors shall be provided by others.
 - .9 Minimum reinforcing, anchor and other component thickness shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".
 - .10 Each interior door opening shall be prepared for single stud rubber door silencers, three (3) for single door openings, two for double door openings, except on gasketed frame product.
 - .11 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.12 Fire-rated frame products shall be provided for those openings requiring fire protection as determined and scheduled by the Consultant. Frames, transom and sidelight assemblies shall be listed for conformance with ULC 104. Window assemblies shall be listed for conformance with ULC 106. All fire-rated frame products shall bear the label of and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated frame products shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.2 Welded Type

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Where frame product is to be installed prior to the adjacent partition, a floor anchor shall be securely attached to the inside of each jamb profile. Each floor anchor shall be provided with two holes for securing to the floor. For conditions that do not permit the use of a floor anchor, an additional wall anchor, located within 150 mm of the base of the jamb, shall be substituted.
- .6 Weld in two temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling, which shall not be used for installation.
- .7 Glazing stops shall be formed steel channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .8 When required due to site access, when advised by the contractor responsible for coordination or installation, as specified on the drawings or due to shipping limitations, frame product for large openings shall be fabricated in sections as designated on the approved submittal drawings, with splice joints for field assembly and welding by others.
- .9 Prior to shipment, mark each frame product with an identification number as shown on the approved submittal drawings.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .11 Manufacturer's nameplates on frames and screens are not permitted

2.5 Fabrication - Doors

.1 General

- .1 Interior doors: insulated steel construction with honeycomb core laminated to minimum 1.19 mm nominal thickness steel face sheets under pressure.
 - .2 Exterior doors: insulated steel construction with polyisocyanurate core laminated to minimum 1.19 mm nominal thickness steel face sheets under pressure.
 - .3 Voids between vertical stiffeners shall be filled with fiberglass batt type insulation.
 - .4 Doors: swing type, flush.
 - .5 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E330.
- .2 Longitudinal edges shall be mechanically inter-locked, adhesive assisted. Seams: visible grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .3 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware and electronic hardware, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .4 Holes 12.7 mm diameter and larger shall be factory prepared, except mounting and through-bolt holes, which are by others, on site, at time of hardware installation. Holes less than 12.7 mm diameter shall be factory prepared only when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.
- .5 Doors shall be reinforced where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- .6 Provide top and bottom of doors with inverted, recessed, welded steel channels. Exterior doors shall be provided with rigid PVC top caps.
- .7 Minimum reinforcing and component thickness shall be in accordance with Table 1 of the CSDMA, "Recommended Specifications for Commercial Steel Door and Frame Products".
- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .9 Fire-rated doors shall be provided for those openings requiring fire protection and temperature rise ratings, as indicated. Such products shall be listed for

conformance with ULC 104. All fire-rated doors shall bear the label of and be listed by a nationally recognized testing agency having a factory inspection service. Labeling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Fire-rated doors shall be constructed as listed for labeling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

- .10 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.
- .11 Welded Stiffener Construction (Reinforced Doors)
 - .1 Both face sheets for interior doors shall be formed from a sheet of 1.30 mm thick steel.
 - .2 Doors shall be reinforced with vertical stiffeners, securely welded to each face sheet at 150 mm on center maximum.
 - .3 Voids between vertical stiffeners shall be filled with fiberglass batt type insulation.
- .12 Manufacturer's nameplates on doors are not permitted.

2.6 Glazing Stops

- .1 Glazing stops shall be accurately fitted, butted at corners with removable stops located on push side of door.
- .2 Provide tamper proof screws on all doors and screens.

2.7 Finishes

- .1 Doors and frames shall wipe coat zinc, ready for painting.

Part 3 Execution

3.1 Manufacturer's Instructions

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 Installation

- .1 Install doors and frames to CSDMA Installation Guide, NAAMM-HMMA 840, Installation Guide for Commercial Steel Doors and Frames.
- .2 Fire-rated door and frame product shall be installed in accordance with NFPA-80.

- .3 Prior to installation, remove temporary shipping spreaders.
- .4 Prior to installation, the area of floor on which the frame is to be installed, and within the path of the door swing, shall be checked and corrected for flatness.
- .5 Check door and frame product for correct size, swing, rating and opening number.
- .6 The supplier shall be advised of any discrepancies prior to installation.
- .7 Set frames plumb, square, level and at correct elevation.
- .8 Secure anchorages and connections to adjacent construction.
- .9 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at centre of head for openings exceeding 1200 mm in width.
- .10 During the setting of frame product, check and correct as necessary for opening width, opening height, square, alignment, twist and plumb, in accordance with the CSDMA "Recommended Dimensional Standards for Commercial Steel Doors and Frames".
- .11 Remove wood spreaders after frames have been built-in.
- .12 Make allowance for deflection to ensure structural loads are not transmitted to frame product.
- .13 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 - Door Hardware. Coordinate with Section 08 71 13 for preparation and installation of automatic door operators.
- .14 Adjust operable parts for correct clearances and function.
- .15 Install louvers, glazing and door silencers.
- .16 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows:
 - .1 Hinge side: 1.0 mm.
 - .2 Latch side and head: 1.5 mm.
 - .3 Finished floor and thresholds: 13 mm.
- .17 Caulk perimeter of frames. Refer to Section 07 92 00 – Joint Sealants.

3.3 Finish Repairs

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.4 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 06 20 00 Finish Carpentry
- .2 Section 08 11 00 Metal Doors and Frames
- .3 Section 08 50 00 Aluminum Doors, Windows and Screens

1.3 References

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/DHI A115.1G-1994 Installation Guide for Doors and Hardware
 - .2 ANSI/ICC A117.1-2017 Accessible and Usable Buildings and Facilities
 - .3 ANSI/BHMA A156.1-2013 American National Standard for Butts and Hinges.
 - .4 ANSI/BHMA A156.2-2011 Bored and Preassembled Locks and Latches.
 - .5 ANSI/BHMA A156.3-2014 Exit Devices.
 - .6 ANSI/BHMA A156.4-2013 Door Controls - Closers.
 - .7 ANSI/BHMA A156.5-2014 Auxiliary Locks and Associated Products.
 - .8 ANSI/BHMA A156.6-2010 Architectural Door Trim.
 - .9 ANSI/BHMA A156.8-2010 Door Controls - Overhead Stops and Holders.
 - .10 ANSI/BHMA A156.10-2011 Power Operated Pedestrian Doors.
 - .11 ANSI/BHMA A156.12-2013 Interconnected Locks and Latches.
 - .12 ANSI/BHMA A156.13-2012 Mortise Locks and Latches Series 1000.
 - .13 ANSI/BHMA A156.15-2011 Release Devices - Closer Holder, Electromagnetic and Electromechanical.
 - .14 ANSI/BHMA A156.16-2013 Auxiliary Hardware.
 - .15 ANSI/BHMA A156.18-2012 Materials and Finishes.
 - .16 ANSI/BHMA A156.19-2013 Power Assist and Low Energy Power - Operated Doors.
 - .17 ANSI/BHMA A156.21-2014 Thresholds.
 - .18 ANSI/BMHA A156.22-2012 Door Gasketing and Edge Seal Systems
- .2 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): Standard Hardware Location Dimensions.
- .3 National Wood Window and Door Association (NWWDA)
- .4 Door Hardware Institute (DHI)
- .5 Accessibility for Ontarians with Disabilities Act (AODA)

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
- .3 Samples:
 - .1 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .2 After approval samples will be returned for incorporation in the Work.
- .4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Manufacturer's Instructions: Submit manufacturer's installation instructions.
- .6 Provide operation and maintenance data for door closers, locksets, door holders, electrified hardware and fire exit hardware for incorporation into Operations and Maintenance Manuals specified in Section 01 78 00 - Closeout Submittals.

1.5 Quality Assurance

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
 - .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

- .3 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
 - .4 Receive the delivery of the Finishing Hardware and identify all items against the Finishing Hardware Schedule. Ensure each hardware item is accompanied by the correct template, installation instructions, special tools, fastening devices and other loose items. Advise the finish hardware supplier and Consultant in writing of errors or omissions.
 - .5 Storage and Protection: Store finishing hardware in locked, clean and dry area.
 - .6 Remove all hardware from doors and frames prior to painting. After painting is complete and dry, reinstall all hardware to manufacturer's recommendations.
- 1.7 Waste Management and Disposal
- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.
- 1.8 Warranty
- .1 Warrant all hardware against defects of workmanship and material, for a period of one year, except for door closers which shall be warranted for ten years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

Part 2 Products

2.1 Materials

- .1 All hardware shall be supplied as specified in the Finishing Hardware Schedule.
- .2 All finishes shall be as indicated in the Finishing Hardware Schedule by international codes.
- .3 All door handles shall be lever type meeting requirements of the Ontario Building Code.
- .4 Power Door Operators and controls shall be CSA approved and shall meet the requirements of the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act (AODA).

2.2 Fastenings

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.3 Electrified Devices

- .1 Electrified exit devices shall conform to all traditional exit device standards as specified above. All power requirements for exit devices used must utilize a continuous circuit electric hinge for clean design and no visible means of interrupting power to device.
- .2 All exit devices with electric latch retraction shall provide for a remote means of unlocking for momentary or maintained periods of time.
- .3 Exit devices with electrified trim shall be fail-secure unless otherwise specified.

2.4 Keying

- .1 Keying: All permanent cylinders to be grandmaster-keyed as directed by the Owner. The factory shall key all locks and cylinders and maintain keying records. The factory shall establish a System Information Document (SID) to designate primary system administrators and require a separate letter of authorization for all future shipments of keyed products.
- .2 Remove all construction cores and install all permanent cores. Unless otherwise directed by the Owner.
- .3 Construction master/change keys are to be delivered by the contractor directly to The Owner.
- .4 Ship all permanent cylinders and keys separately. Identify door number and keyset symbol on each envelope for direct factory delivery to the owner.

Part 3 Execution

3.1 Manufacturer's Instructions

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 Examination

- .1 Before installing any hardware, carefully check all architectural drawings of the work requiring hardware, verify door swings, door and frame materials and operating conditions, and assure that all hardware will fit the work to which it is to be attached.
- .2 Check all shop drawings and frame and door lists affecting hardware type and installation, and certify to the correctness thereof, or advise the hardware supplier and Consultant in writing of required revisions.

3.3 Templates

- .1 Check the hardware schedule, drawings and specifications, and furnish promptly to the applicable trades any patterns, templates, template information and manufacturer's literature required for the proper preparation for and application of hardware, in ample time to facilitate the progress of the work.

3.4 Installation

- .1 Installation of hardware shall be in accordance with ANSI A115.1G, manufacturer's templates and instructions.
- .2 Install each item of mechanical and electromechanical hardware and access control equipment to comply with the manufacturer's written instructions and according to specifications. All items to be installed with fasteners identified by manufacturer's installation instructions unless otherwise noted.

- .3 Mounting Heights: Install door hardware at heights indicated in the following applicable publications unless; specifically indicated or required by local governing regulations, requirements to match for special templates, necessary coordination with door elevations, and or to ensure consistency with pairs of doors.
 - .1 DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames"
 - .2 DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors"
 - .3 ANSI/ICC A117.1 Accessibility Guidelines for Buildings and Facilities
 - .4 NWWDA
 - .5 AODA
- .4 Power door operator products and accessories are required to be installed by an AAADM certified technician as approved by the manufacturer. Adjust for proper opening and closing operation after final balancing of HVAC system.
- .5 Coordinate installation of electric door strikes, keypad locks, card readers, washroom duress systems, and other electronic door control and security devices with Electrical contractor including supply and installation of wiring and all terminations.
- .6 All hardware shall be installed by carpenters, skilled in the application of architectural hardware and satisfactory to the hardware supplier. Refer to Section 06 20 00 - Finish Carpentry. Instruction sheets, details and templates shall be read and understood before installation.
- .7 Install all materials as listed in the Finishing Hardware Schedule on the doors and frames listed. Interchanging of hardware will not be allowed.
- .8 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .9 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .10 Remove construction cores when directed by Owner's Representative.
- .11 After installation, templates, installation instructions and details shall be put in a file and turned over to the Owner, when building is Substantially Performed.

3.5 Field Quality Control

- .1 Conduct periodic inspections to ensure that door frames are installed plumb, level and square with verification by installer prior to installation of doors and door hardware.
- .2 Hardware supplier to attend site meetings as required to ensure proper execution of the guidelines set forth herein.
- .3 Hardware supplier will perform final field inspection of installed door hardware after final adjustment of all products and will document and report any deficiencies or omissions for correction and written acceptance by the Contractor.

3.6 Adjusting

- .1 Adjust door hardware, operators, closers and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to provide tight fit at contact points with frames.

3.7 Demonstration

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

3.8 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .4 Remove protective material from hardware items where present.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 08 11 00 Metal Doors and Frames
- .2 Section 08 50 00 Aluminum Doors and Screens
- .3 Section 08 71 10 Door Hardware

1.3 References

- .1 American National Standards Institute/Builders Hardware and Manufacturers Association (ANSI/BHMA):
 - .1 BHMA A156.10: 2017 Power Operated Pedestrian Doors
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.108-M89 Bituminous Solvent Type Paint
- .3 Canadian Electrical Code.
- .4 Ontario Building Code.
- .5 Accessibility for Ontarians with Disabilities Act (AODA)

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings: Submit shop drawings for review indicating all components, required clearances, electrical hook-up and coordination required with the work of related trades.
 - .1 Indicate materials, thickness, anchorage, finishes and operation. Indicate minimum acceptable clearances required.
 - .2 Provide layout for installation of door controller paddles and devices including mounting heights and conduit requirements.
 - .3 Submit wiring diagrams and schematics.
- .3 Provide maintenance data for automatic door operators complete with operation and maintenance instructions, pertinent details and spare parts list for incorporation into Maintenance Manuals specified in Section 01 78 00 – Closeout Submittals.

1.5 Maintenance

- .1 Instruct Owner in operation and maintenance of door operators.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.7 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.8 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of two years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

Part 2 Products

2.1 General

- .1 Power Door Operators and controls shall be CSA approved and shall meet the requirements of the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act (AODA).
- .2 Manufacturer: This specification is based on Stanley Access technologies Magic Swing Door Operators. Equivalent products by the following manufacturers are acceptable, subject to approval of the Consultant:
 - .1 Besam/Assa -Abloy
 - .2 Dormakaba
 - .3 Dor-O-Matic.
 - .4 Horton Automatics,

2.2 Material/Design/Operation

.1 Operator

- .1 Shall be Stanley Magic-Swing, electro-mechanical system sealed against dirt, dust and corrosion in a cast aluminum case and fully lubricated to minimize wear and friction of the moving parts between temperature extremes of -20 ° C and +60 ° C. The entire operator shall be removable from the header as a unit.
- .2 Size operators to suit weight of doors as indicated on the Door and Frame Schedule.
- .3 Aluminum header extrusions to be minimum 3.0 mm wall thickness and have a clear anodized finish to match adjacent frames.
- .4 Back paint all aluminum in contact with steel with bituminous paint to CGSB 1.108 and install PVC isolating strips.
- .5 All automatic entrance equipment is to comply with all sectors of ANSI A-156.10 and be C.S.A. approved.

- .2 Power Opening: The operator shall open the door with a 1/8 hp DC motor through reduction gears, ball screw actuator and a forged steel rack and pinion. Opening time to back-check (approximately 75°) shall be 1.25-1.6 seconds. The drive train shall have positive, constant engagement. A force no greater than 25 lbF at the lock stile shall stop the door from opening. The operator shall stop the door in the open position by electrically reducing the motor voltage and holding against an adjustable 90° stop.

- .3 Spring Closing: The operator shall close the door by spring energy. Closing speed shall be controlled by employing the motor as a dynamic brake and closing to latch check (approximately 10°) shall be in 3 seconds. Closing through last 10° shall be in 1.5 seconds minimum. The closing spring shall be a helical compression spring, pre-loaded for positive closing action at a low material stress level for long spring life.

- .4 Emergency Release: The operator shall have built in emergency release with controlled spring return to the closed position without manual resetting. While the door is in the emergency release mode, a disconnect switch shall prevent powered operation. No header or jamb mounted stops or cams shall be required for emergency function. Not more than 50 lbF at the lock stile shall be required for emergency use per ANSI A-156.10.

- .5 Manual Use: The operator shall function as a manual door closer in the direction of swing with or without electrical power.
 - .1 Entrapment Protection: the forces and speeds of power opening, manual opening in both directions of swing, and spring closing in both directions of swing shall conform to the requirements of ANSI-A-156.10.
- .6 Electrical Control: A solid state, completely enclosed electronic control with quick connect plugs shall incorporate the following features:
 - .1 A "safety plus" - 1 ½ second extension of both operate and safety signals after pressure has been removed from the control mats.
 - .2 A 2 ½ ampere current limiting circuit which limits the opening force of the operator to a maximum of 24 lbF at the lock stile.
 - .3 A "soft-start" motor driving circuit that reduces power to the motor after seven seconds of maintained opening speed.
 - .4 A cam actuated emergency breakout switch to disconnect power to the motor when the door is manually pushed in the emergency direction. The operator shall then automatically reset and power will be resumed.
- .7 Door Arm
 - .1 Linkage assembly shall provide positive control of door through entire swing; shall permit use on butt hung doors.
 - .2 Header shall be 140 mm wide by 152 mm high extruded aluminum of 3.0 mm thickness. Access to the operator and electronic control box shall be by a full length removable cover, edge rabbited to the header to insure flush fit. Finish to be anodized.
- .8 Controls
 - .1 Shall be manufacturer's standard Touchless, stainless steel push plate embossed with Handicap Symbol and "WAVE TO OPEN". Size of plate to meet Code requirements.
 - .2 CM-7536VR Clear Anodized.
 - .3 Provide CSA approved 50 x 100 mm minimum galvanized steel junction box or size to match frames. Any exposed boxes must be complete with necessary trim kits around boxes.
 - .4 Control devices shall be weatherproof.
 - .5 Where indicated, install junction box/control on door control pedestal. Pedestal shall be stainless steel, brushed finish purpose made for door operator controls.
 - .1 152 x 152 mm stainless steel pedestal.
 - .2 1220 mm high with sloped top.

- .3 1 single gang and 2 double gang openings. (Intercom/Card Reader/Door operator). Centrelines between 900mm and 1100mm to meet OBC Barrier Free requirements.

Part 3 Execution

3.1 Inspection

- .1 Inspect the site to ensure that no defects are present in the completed phases of the work which would result in poor application or installation or cause latent defects of the automatic door equipment.

3.2 Installation

- .1 Install components and wire operators in accordance with Manufacturer's instructions.
- .2 Power door operator products and accessories are required to be installed by an AAADM certified technician as approved by the manufacturer. Adjust for proper opening and closing operation after final balancing of HVAC system
- .3 Coordinate installation of operators with other Sections. Supply material to be built into the work when required.
- .4 Install control switches at heights in accordance with referenced standards and reviewed shop drawings.
- .5 Pedestals for automatic door operators shall be mounted on concrete foundations in accordance with manufacturer's recommendations and installation instructions. Exterior air entrained concrete as specified in Section 03 30 00.
- .6 Maintain minimum headroom requirements at doors as indicated on the reviewed shop drawings.
- .7 Adjust door operating components to ensure smooth opening and closing of doors.
- .8 Instruct the Owner in the correct operation, care and maintenance of the door operators.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Automatic Door
Operators
Section 08 71 13

3.3 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 07 92 00 Joint Sealants
- .2 Section 08 11 00 Metal Doors and Frames
- .3 Section 08 44 13 Glazed Aluminum Curtain Walls
- .4 Section 08 50 00 Aluminum Doors, Windows and Screens
- .5 Section 10 28 10 Toilet and Bath Accessories

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C162-05 (2015) Standard Terminology of Glass and Glass Products.
 - .2 ASTM C542-05(2017) Standard Specification for Lock-Strip Gaskets
 - .3 ASTM C1048-18 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
 - .4 ASTM C1376-15 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
 - .5 ASTM C1503-18 Standard Specification for Silvered Flat Glass Mirrors
 - .6 ASTM D790-17 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - .7 ASTM D1003-13 Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics
 - .8 ASTM D1929-20 Standard Test Method for Determining Ignition Temperature of Plastics
 - .9 ASTM D2240-15e1 Standard Test Method for Rubber Property—Durometer Hardness
 - .10 ASTM E84-20 Standard Test Method for Surface Burning Characteristics of Building Materials
 - .11 ASTM E330/E330M-14 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
 - .12 ASTM E1300-16 Standard Practice for Determining Load Resistance of Glass in Buildings
- .2 American National Standards Institute (ANSI).
 - .1 ANSI Z97.1 American National Standard for Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- .3 National Fire Protection Association
 - .1 NFPA 80 Standard for Fire Doors, Fire Windows.

- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-17 Safety Glazing
 - .2 CAN/CGSB-12.2-91 (R2017) Flat, Clear Sheet Glass.
 - .3 CAN/CGSB-12.3-91 (R2017) Flat, Clear Float Glass.
 - .4 CAN/CGSB-12.4-91 (R2017) Heat Absorbing Glass
 - .5 CAN/CGSB-12.8-17 Insulating Glass Units
- .5 CSA Group (CSA)
 - .1 AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
- .6 Consumer Product Safety Commission
 - .1 CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
- .7 Environmental Choice Program (ECP).
 - .1 CCD-045-95 Sealants and Caulking.
- .8 Flat Glass Manufacturers Association (FGMA).
 - .1 FGMA Glazing Manual - 1997.
- .9 Glass Association of North America (GANA)
 - .1 GANA Glazing Manual 50th Anniversary Edition-2008.
 - .2 GANA Laminated Glazing Reference Manual - 2009.
 - .3 GANA Sealant Manual-2008.
 - .4 GANA Guide to Architectural Glass (2010).
 - .5 GANA/PGC International Protective Glazing Manual (2010).
- .10 South Coast Air Quality Management District, California State (SCAQMD)
 - .1 SCAQMD Rule 1168-03, Adhesives and Sealants Applications.
- .11 Ontario Ministry of Municipal Affairs and Housing (MMAH)
 - .1 Ontario Building Code
 - .2 MMAH Supplementary Standard SB-10, Energy Efficiency Requirements.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials and assemblies comply with specified performance characteristics and criteria and physical requirements.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

- .6 Samples: Submit duplicate 300 x 300 mm size samples of glass and sealant material.
- .7 Manufacturer's Instructions: Submit manufacturer's installation instructions.
- .8 Provide maintenance data for glazing for incorporation into Operation and Maintenance Manual specified in Section 01 78 00 – Closeout Submittals.

1.5 Quality Assurance

- .1 Perform work in accordance with FGMA Glazing Manual and Laminators Safety Glass Association Standards Manual for glazing installation methods.
- .2 Installer: Company specializing in the installation of structural glazing with five years proven experience and approved by the manufacturer for installation of their products.
- .3 Safety glass products shall comply with the testing requirements of CAN/CGSB-12.1, Type 1 for Laminated Glass and Type 2 for Tempered Glass.
- .4 Provide safety glass permanently marked with the company name or logo and CAN/CGSB-12.1 if the product meets categories 1 and 2, or mark as CAN/CGSB 12.1M-1 if the product meets the requirements of Category 1 only.
- .5 Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or referenced standards.
 - .1 GANA Publications
 - .2 AAMA Publications
 - .3 IGMA/IGMAC Publications
- .6 Insulating Glass products are to be permanently marked either on spacers or at least one insulating unit component with appropriate certification label of the Insulating Glass Manufacturers Alliance (IGMA) or Insulating Glass Manufacturers Association of Canada (IGMAC)
- .7 Single-source fabrication responsibility: All glass fabricated for each type shall be processed and supplied by a single fabricator.
- .8 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

- .9 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 System Description

- .1 Performance Requirements: Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follows:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
 - .2 Insulating glass units in combination with aluminum window, storefront or curtain wall framing specified elsewhere shall be designed by the supplier to comply with energy efficient requirements specified in MMAH Supplementary Standard SB-10. Submit engineered shop drawings, calculations and certificates certifying compliance with that standard.

1.7 Design Requirements

- .1 Design glass, glazing channels, connections, attachments and glazing accessories to withstand loads designated by the Ontario Building Code and to accommodate all building deflections.
- .2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to a design pressure of 1.2 kPa as measured in accordance with ANSI/ASTM E330.
- .3 Limit glass deflection to 1/200 with full recovery of glazing materials.
- .4 Glass thicknesses indicated are minimum and are for detailing only. Confirm glass thickness by analyzing project conditions, including in-service conditions and loads. Provide glass lites for various size openings in nominal thicknesses indicated but not less than required to meet performance requirements of referenced standards including energy efficiency requirements of MMAH-SB-10. Coordinate glass thicknesses with manufacturers of framing systems.

1.8 Project Conditions

- .1 Install glazing when ambient temperature is 10 ° C minimum. Maintain ventilated environment for 24 hours after application.
- .2 Maintain minimum ambient temperature before, during and for 24 hours after installation of glazing compounds.

1.9 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Provide glass units with interleaving protection between lites. Keep glass and interleaving dry and store cases in clean, cool, dry areas with temperatures above the dew point. Circulation of cool, dry air in storage areas is essential. Open cases and inspect units periodically for moisture accumulation.
- .4 Do not store glass in direct sunlight without an opaque protective covering over same.

1.10 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.11 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of ten years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.
- .2 Warrant insulating glass units for ten years from date of Substantial Performance against seal failure, interpane dusting, or interpane misting.
- .3 Warrant low-emissivity coatings when applied to the second or third surfaces of an insulating glass unit, for ten years against peeling or coating deterioration due to product failure.
- .4 Warrant Laminated glass for ten years against delamination and discolouration.

Part 2 Products

2.1 Materials-Flat Glass

- .1 Float glass: to CAN/CGSB-12.3, glazing quality, 6 mm thick minimum.
- .2 Sheet glass: to CAN/CGSB-12.2, laminated tempered glass, 6 mm thick minimum.

- .3 Tempered Safety Glass: To CAN/CGSB-12.1, transparent, 10 mm thick unless indicated otherwise. Type 2-tempered.
 - .1 Class B-float.
 - .2 Category 1
 - .3 Edge treatment: ground, bevel edge.
- .4 Mirror Glass: Silvered mirror glass laminated-tempered: to ASTM C1503, minimum 6 mm thick.
 - .1 All edges ground and polished.
 - .2 All glazing for mirror shall be laminated tempered mirror glass units.

2.2 Insulating Glass Units

- .1 Performance requirements for insulating glass units specified herein are the minimum permitted requirements. Provide engineered shop drawings and calculations showing that glazed assemblies including framing and glazing products in combination, meet or exceed the minimum requirements of MMAH Supplementary Standard SB-10.
- .2 Insulating Glass Units: To CAN/CGSB-12.8-M, double glazed sealed units, 25 mm overall thickness.
 - .1 Glass: to CAN/CGSB-12.1(tempered)
 - .2 Glass thickness: 6.4 mm each light
 - .3 Inter-cavity space thickness: 12.7 mm with low conductivity spacers.
 - .4 Glass coating: surface number 2, low "E".
 - .5 Inert gas fill: argon.
- .3 Interior Units: Insulating Glass Type 2: For separation of "environmental areas", between Rink and Heated Spaces:
 - .1 Inner lite: 6mm tempered glass, clear.
 - .2 Air space. Argon Filled
 - .3 Outer lite: 6 mm tempered glass, clear.
 - .4 Total thickness: 25 mm.

2.3 Glazing Products

- .1 Select appropriate glazing sealants, tapes, gaskets and other glazing materials of proven compatibility with other materials that they contact. These include glass products, insulating glass unit seals and glazing channel substrates under installation and service conditions, as demonstrated by testing and field experience.
- .2 Setting blocks: Neoprene 80-90 Shore A durometer hardness to ASTM D 2240, to suit glazing method, glass light weight and area.

- .3 Spacer shims: Neoprene 50-60 Shore A durometer hardness to ASTM D 2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self-adhesive on one face.
- .4 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D 2240; coiled on release paper; black colour.
 - .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to effect an air and vapour seal.
- .5 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, colour as selected.
- .6 Lock-strip gaskets: to ASTM C542.
- .7 Glazing Gaskets: To ASTM C864.
- .8 Sealant: as specified in Section 07 92 00 – Joint Sealants. Low VOC.

Part 3 Execution

3.1 Manufacturer's Instructions

- .1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 Examination

- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.3 Preparation

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.4 Installation – General

- .1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.

3.5 Installation: Exterior Dry Method- Preformed Glazing

- .1 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant.
- .2 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .3 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- .4 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.
- .5 Trim protruding tape edge.

3.6 Installation: Exterior Wet/Dry Method (Preformed Tape and Sealant)

- .1 Cut glazing tape to length and set against permanent stops, 6 mm below sight line. Seal corners by butting tape and dabbing with sealant.
- .2 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
- .3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape and heel head of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.
- .5 Install removable stops with spacer strips inserted between glazing and applied stops 6 mm below sight line.
- .6 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 9 mm below sight line.
- .7 Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 Installation: Interior - Dry Method

- .1 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 9 mm below sight line.
- .2 Apply cap bead of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.
- .3 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .4 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .5 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
- .6 Place glazing tape on free perimeter of glazing.
- .7 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .8 Knife trim protruding tape.
- .9 Glaze hollow metal doors and pressed steel screens. Glass type as indicated.
- .10 Install wired glass in fire rated doors and screens to meet requirements of NFPA 80.

3.8 Glazed Doors and Sidelights

- .1 Doors and sidelights in a barrier-free path of travel consisting of a sheet of glass shall be marked with a continuous opaque strip conforming to Article 3.3.1.18 of the Ontario Building Code.

3.9 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Perform cleaning to remove construction and accumulated environmental dirt.
- .3 Remove traces of primer, caulking.
- .4 Remove glazing materials from finish surfaces.

- .5 Remove labels after work is complete.
- .6 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
- .7 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.10 Protection of Finished Work

- .1 After installation, mark light with an "X" by using removable plastic tape.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 41 00 Structural Metal Stud Framing
- .2 Section 06 10 00 Rough Carpentry
- .3 Section 07 21 13 Building Insulation
- .4 Section 07 26 00 Vapour Retarders
- .5 Section 07 27 13 Modified Bituminous Sheet Air Barriers
- .6 Section 07 84 00 Firestopping
- .7 Section 07 92 00 Joint Sealants
- .8 Section 09 21 16.13 Shaftwall Systems
- .9 Section 09 22 16 Non-Structural Metal Framing
- .10 Section 09 91 23 Interior Painting

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C514-04(2020) Standard Specification for Nails for the Application of Gypsum Board
 - .2 ASTM C840-20 Standard Specification for Application and Finishing of Gypsum Board
 - .3 ASTM C954-18 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - .4 ASTM C1002-18 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 - .5 ASTM C1047-14a (2019) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
 - .6 ASTM C1177/C1177M-17 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - .7 ASTM C1178/C1178M-18 Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
 - .8 ASTM C1278/C1278M-17 Standard Specification for Fiber-Reinforced Gypsum Panel
 - .9 ASTM C1280 - 18 Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.

-
- .10 ASTM C1288-17 Standard Specification for Fiber-Cement Interior Substrate Sheets
 - .11 ASTM C1325-22 Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units
 - .12 ASTM C1396/C1396M - 17 Standard Specification for Gypsum Board
 - .13 ASTM C1629/C1629M-19 Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
 - .14 ASTM E90-09 (2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - .15 ASTM E814-13a (2017) Standard Test Method for Fire Tests of Penetration Firestop Systems
 - .16 ASTM E1966-15 (2019) Standard Test Method for Fire-Resistive Joint Systems
 - .2 American National Standards Institute (ANSI)
 - .1 ANSI A118.9-1992 Test Methods and Specifications for Cementitious Backer Units.
 - .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34 Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB 19-GP-21M Sealing and Bedding Compound for Acoustical Purposes
 - .4 Underwriters Laboratories of Canada (ULC)
 - .1 ULC 102-2018 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 ULC 114-2018 Standard Method of Test for Determination of Non-Combustibility in Building Materials
 - .3 ULC 129- 2015 Standard Method of Test for Smoulder Resistance of Insulation (Basket Method)
 - .4 ULC List of Equipment and Material, Volume III, Fire Resistance Ratings.
 - .5 Gypsum Association (GA)
 - .1 GA-214-10 Recommended Levels of Gypsum Board Finish.
 - .2 GA-216-10 Application and Finishing of Gypsum Board.
 - .3 GA-253-12 Application of Gypsum Sheathing
 - .6 Wall and Ceiling Bureau
 - .1 Technical Bulletin Control Joint Placement in Gypsum Board Assemblies
- 1.4 Submittals
- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.

1.5 Quality Assurance

- .1 Dry wall installers: minimum 5 years proven experience.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
- .5 Mock-Ups
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up gypsum board wall installation including one inside corner and one outside corner. Mock-up may be part of finished work.
 - .3 Allow two working days for inspection of mock-up by Consultant before proceeding with rest of the work.
 - .4 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

1.6 Design Requirements

- .1 Where indicated provide minimum sound transmission rating of installed partitions of STC 50 tested to ASTM E90.
- .2 Provide fire resistance rating of installed partitions as indicated and according to referenced IULC design.

1.7 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Protect gypsum board materials before, during and after installation and to protect the installed work and materials of other trades affected by this work. Store materials in a dry area inside the building. Do not remove wrapping until ready for use. Prevent damage to all edges and surfaces.

1.8 Project Conditions

- .1 Maintain temperature minimum 10 ° C, maximum 21 ° C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

1.9 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 Gypsum Board

- .1 To ASTM C1396/C1396M. Standard for non-rated applications, Type X for rated applications, 1220 mm wide x maximum practical length, ends square cut, edges tapered with round edge, 12.7 mm thick or to thickness indicated on drawings. All fire rated board shall be minimum 16 mm thickness.
- .2 Abuse Resistant Gypsum Board: CGC Fibrerock abuse resistant fibre/gypsum panels, 16 mm thickness.
- .3 Water and Moisture Resistant Board: to ASTM C1396, 12.7 mm thick, 1220 mm wide with tapered edges.

- .4 Glass Mat Water-Resistant Gypsum Board: to ASTM C1178 with glass mat facings, both sides, regular and Type X, thicknesses as indicated on drawings, 1200 mm wide x maximum practical length, ends square cut, long edges tapered.
- .5 Glass Mat Exterior Gypsum Sheathing: to ASTM C1177, 12.7 mm thick, 1219 mm wide x 2440 mm long, square edge.
 - .1 Weight: 9.27 kg/m²
 - .2 Surfacing: Fiberglass mat on face, back, and long edges.
 - .3 Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 pounds per square foot, dry.
 - .4 Flexural Strength, Parallel (ASTM C473): 80 lbf, parallel.
 - .5 Humidified Deflection (ASTM C1177): Not more than 6.0 mm.
 - .6 Permeance (ASTM E96): Not less than 23 perms.
 - .7 R-Value (ASTM C518): 0.56.
 - .8 Mold Resistance (ASTM D3273): 10, in a test as manufactured.
 - .9 Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
 - .1 CGC Securock
 - .2 Georgia Pacific DENS-Glass Gold
 - .3 Certainteed GlasRoc

2.2 Cementitious Backer Board

- .1 Cementitious backer board: cementitious, water durable, board; surfaced with fiberglass reinforcing mesh on front and back; long edges wrapped; to ANSI A118.9, ASTM C1288 and ASTM C1325, 13 mm thick, edges tapered, 1200 mm wide x maximum practical length. Compressive strength: Not less than 15.51 MPa when tested in accordance with ASTM D2394. Water absorption: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C473.
 - .1 CGC Durock Brand
 - .2 Certainteed Diamondback

2.3 Fastening and Adhesives

- .1 Drywall Screws: To ASTM C954 or ASTM C1002 self-drilling, self-tapping, case hardened, length to suit board thickness and provide minimum 12 mm penetration into support.
- .2 Sheathing Screws: To ASTM C1002, corrosion resistant, heat treated self-tapping sheet metal screws minimum 32 mm long.

.3 Joint Tape: To ASTM C475, 50 mm perforated with preformed seam, mould and mildew resistant.

.1 Joint tape for abuse resistant gypsum board: CGC Mould Resistant Fiberglass Drywall Tape.

.4 Joint Filler and Topping: To ASTM C475 vinyl or latex base, slow setting.

.5 Joint Treatment for Gypsum Sheathing: 50 mm wide, 10 x 10 woven threads per 25 mm, self-adhering fibreglass joint tape and Borden HPPG Elmer's Siliconized Acrylic Latex Caulk.

.6 Laminating Compound: as recommended by manufacturer, asbestos-free.

2.4 Acoustic Insulation

.1 Acoustic Attenuation: Min 50 STC in accordance with ASTM E90.

.2 Acoustic Insulation: Mineral or Glass Fibre Acoustic Insulation:

.1 Mineral Fibre Acoustic Insulation: To ASTM C665, Mineral fibre blanket insulation, minimum density of 40 kg/m³:

.1 AFB Acoustical Fire Batts manufactured by Roxul Inc.

.2 Creased SAFB manufactured by Owens Corning Canada.

.2 Glass Fibre Acoustic Blanket Insulation: To CAN/ULC-S702, type 1, pre-formed unfaced glass fibre batt acoustic insulation.

.1 QUIETZONE Acoustic Blanket insulation manufactured by Owens Corning Canada.

.3 Surface burning characteristics to ULC 102:

.1 Flame spread: 15

.2 Smoke developed: 5

.3 Smoulder resistance: to ULC 129.

.4 Non-combustible: to ULC 114

.4 Thickness to suit depth of wall framing and as indicated.

.5 Acoustic sealant: as specified in Section 07 92 00 - Joint Sealants.

2.5 Accessories

.1 Casing beads, corner beads and edge trim: to ASTM C1047, zinc-coated by hot-dip process 0.5 mm base thickness, perforated flanges, one piece length per location.

- .2 Insulating Strip: Rubberized, moisture resistant, 3.0 mm thick, 12 mm wide closed cell neoprene strip, with self-sticking permanent adhesive on one face; lengths as required.
- .3 Sealants: as specified in Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 General

- .1 Prior to installation of gypsum wallboard, ensure that all required vapour barriers, air seals, gaskets and the like installed under another Section have been inspected and accepted by Municipal authorities and the Consultant. Failure to do so will result in removal of all gypsum board installed prior to approval and replacement, at no additional cost to the Owner.
- .2 Unless otherwise indicated on the drawings, all gypsum board partitions shall extend from floor level to the underside of floor or roof structures above.

3.2 Acoustic Insulation

- .1 Install acoustic blankets full width and length, with tight joints, between wall framing and around penetrating electrical service boxes, piping, air ducts and frames.
- .2 Place acoustic blankets where indicated on the Drawings and to thickness required to obtain acoustic performance indicated for the assembly.
- .3 Place acoustic blankets between studs ensuring friction fit, free of sags, folds or open joints that may let sound pass through.
- .4 Install blankets from the bottom up, tightly adjusted and trim accurately with a utility knife.

3.3 Gypsum Board Application

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do not apply gypsum board until bucks, anchors, blocking, electrical, and mechanical work are approved.

- .3 Apply gypsum board at right angles to framing members or furring using screw fasteners. Maximum spacing of screws 300 mm o.c.
- .4 Install fibre gypsum abuse resistant panels at all ceilings and bulkheads except as noted below. Treat joints with fibreglass reinforced joint tape in accordance with manufacturer's instructions.
- .5 Apply water or moisture resistant gypsum wallboard where indicated. Apply water resistant sealant to edges, ends and cut outs which expose gypsum core.
- .6 Install Hi-Density Water Resistant Gypsum Sheathing in showers and other wet areas.
- .7 Laminate gypsum board to existing masonry wall surfaces where indicated.
- .8 Carry gypsum board from floor to underside of floor or roof structure above. Furr out and carry gypsum board around any structural members as may be required. Neatly cope gypsum board to fill deck flutes where gypsum board abuts floor or roof deck.

3.4 Gypsum Sheathing

- .1 Install in accordance with GA-253, ASTM C1280 and manufacturer's recommendations.
- .2 Install exterior gypsum sheathing horizontally on all exterior walls where indicated. Stagger joints between adjacent sheets.
- .3 Screw-attach gypsum sheathing to each stud with 32 mm self-drilling corrosion resistant sheathing screws spaced 10 mm from ends and edges 200 mm o.c. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink. Apply sealant around sheathing perimeter at interface with other materials and install flashing as indicated on the drawings.
- .4 Apply fibreglass joint treatment to all joints, overlapping at intersections by the width of the tape. Apply 10 mm bead of sealant along the joint and embed the sealant into the entire surface of the tape with a trowel. Apply enough sealant to each exposed fastener to cover completely when trowelled smooth.

3.5 Cementitious Backer Board

- .1 Install cementitious backer board where indicated in shower and tub enclosures and other wet areas indicated.

- .2 Install in accordance with manufacturer's instructions.

3.6 Accessories

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges.
- .2 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.
- .3 Install insulating strips continuously at edges of gypsum board or casing beads abutting exterior door or window frames, to provide thermal break.
- .4 Install continuous bead of acoustic sealant at all penetrations through sound control partitions.
- .5 Provide control joints in gypsum board facing. Construct control joints in accordance with ASTM C840 and as described in Wall and Ceiling Bureau Technical Bulletin "Control Joint Placement in Gypsum Board Assemblies". Place control joints consistent with lines of building spaces as indicated. Where not indicated install as directed at maximum 6.0 m spacing. Control joints shall be supported with metal studs or furring channels on both sides of the joint. Construct joints using back-to-back casing beads filled with a low modulus sealant capable of flexible joint movement. Maintain fire-resistance rating of wall assemblies. Control joints shall be provided:
 - .1 At abutting structural elements, steel columns.
 - .2 At expansion or control joints in the substrate;
 - .3 At each door jamb.

3.7 Access Doors

- .1 Install access doors to electrical and mechanical fixtures specified in respective Sections.
- .2 Rigidly secure frames to furring or framing systems, to satisfy fire rating requirements.

3.8 Taping and Filling

- .1 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

- .2 Finish corner beads, control joints and trims as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .3 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.
- .4 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .5 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

3.9 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 41 00 Structural Metal Stud Framing
- .2 Section 09 21 16 Gypsum Board
- .3 Section 09 21 16.13 Shaftwall Systems

1.3 References

- .1 ASTM International (ASTM).
 - .1 ASTM A653/A653M-20 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM C645-18 Standard Specification for Nonstructural Steel Framing Members
 - .3 ASTM C754-20 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
 - .4 ASTM C841-03(2018) Standard Specification for Installation of Interior Lathing and Furring.
 - .5 ASTM C1002-18 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 - .6 ASTM E90-09(2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - .7 ASTM E814 - 13a(2017) Standard Test Method for Fire Tests of Penetration Firestop Systems
 - .8 ASTM E1966-15(2019) Standard Test Method for Fire-Resistive Joint Systems
- .2 Canadian General Services Board (CGSB).
 - .1 CAN/CGSB-1.40-97 Primer, Structural Steel, Oil Alkyd Type.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 ULC List of Equipment and Material, Volume III, Fire Resistance Ratings.
- .4 CSSBI Lightweight Steel Framing Manual

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for metal framing and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

- .1 Submit duplicate 300 mm long samples of non-structural metal framing.

1.5 Quality Assurance

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.7 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 Metal Stud Framing Systems

- .1 Non-load bearing channel stud framing: to ASTM C645, stud size as indicated, roll formed from 0.53 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
 - .1 Thickness of materials to conform to referenced standards unless noted otherwise.

- .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.
- .3 Metal channel stiffener: 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.
- .4 Tie Wire: 0.90 mm, galvanized, soft annealed, steel wire or clip as recommended by the manufacturer of furring channels.
- .5 Wind bearing light weight steel stud framing for exterior wall applications is specified in Section 05 41 00.

2.2 Metal Furring and Suspension Systems

- .1 Channel framing: to ASTM C645, stud size as indicated, roll formed from 0.53 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board.
 - .1 Thickness of materials to conform to referenced standards unless noted otherwise.
- .2 Metal Furring Runners, Hangers, Tie Wires, Inserts, Anchors: to ASTM C645 , electro-zinc coated steel.
- .3 Runner Channels: 38 x 19 x 0.59 mm and 38 x 9.5 x 0.45 mm, hot dip or electro-galvanized sheet steel. Use of various sizes governed by applied loads and applicable spans.
- .4 Drywall Furring Channel: Channel shaped furring member for screw attachment of drywall with knurled face. For interior use. Furring masonry or concrete surfaces. Cross furring under steel joist or suspended metal channels in suspended ceiling systems: 70 x 22 x 0.9 mm with knurled face, hot dip or electro-galvanized sheet steel. Bailey D-1001.
- .5 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .6 Deflection Track: Bailey Multi-Slot Track MST 250, size to suit studs, and top deflection clips TDC 350 and TDC 587.
- .7 Horizontal Flange attachment: Bailey Horizontal Flange Attachment Clip (HFA Clip)

- .8 Hangers: minimum 4.1 mm diameter (or as required by ULC fire rating design requirements) mild steel rods.

2.3 Shaft Wall Framing Systems

- .1 Shaft Wall Framing (Firewalls): To meet requirements of ULC design W446 for two (2) hour fire wall as indicated including C-H studs, E studs, and J runners, hot dip galvanized.
 - .1 CGC Cavity Shaft Wall framing system.
 - .2 Certainteed Glasroc Shaftliner framing system.

2.4 Fasteners

- .1 Powder activated fasteners: to suit structural conditions and fastening requirements and in accordance with manufacturer's recommendations: Ramset; Hilti; or approved equivalent.
- .2 Sheet Metal Screws: To ASTM C1002, self-drilling, self-tapping, case hardened, length to suit board thickness and provide minimum 12 mm penetration into support.

2.5 Accessories

- .1 Acoustic sealant: To ASTM E814 and ASTM E1966, with STC performance rating of 55 to ASTM E90.
- .2 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 mm wide, with self-sticking adhesive on one face, lengths as required.
- .3 Zinc Rich Paint: to CGSB 1-GP-181M. Low VOC type.

Part 3 Execution

3.1 Examination

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Consultant.

3.2 Erection

- .1 Comply with ASTM C754.
- .2 All gypsum board shall be supported with steel framing whether indicated or not.
- .3 Unless otherwise indicated on the drawings, all gypsum board partitions shall extend from floor level to the underside of floor or roof structures above.
- .4 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum. Provide top deflection tracks where indicated or as required to permit structural deflection. Install top deflection clips as necessary to increase load capacity,
- .5 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .6 Place studs vertically at 400 mm on centre unless noted otherwise and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .7 Erect metal studding to tolerance of 1:1000.
- .8 Attach studs to bottom and ceiling track using screws.
- .9 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .10 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .11 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .12 Install heavy thickness single jamb studs at openings.
- .13 Erect track at head of door/window openings and sills of window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

- .14 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .15 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .16 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .17 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50 mm leg ceiling tracks.
- .18 Erect drywall resilient furring transversely across studs and joists, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screws.
- .19 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.
- .20 Install continuous insulating strips to isolate studs from un-insulated surfaces.
- .21 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 Wall Furring

- .1 Install wall furring for gypsum board wall finishes in accordance ASTM C754 and ASTM C841 except where specified otherwise and indicated on drawings.
- .2 Frame openings and around built-in equipment, cabinets, access panels, etc., on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .3 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.4 Shaft Wall Framing

- .1 Install runners, studs, liner panels and finish panels for Firewall assemblies, where indicated, and in accordance with system manufacturer's printed instructions and to meet ULC W446 requirements for 2 hour firewall.
- .2 Finished assembly shall meet requirements for ULC listed assembly indicated.

3.5 Suspended and Furred Ceilings and Bulkheads

- .1 Erect hanger and runner channels for suspended gypsum board ceilings and bulkheads in accordance with ASTM C754 and ASTM C841 except where specified otherwise and indicated on drawings.
- .2 Securely anchor hanger to structural supports 1220 mm o.c. maximum along runner channels and not more than 150 mm from ends. Under no circumstances shall hanger wires be secured to or supported from mechanical or electrical materials or equipment or penetrate mechanical ductwork.
- .3 Space runner or furring channels as shown on drawings and not more than 610 mm o.c. maximum nor 150 mm from walls. Run channels in long direction of board. Bend hanger sharply under bottom flange of runner and securely wire in place with a saddle tie. Provide channels below mechanical or electrical equipment and mechanical ductwork to maintain maximum spacing.
- .4 Install furring channels transversely across runner channels in short direction of wallboard at 610 mm o.c. maximum or 150 mm from walls and interruptions in ceiling continuity. Secure channels to support with furring clips or wire. Where splicing is necessary lap minimum 200 mm and wire tie each end with double loops of 0.90 mm galvanized tie wire, 25 mm from each end of overlap.
- .5 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 610 mm around perimeter of fixture. Coordinate with Electrical.
- .6 Install work level to tolerance of 1:1200.
- .7 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles, etc.
- .8 Install furring channels parallel to, and at exact locations of steel stud partition header track.
- .9 Furr for gypsum board faced vertical bulkheads within or at termination of ceilings.

3.6 Gypsum Board

- .1 Installation of gypsum board is specified in Section 09 21 16

3.7 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 30 00 Cast-in-Place Concrete
- .2 Section 04 20 00 Concrete Unit Masonry
- .3 Section 07 92 00 Joint Sealants
- .4 Section 09 21 16 Gypsum Board
- .5 Section 07 92 00 Joint Sealants

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C150/C150M-18 Standard Specification for Portland Cement
 - .2 ASTM C207-06 (2011) Standard Specification for Hydrated Lime for Masonry Purposes
- .2 American National Standards Institute (ANSI)
 - .1 ANSI A108/A118/A136.1:2017 American National Specifications for the Installation of Ceramic Tile.
 - .2 ANSI A118.10 Waterproof Membrane
 - .3 ANSI A137.1: 2017 American National Standard Specifications for Ceramic Tile
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP 22M 1978 Adhesive, Organic, for Installation of Ceramic Wall Tile
- .4 International Standards Organization (ISO)
 - .1 ISO 10545 Series Ceramic Tiles, Standards for Testing
 - .2 ISO 13006-2012 Ceramic Tiles, Definitions, Classifications, Characteristics and Marking.
 - .3 ISO 13007-2010 Ceramic Tiles, Grouts and Adhesives.
- .5 Terrazzo, Tile and Marble Association of Canada (TTMAC)
 - .1 TTMAC 2016-2017 Specifications Guide 09 30 00, Tile Installation Manual.
 - .2 TTMAC Hard Surface Maintenance Guide.
- .6 Ontario Regulation 565/90: Public Pools

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

- .2 Provide product data. Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Mortar and grout.
 - .3 Divider strip.
 - .4 Levelling compound.
 - .5 Waterproofing isolation membrane.
- .3 Submit duplicate samples of tile. Samples to be submitted on 300 x 600 mm sample board for each colour, texture, size and pattern of tile. Grout sample joints for representative sample of final installation.
- .4 Trim and Accessories: submit duplicate samples of each trim.
- .5 Shop drawings: submit tiling plans giving all details of special fittings, expansion joints, joint layout, slopes, etc.
- .6 Maintenance Data: Provide maintenance data for tile work, for incorporation into Maintenance Manuals specified under Section 01 78 00.

1.5 Quality Assurance

- .1 Do tile work in accordance with Installation Manual 200, Ceramic Tile, by Terrazzo, Tile and Marble Association of Canada (TTMA), except where this specification is more stringent.
- .2 For the installation of ceramic tile, use only skilled tradesmen who are familiar with the referenced standards and with the requirements for this Work. Installer of ceramic tiles shall have a minimum of 10 years of experience including at least five projects of similar scope and scale. Submit documented proof of experience prior to commencing work of this Section.
- .3 The setting material manufacturer's representative shall review the details with the Contractor prior to the start of work. Instruct the Contractor on the proper installation procedures to ensure compliance with the guarantee requirements.
- .4 Pre Installation Conference
 - .1 Convene one week prior to commencing work of this section.
 - .2 Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.
 - .3 Meeting agenda includes but is not limited to:
 - .1 Tile and installation material compatibility.
 - .2 Grouting procedure.

- .3 Maintenance and cleaning products and methods.
- .4 Surface Preparation.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver packaged materials in original unopened containers.
- .3 Keep delivered material dry and free from stains. Store cementitious material off damp surfaces.
- .4 Use all means necessary to protect materials, before, during and after installation and to protect the installed work and materials of all other trades.
- .5 In the event of damage, immediately make all repairs and replacements necessary to the approval of the Consultant and at no additional cost to the Owner.
- .6 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.7 Project Conditions

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 °C for 48 hours before, during and after installation.
- .2 Do not install tiles at temperatures less than 12 °C or above 38 °C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 °C or above 25 °C.
- .4 Provide and maintain temporary lighting. Lighting levels shall be sufficient to complete work including inspections. Provide minimum lighting levels of 400 lux at work areas.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.9 Maintenance

- .1 Upon completion of the installation and as a condition of acceptance, deliver to the Owner 2% of tile and accessory tiles in each colour and pattern of ceramic tiles installed under this section for the Owners maintenance program. Identify each carton for location and installation date. Submission must be made all at one time and prior to Substantial Performance.

1.10 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of five years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

Part 2 Products

2.1 Materials

- .1 Materials shall be graded and containers grade sealed, delivered to the job site in their original packages or containers with the manufacturer's labels and seals intact.
- .2 Tile and grout colours shall be selected by the Consultant from the manufacturer's standard range of colours.
- .3 Tile shall conform to ANSI A137.1.
- .4 Floor tile shall have coefficient of slip resistance conforming to ANSI A137.1.
- .5 Provide coves, corners, reveals, surf caps, inners and outers as required to complete the work.

2.2 Porcelain and Ceramic Tile

- .1 Tile Type PCT: Shower Floor Tile: Olympia Tile, Quebec Series, 50 x 50 Mosaic, Anthracite Fleck Matte
- .2 Tile Type CT: Wall Tile: Olympia Colour and Dimension Series 100 x 305 mm Bone Bright glazed ceramic tile

2.3 Mortar, Grout, Additives, Waterproof Membranes and Adhesives

- .1 The products of one manufacturer shall be used throughout the project to ensure compatibility of materials. Manufacturers of commercial mortar, grout and adhesive having product considered acceptable for use:
 - .1 Laticrete
 - .2 Mapei
 - .3 Flextile
- .2 Water: Fresh, clean, potable, free from deleterious matter, acids or alkalis.
- .3 Floors: (thinset) T.T.M.A.C. Detail #311F.
 - .1 Moisture mitigation system (where indicated) as specified in Section 09 05 61.13
 - .2 Thinset mortar: Laticrete 4237 latex additive plus 211 Crete filler powder or Mapei Kerabond mixed with Keralastic high performance latex admixture or Flextile 52 thin set.
 - .3 Levelling Compound (if required): Laticrete 3701 latex or 226 Mapecem mortar mixed with Planicrete 50.
 - .4 Grout: Laticrete Latapoxy SP100, solid epoxy grout or Mapei Kerapoxy. Colours to Consultant's selection.
- .4 Walls:
 - .1 Concrete and Concrete Block: T.T.M.A.C. Detail #303W:
 - .1 Levelling Coat: Laticrete 3701 or Mapei Mapecem mixed with Planicrete 50.
 - .2 Thinset mortar: Laticrete 4237 latex additive plus 211 Crete filler powder or Mapei Kerabond mixed with Keralastic high performance latex admixture.
 - .3 Grout: Laticrete Latapoxy SP100 solid epoxy grout or Kerapoxy. Colours to Consultant's selection.

2.4 Patching and Levelling Compound

- .1 Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and levelling concrete floors, capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish and having not less than the following physical properties:
 - .1 Compressive strength: 25 MPa.
 - .2 Tensile strength: 7 MPa.
 - .3 Flexural strength: 7 MPa.
 - .4 Density: 1.9
 - .5 Products containing gypsum are not acceptable.

- .2 Levelling Compound: Laticrete 3701 latex or 226 Mapecem mortar mixed with Planicrete 50.

2.5 Floor Sealer and Protective Coating

- .1 To tile and grout manufacturer's recommendations.

2.6 Accessories

- .1 CT Edge Protection: Schluter RONDEC, size to suit tile thickness. Satin anodized aluminum. Trim to come with all connectors or end caps required for a complete and finished installation. As a minimum, provide edge protection at the following locations:
 - .1 Top of PC Base;
 - .2 Top of CT wall tile;
 - .3 All outside corners of wall tile or porcelain ceramic tile base.
 - .4 All porcelain tile wall base through the change rooms shall be complete with a cove base and necessary transition at all terminations and corners in the wall. Poor workmanship with the cove base will not be accepted.
- .2 Transition strip T1 Schluter Schiene Basic Finish, Zinc
- .3 Sealant: as specified in Section 07 92 00.

Part 3 Execution

3.1 Surface Conditions

- .1 Surfaces on which tile is to be applied, shall be thoroughly cleaned down.
- .2 Verify that concrete substrates have been allowed to cure for a minimum of 28 days in accordance with T.T.M.A.C. requirements.
- .3 Verify that Moisture Mitigation Control System specified in Section 09 05 61.13 has been installed, cured and accepted by the Consultant.
- .4 Verify that substrates for bonding tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and are within starting flatness tolerances as specified in Section 03 30 00 and are ready for application of levelling materials specified in this Section.

-
- .5 Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of Work, and similar items located in or behind tile have been completed before installing tile.
 - .6 Drywall surfaces on which wall and floor tile is to be applied, shall be free from dust, excess plaster and shall be plain and true without any irregularities. Prepare existing gypsum board surfaces as recommended by TTMAC and product manufacturer to support tile installation.
 - .7 Existing painted masonry or concrete wall surfaces to receive ceramic tile shall be thoroughly cleaned of all paint down to concrete or concrete block surfaces using paint stripper. Prepare painted surfaces in accordance with manufacturer's instructions and TTMAC recommendations.
 - .8 In the event of discrepancies, immediately notify the Consultant and do not proceed with installation in such areas until all such discrepancies have been fully resolved.
 - .9 Check that conditions of temperature, humidity, traffic and usage are suitable as required by Installation Manual specifications. Minimum temperature to be not less than 10 °C.
 - .10 Check that surfaces ready to receive tiling are cured, level and/or graded, plumb, smooth, firm, free from loose particles, droppings, projection, grease, solvent, paint and other foreign matter and from other unsuitable conditions.
 - .11 Install transition strips, reducers and edge trim at exposed edges of all tiled walls and floors in accordance with manufacturer's instructions.

3.2 Installation

- .1 Install tiling in accordance with requirements of TTMAC Tile Installation Manual and parts of ANSI A108 Series of tile installation standards that apply to types of bonding and grouting materials, and to methods required for complete tile installation.
- .2 Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions:
 - .1 Terminate Work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 - .2 Make cut edges smooth, even and free from chipping.
 - .3 Do not split tile.

-
- .3 Accurately form intersections and returns; perform cutting and drilling of tile without marring visible surfaces:
 - .1 Cut, drill, and fit tile to accommodate work of other subcontractors penetrating or abutting work of this Section.
 - .2 Carefully grind cut edges of tile abutting trim, finish, or built in items for straight aligned joints.
 - .3 Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile and to provide a uniform joint appearance.
 - .4 Lay tile in pattern indicated on Drawings and as follows:
 - .1 Align joints when adjoining tiles on floor, base, walls, and trim are the same size.
 - .2 Centre tile patterns between control and movement joints; notify Consultant for further instructions where tile patterns do not align with control or movement joints.
 - .3 Cut tile accurately and without damage.
 - .4 Smooth exposed cut edges with abrasive stone, where exposed.
 - .5 Chipped or split edges are not acceptable.
 - .6 Provide pool markings where required and in conformance with Ontario Regulation 565/90 – Public Pools.
 - .5 Bonding Bed: Set tile in place while bond coat is wet and tacky and as follows:
 - .1 Adjust amount of bonding materials placed on substrates based on temperature and humidity to prevent skinning over of bonding materials.
 - .2 Use sufficient bond coat to provide a minimum 80% contact for tiles smaller than 300 mm x 300 mm with bonding material evenly dispersed and pressed into back of tile; refer to back buttering requirements for larger materials and installations having Moderate or higher Load Bearing Performance requirements.
 - .3 Notch bond coat in horizontal straight lines and set on freshly placed bonding material while moving (sliding) tile back and forth at 90° to notches.
 - .4 Verify that corner and edges are fully supported by bonding material.
 - .5 Set tiles to prevent lippage greater than 1 mm over a 3 mm grout joint.
 - .6 Keep two-thirds of grout joint depth free of bonding materials.
 - .7 Clean excess bonding materials from tile surface prior to final set.
 - .8 Sound tiles after bonding materials have cured and replace hollow sounding tile before grouting.

- .6 Back Buttering: Obtain 100% mortar coverage in accordance with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108 series of tile installation standards for the following applications:
- .1 Tile in wet areas:
 - .1 Showers
 - .2 Tile installed with chemical resistant mortars and grouts
 - .3 Tile having tiles 300 mm or larger in any direction
 - .4 Tile having tiles with raised or textured backs
 - .5 Tile having tile installation rated for Heavy or Extra Heavy Duty.
 - .6 All porcelain tiles with more than 20% of the tile backs covered with firing release dust back buttered so that 100% of the back is covered with adhesive mortar rated for C627, Extra Heavy Duty rating.
 - .7 Install prefabricated edge strips and control at locations indicated or where exposed edge of floor tile meets different flooring materials and exposed substrates.
 - .8 Install finishing and edge protection at exposed corners of wall tile.
 - .9 Protect exposed edges of floor tile with properly sized transition strips, use sloped reducer strips where uneven transitions between 6 mm and 13 mm occur.
 - .10 Control and Movement Joints: Install control joints and expansion joints in tile work in accordance with TTMAC Detail 301MJ; keep control and expansion joints free of bonding materials and as follows:
 - .1 Cut tiles to establish line of joints; sawn joints after installation of tiles will not be acceptable.
 - .2 Locate joints in tile surfaces directly above joints in concrete substrates.
 - .3 Provide floor control joints over structural control joints.
 - .4 Install prefabricated joint profiles in accordance with manufacturer's written instructions, set with top surface of joint profile slightly below top surface of tile.
 - .5 Prepare joints and apply sealants in accordance with requirements of Section 07 92 00.
 - .6 Keep control and movement joints free from setting materials.
 - .7 Form an open joint for sealant in tile wherever a change in backing material occurs, at all vertical interior corners, around penetrating pipes and fixtures, and where tile abuts other materials or fixtures.
 - .8 Install control joints where indicated or at not less than the following spacings:

| Environment | Minimum | Maximum | Joint Width (minimum) |
|-------------------|---------|---------|-----------------------|
| Interior/Shaded | 4800 mm | 6100 mm | 6 mm |
| Interior/Sunlight | 2400 mm | 3700 mm | 6 mm |

- .11 Waterproof membrane and setting materials shall be installed in strict accordance with manufacturer's instructions.

3.3 Grouting

- .1 Grouting: Install grout in accordance with manufacturer's written instructions, the requirements of TTMAC, and as follows:
 - .1 Allow proper setting time before application of grout.
 - .2 Pre-seal or wax tiles requiring protection from grout staining.
 - .3 Force grout into joints to a smooth, dense finish.
 - .4 Remove excess grout in accordance with manufacturer's written instructions and polish tile with clean cloths.
- .2 Grout all tile using specified grout in strict accordance with manufacturers written instructions all to give a flush, hard joint.
- .3 Joints in tile shall be filled solid and flush with grout.
- .4 Prepare joints and mix grout in accordance with manufacturer's printed instructions. Force maximum amount of grout into joints, avoiding air traps or voids.
- .5 Remove all excess grout by washing diagonally across the joints. Check for voids, air pockets and gaps and fill same. Remove all discoloured grout and replace with new.
- .6 Cure all joints.

3.4 Floor Sealer and Protective Coatings

- .1 Apply in accordance with manufacturer's instructions.

3.5 Cleaning and Protection

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Cleaning: Clean tile surfaces so they are free of foreign matter using manufacturer recommended cleaning products and methods after completion of placement and grouting and as follows:
 - .1 Remove grout residue from tile as soon as possible.
 - .2 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days

after installation; protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.

- .3 Flush surface with clean water before and after cleaning.
- .3 Protection: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies as follows:
 - .1 Protect finished areas from traffic until setting materials have sufficiently cured in accordance with TTMAC requirements.
 - .2 Protect floor areas from traffic after grouting is completed in accordance with manufacturer's written instructions.
 - .3 Prevent foot and wheel traffic from floors for a minimum of 24 hours after completion of grouting.
 - .4 Provide protective covering until Substantial Performance of the Work.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 09 21 16 Gypsum Board
- .2 Section 09 53 00 Acoustical Suspension

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM C423-22 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - .2 ASTM E84-22 Standard Test Method for Surface Burning Characteristics of Building Materials
 - .3 ASTM E1264-22 Standard Classification for Acoustical Ceiling Products
 - .4 ASTM E1414/E1414M-21a Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
 - .5 ASTM E1477-98A(2017)e1 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 ULC 102-2018 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
 - .1 Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- .3 Submit duplicate 300 x 300 mm samples of each type of acoustical units.

- .4 Provide maintenance data for acoustic panel ceilings for incorporation into Operation and Maintenance Manual specified in Section 01 78 00 – Closeout Submittals.

1.5 Quality Assurance

- .1 Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
 - .1 Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - .2 Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E1264 Classification.
 - .3 Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory
- .2 Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
- .3 Mock-up:
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up 10 m² minimum of acoustical panel tile ceiling including one inside corner and one outside corner.
 - .3 Construct mock-up where directed.
 - .4 Allow 48 hours for inspection of mock-up by Consultant before proceeding with ceiling work.
 - .5 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of the finished work.

1.6 Project Conditions

- .1 Permit wet work to dry before beginning to install.
- .2 Maintain uniform minimum temperature of 15° C and humidity of 20-40% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.
- .4 Building areas to receive ceilings shall be free of construction dust and debris.

1.7 Performance Requirements

- .1 Surface-Burning Characteristics: Conform to ULC S102 or ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- .2 Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to applicable code.

1.8 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Protect on site stored or installed absorptive material from moisture damage.

1.9 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.10 Extra Materials

- .1 Provide extra materials of acoustic units in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide acoustical units amounting to 5% of gross ceiling area for each pattern and type required for project.
- .3 Ensure extra materials are from same production run as installed materials.

Part 2 Products

2.1 Materials

- .1 Acoustic units for suspended ceiling system: to ASTM E1264
- .2 Panel Type 1: CGC Rada Illusion Acoustical Ceiling Panels
 - .1 Class A.
 - .2 Composition: Water Felted Mineral Fiber
 - .3 Pattern regular fissured.
 - .4 Texture: medium.

- .5 Flame spread: ASTM E1264, Class A (U.L.C.), 25 or less.
 - .6 Smoke developed 50 or less in accordance with ULC 102.
 - .7 Noise Reduction Coefficient (NRC): ASTM C423; Classified with UL label, 0.55
 - .8 Ceiling Attenuation Class (CAC): ASTM C1414; Classified with UL label, .35
 - .9 Light Reflectance (LR) range of 0.84 to ASTM E1477.
 - .10 Dimensional Stability: Standard
 - .11 Edge Profile: Square Lay-In
 - .12 Colour: White.
 - .13 Size 610 x 1219 x 16 mm thick.
 - .14 Shape flat.
 - .15 Surface coverings: Ecolabel certified paint.
- .3 Alternate manufacturer: Products as manufactured by the following are acceptable, subject to Consultants approval of style, finish, performance characteristics and texture:
- .1 Armstrong Industries
 - .2 Certainteed
- .4 Ceiling Suspension System: as specified in Section 09 53 00.

Part 3 Execution

3.1 Examination

- .1 Do not install acoustical panels until work above ceiling has been inspected by Consultant.

3.2 Installation

- .1 Co-ordinate with Section 09 53 00 - Acoustical Suspension.
- .2 Coordinate layout and installation of ceilings with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and fire-suppression system.
- .3 Install acoustical panels and tiles in ceiling suspension system.
- .4 Install acoustical units parallel to building lines with edge unit not less than 50% of unit width, with directional pattern running in same direction. Refer to reflected ceiling plan.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Acoustic Panel
Ceilings
section 09 51 13

- .5 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding

3.3 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 12 23 Structural Steel
- .2 Section 09 21 16 Gypsum Board
- .3 Section 09 51 13 Acoustic Panel Ceilings
- .4 Division 23 Mechanical
- .5 Division 26 Electrical

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A307-21 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
 - .2 ASTM A641/A641M-19 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .3 ASTM A1011/A1011M-18a Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - .4 ASTM C635/C635M-17 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay in Panel Ceilings.
 - .5 ASTM C636/C636M-19 Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - .6 ASTM A653 / A653M – 20 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .7 ASTM E84-21a Standard Test Method for Surface Burning Characteristics of Building Materials
 - .8 ASTM E119-20 Standard Test Methods for Fire Tests of Building Construction and Materials
 - .9 ASTM E1264-19 Standard Classification for Acoustical Ceiling Products

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Submit manufacturer's technical data for each type of acoustical

ceiling unit and suspension system required.

- .3 Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
- .4 Submit one representative model of each type of ceiling suspension system.
 - .1 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

1.5 Design Requirements

- .1 Determine the superimposed loads that will be applied to suspension systems by components of the building other than the ceiling and ensure that adequate hangers are installed to support the additional loads in conjunction with the normal loads of the system.
- .2 Design supplemental suspension members and hangers where width of ducts and other construction within ceiling plenum produces hanger spacing that interferes with location of hangers at required spacing to support standard suspension system members:
 - .1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- .3 Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of L/360 to ASTM C635 deflection test.

1.6 Performance Requirements

- .1 Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to applicable code.

1.7 Quality Assurance

- .1 Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- .2 Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - .1 Surface Burning Characteristics: Tested per ASTM E84 and complying with ASTM E1264 Classification.

- .3 Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
- .4 Where required, provide fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .5 Construct mock-ups in accordance with Section 01 45 00 - Quality Control and as described in Section 09 51 13.

1.8 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.9 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 Materials

- .1 Components: All main beams and cross tees, base metal and end detail shall be commercial quality hot-dipped galvanized steel as per ASTM C635. Main beams and cross tees shall be double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
- .2 Face width: 22 mm
- .3 Edge Moldings and Trim: Hemmed angle moulding to match main beams and cross tees.
- .4 Structural Classification: Intermediate Duty System, ASTM C635.
- .5 Colour: White and match the actual colour of the specified ceiling tile.

- .6 Standard of Acceptance:
 - .1 Armstrong Prelude XL
 - .2 Donn DXT
 - .3 Certainteed Classic Environmental Stab.
- .7 Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1, Direct Hung unless otherwise indicated or required.
- .8 Threaded Rod: to ASTM A397. Galvanized or zinc plated.
- .9 Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three times design load, but not less than 2.06 mm thick.
- .10 Channel Framing and Fittings: Strut type metal framing and components to ASTM A1011 or ASTM A653. Unistrut P1000SL or equivalent. Galvanized.

Part 3 Execution

3.1 Manufacturer's Instructions

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 Examination

- .1 Do not proceed with installation until all wet work such as concrete, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.3 Preparation

- .1 Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- .2 Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 - .1 Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.4 Installation

- .1 Install suspension system and panels in compliance with ASTM C636; CISCA Seismic Guidelines and in accordance with the manufacturer's installation instructions.
- .2 Install wall moldings at intersection of suspended ceiling and vertical surfaces.
- .3 Do not erect ceiling suspension system until work above ceiling has been inspected by Consultant.
- .4 Secure hangers to overhead structure using attachment methods as indicated by manufacturer. Do not suspend ceiling systems from building services including plumbing lines, conduit, cable trays or duct work.
- .5 Hanger and bracing wires shall not attach to or bend around obstructions including but not limited to: piping, ductwork, conduit and equipment. Provide trapeze or other supplementary support members at obstructions to allow typical hanger spacing. Brace assemblies must be configured and/or located in order to avoid obstructions in addition to maintaining the required brace assembly spacing.
- .6 Install hangers spaced at maximum 1219 mm centres and within 152 mm from ends of main tees. Install hanger wires plumb and straight.
- .7 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter with border units not less than 50% of standard unit width.
- .8 Ensure suspension system is coordinated with location of related components.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles, and speakers.
- .10 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 610 mm around perimeter of fixture.
- .11 Interlock cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Install access splines to provide ceiling access.

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Acoustical
Suspension
Section 09 53 00

.14 Finished ceiling system to be square with adjoining walls and level within 1:1000

3.5 Cleaning

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 Touch up scratches, abrasions, voids and other defects in painted surfaces

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 30 00 Cast-in-Place Concrete

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM D2047-11 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 - .2 ASTM D2240-05(2010) Standard Test Method for Rubber Property—Durometer Hardness
 - .3 ASTM D5116-10 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
 - .4 ASTM E648-15e1 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - .5 ASTM E662-15a Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
 - .6 ASTM E1745-11 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
 - .7 ASTM F970-15 Standard Test Method for Static Load Limit
 - .8 ASTM F1869-11 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - .9 ASTM F710-11 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
 - .10 ASTM G21-15 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101, Code for Safety to Life from Fire in Buildings and Structures.
- .3 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-03, Adhesives and Sealants Applications.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Before any rubber flooring materials are delivered to the job site, submit a complete list of all materials proposed to be furnished and installed under this

Section of the Work, stating manufacturer's name and catalogue number for each item, and product samples in colours specified.

- .3 Submit two copies of the manufacturer's current recommended method of installation for each item.
- .4 Submit Manufacturer's current printed data sheets on specified products.
- .5 Samples: submit duplicate 100" x 100 mm" samples of full range of manufacturer's specified products and colours.
- .6 Submit maintenance data for athletic rubber tile flooring for Operation and Maintenance Manual specified under Section 01 78 00.

1.5 Quality Assurance

- .1 Manufacturer must be certified ISO 9001 and ISO 14001.
- .2 Manufacturer must have experience in the manufacturing of prefabricated rubber athletic flooring.
- .3 Installer must have performed installations of the same scale in the last three (3) years.
- .4 Installer to be recognized and approved by the rubber athletic flooring manufacturer.
- .5 Mock Up: Mock up is to be installed following the same procedures and utilizing the same specified materials that will be used for the actual project. Mock-up size: minimum 3.0 square meters.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Materials must be delivered in Manufacturer's original, unopened and undamaged containers with identification labels intact.

- .4 Store material upright on a clean, dry, flat surface protected from all possible damage, and protect from exposure to harmful weather conditions.
- .5 Store materials at a minimum temperature of 13⁰ C.

1.7 Project Conditions

- .1 Maintain a stable room and subfloor temperature between 18⁰ C to 30⁰ C for a period of 48 hours prior, during and 48 hours after installation.
- .2 Installation to be carried out no sooner than the specified curing time of concrete subfloor.
- .3 Moisture vapor emission content of the concrete slab must not exceed the tolerance of the adhesive used when tested using the anhydrous calcium chloride test as per ASTM F1869.
- .4 Perform an alkalinity test and moisture test before commencing. Moisture content must not exceed the capacity of the specified adhesive (verify using the anhydrous calcium chloride test as per ASTM F1869 and pH level should be in the range of 7 to 8.5.
- .5 Installation of rubber athletic flooring shall not commence unless all other trades in the building are completed.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.9 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of three (3) years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

Part 2 Products

2.1 Materials

- .1 Athletic rubber shall be Mondo Ramflex as distributed by Gym-Con or equal.

- .2 Material shall be rubber athletic flooring, calendered and vulcanized with a base of natural and synthetic rubbers, stabilizing agents and pigmentation. Manufactured in two layers which are vulcanized together. The shore hardness of the top layer will be greater than that of the bottom layer; shore hardness of layers to be recommended by the manufacturer and the limits specified.

- .1 Thickness: 10 mm
- .2 Tile size: 610 x 610 mm
- .3 Colour: standard, solid background colours with random marbleization throughout material. Two (2) colours to be selected by the Consultant from manufacturer's standard colour range.
- .4 Finish: hammered.
- .5 Manufactured in two layers, which are vulcanised together. The shore hardness of the top layer will be greater than that of the bottom layer, shore hardness of layers to be recommended by the manufacturer and the limits specified.

- .3 Performance of the prefabricated rubber athletic flooring shall conform to the following criteria:

| Performance Criteria | Test Method | Result |
|--------------------------|---------------------|---------------------------------|
| Hardness Shore A | ASTM D2240 | 77/71 |
| Critical Radiant Flux | ASTM E648, NFPA 101 | 0.58 W/cm ² , Type I |
| Optical Density of Smoke | ASTM E 662 | < 450, Class I |
| Fungal Resistance Test | ASTM G21-90 | No growth |
| Coefficient of Friction | ASTM D2047 | 1.0 dry, 1.2 wet |
| V.O.C. Compliant | ASTM D5116 | Yes |
| Colour Stability | | Good |
| Light reflection | | Average |
| Chemical Resistance | | Good |

- .4 Adhesive: Provide adhesive certified by the manufacturer, PU 105 Polyurethane Adhesive or EP 55 epoxy adhesive.
- .5 Primers shall be waterproof, best quality formulated for the application of the rubber floor coverings over subfloor as indicated on the drawings and Room Finish Schedules. Primers to be type and brand recommended and certified by the manufacturer of the products for use with his materials and used in strict accordance with the manufacturer's directions.
- .6 Patching or levelling compound to be supplied and/or recommended/approved by rubber athletic flooring Manufacturer and shall be compatible with tile adhesive.

- .7 Reducer strips shall be manufacturer's standard reducer strips, 38 mm wide tapered from 9.5 mm to 0 mm.
- .8 Sealant: As recommended by tile manufacturer.

Part 3 Execution

3.1 Examination

- .1 New concrete floors and toppings must be thoroughly cured (minimum 28 days) prior to tile installation.
- .2 Carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation of rubber flooring may properly commence.
- .3 Confirm that rubber flooring may be installed in accordance with the original design and the manufacturer's recommendations.
- .4 Ensure that no concrete sealers or curing compounds are applied or mixed with the subfloors.
- .5 Ensure concrete surfaces are smooth, dense finish, highly compacted with a tolerance of 3 mm in 3.00 m radius.
- .6 In the event of discrepancy, immediately notify the Consultant. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 Preparation

- .2 Prepare subfloor in accordance with Manufacturer's current printed subfloor preparation guidelines and ASTM F710-11. Include levelling of existing floors and trenches.
- .3 Allow for excessive levelling and preparation of existing floors where previous finishes have been removed.

3.3 Installation

- .1 Install rubber athletic flooring in accordance with Manufacturer's current printed Installation Manual.

- .2 Fill all cavities, cracks, joints and all other surface imperfections in concrete substrate with latex fill or other approved subfloor filler in order to produce a smooth, flat, hard surface for receipt of rubber flooring. Scrape off all ridges, droppings, scale and other projections. Clean floor with an industrial vacuum cleaner. Remove all substance and materials affecting adhesive bond.
- .3 Prime concrete floors and apply adhesive uniformly with notched spreaders, at correct coverage as recommended by the manufacturer. Do not spread more adhesive than can be covered before initial set takes place. Place tiles so that adhesive is squeezed into tile joints and provides a watertight joint.
- .4 Where tiles terminate at doorways, or where tiles of different type or colour butt together the joint shall centre on the door.
- .5 Provide and install reducer strips where rubber floor tiles terminate against a concrete floor where no applied architectural floor finish is required. Reducer strip shall be installed below centre of door where a door occurs.
- .6 Tile shall be laid with all joints square and tightly butted together. Start installation from centre of rooms to ensure equal maximum size edge tiles. Pattern and direction of tile shall be as directed by the Consultant.
- .7 Tile to be laid full depth of closets, toe spaces, and recesses. Cut and fit tiles tightly against openings, breaks, frames, fixtures, columns and other vertical surfaces. Carry tile under all movable fitments. Apply adhesive to provide watertight joint around all cut areas.
- .8 Seal perimeter of all athletic rubber tile at walls and penetrations in accordance with manufacturer's recommendations.

3.4 Schedule

- .1 Refer to the floor plans and schedules for areas to receive Athletic Rubber Flooring (RST)

3.5 Extra Stock

- .1 Upon completion of the installation and as a condition of acceptance, deliver to the Owner 3% of tile and accessory tiles in each colour and pattern of resilient athletic flooring installed under this section for the Owners maintenance program. Identify each carton for location and installation date. Submission must be made all at one time and prior to Substantial Performance.

3.6 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Remove surplus adhesive from athletic rubber floor tiles as the work progresses.
- .3 Maintain rubber athletic flooring according to manufacturer's current maintenance instructions for specified product.
- .4 Protect with non-staining building paper or masonite.
- .5 Immediately prior to Substantial Performance. Remove protection, clean, dry or damp mop floors.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 30 00 Cast-in-Place Concrete

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM F1869-16a Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- .2 American Concrete Institute (ACI)
 - .1 ACI 308 Standard Specification for Curing Concrete
- .3 International Concrete Repair Institute (ICRI)
 - .1 ICRI 310.2R-2013, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-06, Architectural Coatings.

1.2 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data: Submit manufacturer's Product data indicating:
 - .1 Two copies of manufacturer's Product data on characteristics, performance criteria, and limitations.
 - .2 Preparation, installation requirements and techniques, Product storage, and handling criteria.
 - .3 Submit MSDS for specified products and maintain copy on site.
- .3 Manufacturer Certificate: Indicating products listed on Contractor's Product List are compatible and suitable for the specified application.
- .4 Samples: Submit minimum 300 x 300 mm samples indicating coating and final concrete finish.
- .5 Reports: Submit manufacturer's acceptance of substrate prior to installation in writing. Submit verification of moisture content of floor prior to installation.

- .6 Provide maintenance data for floor coating for incorporation into Operating and Maintenance Manuals specified in Section 01 78 00.

1.3 Quality Assurance

- .1 Perform Work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer.
- .2 Arrange with manufacturer's representative to inspect substrates and installation procedures 48 hours in advance of installation.

1.4 Project Conditions

- .1 Do not install the Work of this Section outside of environmental ranges as recommended by the manufacturer without Product manufacturer's written acceptance and as follows:
 - .1 Relative Humidity: In accordance with manufacturers' requirements.
 - .2 When no dust is being raised.
 - .3 In well-ventilated and broom clean areas.
- .2 Post do not enter and appropriate warning signs at conspicuous locations.

1.5 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Store materials at site in an area specifically set aside for purpose that is locked, ventilated, and maintained at a minimum temperature of 16° C.
- .4 Ensure that health and fire regulations are complied with in storage area, and during handling and application.

1.6 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.7 Warranty

- .1 Warrant the work of this Section against defects of workmanship and material, for a period of two (2) years from the date of Substantial Performance and agree to make good promptly any defects which occur or become apparent within the warranty period.

Part 2 Products

2.1 Materials

- .1 Provide liquid densifier sealer and related concrete treatment and admixture products from a single qualified manufacturer.
- .2 Liquid Densifier Sealer: High performance, deeply penetrating concrete densifier; odorless, colorless, VOC - compliant, non-yellowing silicate and silicate based solution designed to harden, dustproof and protect concrete floors and to resist black rubber tire marks. The compound must contain a minimum solids content of 20% of which 50% is silicate.
- .3 Basis of Design Product: Ashford Formula by the Ashford Formula Company.
- .4 Acceptable Alternate Manufacturers:
 - .1 BASF
 - .2 SIKKA
 - .3 W.R. Meadows.
 - .4 Euclid Chemical Co

Part 3 Execution

3.1 Examination

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.
- .2 Examine concrete surfaces to receive liquid densifier sealer. Notify specifier if surfaces do not comply with manufacturer's recommendations. Do not begin surface preparation or application until unacceptable conditions are corrected
- .3 Verify that concrete floor has cured 28 days minimum and that substrate is acceptable to sealer manufacturer.

- .4 Test surfaces for moisture content to ensure that they are suitable for application.

3.2 Preparation

- .1 Concrete must be cured a minimum of 28 days prior to installation of sealers. Ensure substrate is free of dust, dirt, oil, grease laitence and any other foreign material that may affect bond.
- .2 Prepare substrate including existing concrete in accordance with manufacturer's written instructions. Diamond grind and vacuum substrate free of debris and dust.
- .3 Protect adjacent surfaces from damage resulting from Work of this section. Mask and/or cover adjacent surfaces, fixtures, and equipment as necessary.

3.3 Application

- .1 Apply Liquid Densifier Sealer in strict accordance with the directions of the manufacturer. Spray, squeegee or roll on liquid to clean, dry concrete surface at a rate no greater than 5 m². per litre. The liquid shall be scrubbed into the surface with a mechanical scrubber. Keep the surface wet for a minimum of 30 minutes with the liquid densifier sealer during the application process. When the product thickens, but not more than 60 minutes after initial application, the surface shall then be squeegeed or vacuumed to remove all excess liquid.
- .2 Do not leave any residue on surface.
- .3 Do not track material on to untreated surfaces.

3.4 Protection

- .1 Prevent contamination and damage during application and curing stages.

3.5 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 09 91 23 Interior Painting

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A780/A780M-20 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- .2 Environmental Protection Agency (EPA)
 - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings)
- .3 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2018
 - .2 Standard GPS-1-08 and GPS-2-08 MPI Green Performance Standard for Painting and Coatings.
- .4 Society for Protective Coatings (SSPC)
 - .1 Systems and Specifications, SSPC Painting Manual 2009
- .5 South Coast Air Quality Management District, California State (SCAQMD)
 - .1 SCAQMD Rule 1113-96 Architectural Coatings
- .6 Green Seal GS-11 Green Seal Environmental Standard for Paints and Coatings, January 1997
- .7 National Fire Code of Canada

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.

- .2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards.
- .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties and SCAQMD Rule 1113-96.
- .5 Provide maintenance data for paint products for incorporation into Operating and Maintenance Manuals specified in Section 01 78 00- Closeout Submittals. Include following:
 - .1 Product name, number, type and use.
 - .2 Colour numbers.
 - .3 MPI Environmentally Friendly classification system rating.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Contractor: to have a minimum of five years proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
 - .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
- .2 Conform to latest MPI requirements for exterior painting work including preparation and priming.
- .3 Paint materials to be highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and to be compatible with other coating materials as required.
- .4 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Consultant.
- .5 Provide mock-up in accordance with Section 01 45 00 - Quality Control.
 - .1 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing

- selected colours, gloss/sheen and textures. Locate where directed.
- .2 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
- .3 Allow 24 hours for inspection of mock-up before proceeding with work.
- .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver and store materials in original containers, sealed, with labels intact. Labels to indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Provide and maintain dry, temperature controlled, secure storage. Store materials and equipment in well-ventilated area with temperature range 7 °C to 30 °C. Store materials and supplies away from heat generating devices.
- .4 Observe manufacturer's recommendations for storage and handling.
- .5 Keep areas used for storage, cleaning and preparation, clean and orderly. After completion of operations, return areas to clean condition.
- .6 Remove paint materials from storage only in quantities required for same day use.
- .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .8 Remove damaged, opened and rejected materials from site.

1.7 Fire Safety Requirements

- .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
- .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

- .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers. Handle and dispose of hazardous materials in accordance with Municipal regulations.
- .3 Unused materials must be disposed of at official hazardous material collections site.
- .4 Paint and related materials are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from the Ministry of the Environment.
- .5 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .6 Place materials defined as hazardous or toxic waste in containers or areas designated for hazardous waste.

1.9 Maintenance

- .1 Extra Materials:
 - .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Quantity: provide one four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Deliver to Owner and store where directed.

1.10 Ambient Conditions

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 – Temporary Utilities.
 - .2 Do not perform painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 °C for 24 hours before, during and after paint application until paint has cured sufficiently.

-
- .3 Provide continuous ventilation for seven days after completion of application of paint
 - .4 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless specifically pre-approved by Consultant and product manufacturer, perform no painting work when:
 - .1 Ambient air and substrate temperatures are below 10 °C.
 - .2 Substrate temperature is over 32 °C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85 % or when dew point is less than 3 °C variance between air/surface temperature.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .2 Perform no painting work when maximum moisture content of substrate exceeds 12%.
 - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter.
 - .4 Test concrete surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
 - .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .5 Do not apply paint when:
 - .6 Temperature is expected to drop below 10 °C before paint has thoroughly cured.
 - .7 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .8 Surface to be painted is wet, damp or frosted.
 - .9 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
 - .10 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

- .11 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

Part 2 Products

2.1 Materials

- .1 Paint materials listed in latest edition of MPI Approved Products List (APL) and from a single manufacturer for each system used are acceptable for use on this project.
- .2 Paint materials for paint systems: to be products of single manufacturer.
- .3 Only qualified products with E2 or E3 "Environmentally Friendly" ratings are acceptable for use on this project.
- .4 Use only MPI listed 'L' rated materials.
- .5 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, to be as follows:
 - .1 Be water-based water soluble water clean-up.
 - .2 Be non-flammable biodegradable.
 - .3 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
 - .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .6 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .7 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .8 Water-borne surface coatings and recycled water-borne surface coatings must have flash point of 61 °C or greater.

-
- .9 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
 - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .10 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 or E3 rating.
 - .11 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.
 - .12 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
 - .13 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
 - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
 - .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
 - .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 Colours

- .1 Consultant will provide Colour Schedule.
- .2 Exterior colour schedule will be based upon selection of three base colours and two deep tint accent colours.
- .3 Selection of colours will be from manufacturer's full range of colours.

- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 Mixing and Tinting

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 Gloss/Sheen Ratings

- .1 Paint gloss: defined as sheen rating of applied paint, in accordance with following values:

| Gloss Level Category | Units @ 60 Degrees | Units @ 85 Degrees |
|------------------------|--------------------|--------------------|
| G1 – matte finish | 0 to 5 | Max. 10 |
| G2 – velvet finish | 0 to 10 | 10 to 35 |
| G3 – eggshell finish | 10 to 25 | 10 to 35 |
| G4 – satin finish | 20 to 35 | Min. 35 |
| G5 – semi-gloss finish | 35 to 70 | |
| G6 – gloss finish | 70 to 85 | |
| G7 – high gloss finish | > 85 | |

- .2 Gloss level ratings of painted surfaces as specified.

2.5 Exterior Painting Systems

- .1 Asphalt Surfaces: zone/traffic marking for drive and parking areas, etc.

- .1 EXT 2.1A - Latex zone/traffic marking finish. Line stripping to be yellow.
Accessible parking spaces shall be blue.
- .2 Concrete Vertical Surfaces:
 - .1 EXT 3.1K - Latex semi-gloss finish (over alkali resistant primer).
- .3 Steel Doors, Frames and Metal Fabrications:
 - .1 EXT 5.1D – Alkyd G5 semi-gloss finish over alkyd primer.

Part 3 Execution

3.1 General

- .1 Perform preparation and operations for painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and application instructions, and data sheets.

3.2 Examination

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

3.3 Preparation

- .1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting Manual except where specified otherwise.
- .2 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

- .4 Allow surfaces to drain completely and allow to dry thoroughly. Allow sufficient drying time and test surfaces using electronic moisture meter before commencing work.
 - .5 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
 - .6 Many water-based paints cannot be removed with water once dried. Minimize use of kerosene or such organic solvents to clean up water-based paints.
-
- .3 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements and SSPC-SP 6. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
 - .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

3.4 Protection

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas.

3.5 Application

- .1 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.

- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant.
- .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Consultant.
- .4 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .6 Sand and dust between coats to remove visible defects.
- .7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.
- .8 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 Mechanical/Electrical Equipment

- .1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces.
- .2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .3 Do not paint over nameplates.

3.7 Field Quality Control

- .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .2 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

3.9 Restoration

- .1 Remove protective coverings and warning signs as soon as practical after operations cease.
- .2 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 50 00 Metal Fabrications
- .2 Section 06 20 00 Finish Carpentry
- .3 Section 08 11 00 Metal Doors and Frames
- .4 Section 09 21 16 Gypsum Board

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A780/A780M-20 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- .2 Environmental Protection Agency (EPA)
 - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
- .3 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2018
 - .2 Standard GPS-1-08 and GPS-2-08 MPI Green Performance Standard for Painting and Coatings.
- .4 Society for Protective Coatings (SSPC)
 - .1 Systems and Specifications, SSPC Painting Manual 2009
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 ULC 102-18 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
- .6 South Coast Air Quality Management District, California State (SCAQMD)
 - .1 SCAQMD Rule 1113-96, Architectural Coatings.
- .7 Green Seal GS-11 Green Seal Environmental Standard for Paints and Coatings, January 1997.
- .8 National Fire Code of Canada

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish

and limitations.

.3 Samples:

- .1 Submit full range colour sample chips.
- .2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards.
- .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties and SCAQMD Rule 1113-96.

.5 Provide maintenance data for paint products for incorporation into Operating and Maintenance Manuals specified in Section 01 78 00- Closeout Submittals. Include following:

- .1 Product name, number, type and use.
- .2 Colour numbers.
- .3 MPI Environmentally Friendly classification system rating.

1.5 Quality Assurance

.1 Qualifications:

- .1 Contractor: to have a minimum of five years proven satisfactory experience.
- .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
- .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.

.2 Conform to latest MPI requirements for painting work including preparation and priming.

.3 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.

.4 Paint materials to be highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and to be compatible with other coating materials as required.

.5 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Consultant.

- .6 Provide mock-up in accordance with Section 01 45 00 - Quality Control.
 - .1 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen and textures. Locate where directed.
 - .2 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
 - .3 Allow 24 hours for inspection of mock-up before proceeding with work.
 - .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.6 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver and store materials in original containers, sealed, with labels intact. Labels to indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Provide and maintain dry, temperature controlled, secure storage. Store materials and equipment in well-ventilated area with temperature range 7 ° C to 30 ° C. Store materials and supplies away from heat generating devices.
- .4 Observe manufacturer's recommendations for storage and handling.
- .5 Keep areas used for storage, cleaning and preparation, clean and orderly. After completion of operations, return areas to clean condition.
- .6 Remove paint materials from storage only in quantities required for same day use.
- .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .8 Remove damaged, opened and rejected materials from site.

1.7 Fire Safety Requirements

- .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

- .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
- .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers. Handle and dispose of hazardous materials in accordance with Municipal regulations.
- .3 Unused materials must be disposed of at official hazardous material collections site.
- .4 Paint and related materials are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from the Ministry of the Environment.
- .5 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .6 Place materials defined as hazardous or toxic waste in containers or areas designated for hazardous waste.

1.9 Maintenance

- .1 Extra Materials:
 - .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Quantity: provide one four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Deliver to Owner and store where directed.

1.10 Ambient Conditions

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 – Temporary Utilities.
 - .2 Provide heating facilities to maintain ambient air and substrate temperatures

-
- above 10 ° C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Provide continuous ventilation for seven days after completion of application of paint.
 - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .5 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless pre-approved in writing by Consultant and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 ° C.
 - .2 Substrate temperature is above 32 ° C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is under 85% or when the dew point is more than 3 ° C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 ° C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .2 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .3 Perform painting work when maximum moisture content of the substrate is below:
 - .1 Allow new concrete to cure minimum of 28 days.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .4 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .5 Test concrete and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.

Part 2 Products

2.1 Materials

- .1 Provide paint materials for paint systems from single manufacturer.
- .2 Products to meet requirements of GS-11 or SCAQMD Rule 1113-96
- .3 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .4 Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use.
- .5 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- .6 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
 - .1 Non-flammable, biodegradable.
 - .2 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .3 Manufactured without compounds which contribute to smog in the lower atmosphere.
 - .4 Do not contain methylene chloride, chlorinated hydrocarbons or toxic metal pigments.
 - .5 Recycled content of 15% post-consumer and ½ post-industrial waste.
- .7 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .8 Flash point: 61 °C or greater for water-borne surface coatings and recycled water-borne surface coatings.

2.2 Colours

- .1 Consultant will provide Colour Schedule.
- .2 Colour schedule will be based upon selection of eight base colours and six deep tint accent colours.
- .3 Selection of colours will be from manufacturer's full range of colours.

- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 Mixing and Tinting

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .3 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 Gloss/Sheen Ratings

- .1 Paint gloss: defined as sheen rating of applied paint, in accordance with following values:

| Gloss Level Category | Units @ 60 Degrees | Units @ 85 Degrees |
|------------------------|--------------------|--------------------|
| G1 – matte finish | 0 to 5 | Max. 10 |
| G2 – velvet finish | 0 to 10 | 10 to 35 |
| G3 – eggshell finish | 10 to 25 | 10 to 35 |
| G4 – satin finish | 20 to 35 | Min. 35 |
| G5 – semi-gloss finish | 35 to 70 | |
| G6 – gloss finish | 70 to 85 | |
| G7 – high gloss finish | > 85 | |

- .2 Gloss level ratings of painted surfaces as specified and as noted on Finish Schedule.

2.5 Interior Painting Systems

- .1 Concrete Horizontal Surfaces:
 - .1 INT 3.2A Latex floor enamel gloss finish.
 - .2 Concrete Floor Sealer: Refer to Section 09 67 72 Concrete Floor Sealer.

- .2 Structural Steel:
 - .1 INT 5.1X Latex G5 semi-gloss finish (over quick dry shop primer).
- .3 Metal Fabrications:
 - .1 INT 5.3A Latex G5 semi-gloss finish
- .4 Galvanized Metal: interior doors, frames, railings, misc. steel, pipes, and ducts.
 - .1 INT 5.3A Latex G5 semi-gloss finish
- .5 Concrete Masonry:
 - .1 INT 4.2D High performance architectural latex G5 semi-gloss finish.
- .6 Concrete masonry units at wet areas and change rooms:
 - .1 INT 4.2G Epoxy (tile-like) finish.
- .7 Wood Clear Polyurethane Finish:
 - .1 INT 6.3K Polyurethane varnish G6 gloss finish.
- .8 Electrical Equipment Backboards:
 - .1 INT 6.4P Fire retardant, pigmented coating. Low odour/low VOC. Semi-gloss (UL/ULC rated).
- .9 Gypsum Board: Walls and Bulkheads.
 - .1 INT 9.2A Latex G3 eggshell finish over latex sealer.
- .10 Gypsum Board: Ceilings and Bulkheads (wet areas and change rooms)
 - .1 INT 9.2E Epoxy (tile like) finish
- .11 Gypsum Board: Ceilings and Bulkheads:
 - .1 INT 9.2A Latex G2 velvet finish over latex sealer.
- .12 All other surfaces not noted above: high performance finish suitable for commercial and institutional environment and in accordance with MPI painting manual.

Part 3 Execution

3.1 General

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

- .2 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and application instructions, and data sheets.

3.2 Examination

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report damages, defects, unsatisfactory or unfavourable conditions to Consultant before proceeding with work.

3.3 Preparation

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking and in accordance with paint manufacturers and MPI recommendations. If damaged, clean and restore surfaces as directed by Consultant.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .2 Place "WET PAINT" signs in occupied areas as painting operations progress.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths, or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements and SSPC-SP 6. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes blowing with clean dry compressed air or vacuum cleaning.
- .7 Touch up of shop primers with primer as specified.
- .8 Do not apply paint until prepared surfaces have been accepted by Consultant.

3.4 Application

- .1 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

- .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
- .4 Brush out immediately all runs and sags.
- .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .6 Sand and dust between coats to remove visible defects.
- .7 Finish surfaces both above and below sight lines as specified for surrounding surfaces.
- .8 Finish alcoves as specified for adjoining rooms.
- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.5 Mechanical/Electrical Equipment

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces.
- .2 Mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.

- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint fire protection piping red.
- .9 Paint natural gas piping yellow.
- .10 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .11 Do not paint interior transformers and substation equipment.

3.6 Field Quality Control

- .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .2 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.7 Cleaning and Restoration

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 05 50 00 Metal Fabrications
- .2 Section 06 61 16 Solid Surfacing
- .3 Section 08 80 05 Glazing
- .4 Section 09 21 16 Gypsum Board
- .5 Section 10 21 13 Compartments and Cubicles
- .6 Section 10 51 23 Phenolic Lockers

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A653/A653M-18 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM A924/A924M-18 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - .3 ASTM B456-17 Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
 - .2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
 - .3 CGSB 31-GP-107Ma-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.
- .3 CSA Group (CSA)
 - .1 CSA-B651-12 (R2017) Accessible Design for the Built Environment.
 - .2 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings: Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

- .3 Samples:
 - .1 Submit samples when requested.
 - .2 Samples to be returned for inclusion into work.
- .4 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 Shipping, Handling and Storage

- .1 Refer to Section 01 61 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.6 Waste Management and Disposal

- .1 Refer to Section 01 74 19 – Construction Waste Management and Disposal.

1.7 Extra Materials

- .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.
- .2 Deliver special tools to Owner.

Part 2 Products

2.1 Materials

- .1 Sheet steel: to ASTM A653 with ZF001 designation zinc coating.
- .2 Stainless steel sheet metal: Type 304, with Brushed finish.
- .3 Stainless steel tubing: Type 304, commercial grade, seamless welded, minimum 1.2 mm wall thickness.
- .4 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 Manufacturers

- .1 Products and components listed are minimum standard of acceptance. Alternative products by recognized manufacturers of toilet and bath accessories may be accepted subject to review by the Consultant of manufacturer's product information and specifications.
- .2 Acceptable manufacturers include:
 - .1 Bobrick
 - .2 Bradley
 - .3 Frost
 - .4 Hafele
 - .5 Richelieu
 - .6 Watrous

2.3 Components

- .1 TPD: Toilet Tissue Dispenser:
 - .1 Supplied by Owner, installed by Contractor.
- .2 SD: Soap Dispenser: Liquid wall mounted soap dispenser
 - .1 Supplied by Owner, installed by Contractor.
- .3 Surface Mounted Hand Dryers: Dyson Airblade, Automatic hand dryer, 220V, 20 Amp, 2300 Watt, white or approved equal.
- .4 GB1: Grab Bar, 38 mm diameter x 1.6 mm wall tubing of stainless steel, 76 mm diameter wall flanges, concealed screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Knurl bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN. 600 mm long.
 - .1 Bobrick B-6806.99 x 24
- .5 GB2: Barrier Free Toilet Grab Bar (L-shaped) 760 x 760 38 mm dia. Peened finish c/w mounting kits.
 - .1 Bobrick B-6898.99, 90° Angle Grab Bar.
- .6 Framed Mirror: Bobrick B-165 1830.
- .7 SND: Sanitary Napkin Disposal: Contura Series, B-270, Surface Mounted Stainless Steel Sanitary Napkin Disposal.

- .8 Coat Hook: Bright polished stainless steel hook with 50 x 50 mm flange, hook 25 mm wide x 165 mm high. Concealed wall plate.
 - .1 Bobrick B-682
- .9 RSS: Retractable Shower Seat (left hand and right hand) Refer to drawings for locations.
 - .1 Bobrick B-5191
- .10 GB3: Shower Grab Bar (Vertical 1000mm long) 38 mm dia. Peened finish c/w mounting kits.
 - .1 Bobrick B-6806.99 x 36
- .11 GB4: Barrier Free Shower Grab Bar (L-shaped) 760 x 1000, 38 mm dia. Peened finish c/w mounting kits.

2.4 Fabrication

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes, to prevent electrolysis.
- .6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- .7 Shop assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 Finishes

- .1 Chrome and nickel plating: to ASTM B456, satin finish.
- .2 Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31-GP-107Ma, apply one coat Type 2 primer to CAN/CGSB-1.81 and bake, apply two coats Type 2 enamel to CAN/CGSB-1.88 and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by Consultant.
- .3 Manufacturer's or brand names on face of units not acceptable.

Part 3 Execution

3.1 Installation

- .1 Install toilet and bath accessories in accordance with the Ontario Building Code, CSA B651 and manufacturer's instructions.
- .2 Coordinate installation of powered accessories with Electrical.
- .3 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry or concrete: use bolt with lead expansion sleeve set into drilled hole.
- .4 Install grab bars on built-in anchors provided by manufacturer.
- .5 Use tamper proof screws/bolts for fasteners.
- .6 Fill units with necessary supplies shortly before final acceptance of building.
- .7 Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - .1 Verify blocking has been installed properly.
 - .2 Verify location does not interfere with door swings or use of fixtures.
 - .3 Comply with manufacturer's recommendations for backing and proper support.
 - .4 Use fasteners and anchors suitable for substrate and project conditions.
 - .5 Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
 - .6 Conceal evidence of drilling, cutting, and fitting to room finish.
 - .7 Test for proper operation.

- .8 Install electric hand and hair dryers according to manufacturer's instructions. Installation shall be by an electrician and shall be completed in accordance with all relevant standards and Codes.

3.2 Schedule

- .1 Locate accessories where indicated. Exact locations determined by Owner.

3.3 Cleaning

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.
- .3 Touch-up, repair or replace damaged products until Substantial Performance.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 03 30 00 Cast-in-Place Concrete

1.3 References

- .1 The Ontario Building Code
- .2 ASTM International (ASTM)
 - .1 ASTM B221-14 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - .2 ASTM B429/B429M-10e1 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
 - .3 ASTM C920-14a Standard Specification for Elastomeric Joint Sealants
- .3 Canadian Standards Association (CSA)
 - .1 CSA S157-05/S157.1-05 (R2015) Strength Design in Aluminum / Commentary on CSA S157-05, Strength Design in Aluminum
 - .2 CSA G40.20-13/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014)
 - .3 CSA S136S1-04 North American Specification for the Design of Cold Formed Steel Structural Members
 - .4 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles
 - .5 CSA O121, Douglas Fir Plywood
 - .6 CSA W59.2-M1991 (R2013) Welded Aluminum Construction
- .4 Canadian General Services Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass
- .5 Aluminum Association (AA), Designation System for Aluminum Finishes (2000)

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit complete set of manufacturer's standard specifications, installation instructions and details for dasherboard systems including promotional literature. Include list of similar projects utilizing similar board systems and completed within last ten years including current references.

- .3 Submit complete list of materials and products to be used in the construction of dasher board systems and indicate clearly, any deviation from the specified requirements.
- .4 Shop drawings shall bear the seal of a professional engineer licensed to design structures in the Province of Ontario.
- .5 Submit layout of the ice surface showing dasherboards, size and location of doors and gates, players and penalty boxes, removable panels and glass shields.
- .6 Show and describe in detail all components of the work of this Section including large scale details of members and materials, of connection and jointing details and of anchorage devices.
- .7 Submit a dimensioned layout drawing showing location of floor inserts, anchors and base plates to be set into concrete slabs by this Section.
- .8 Indicate layout of advertising panels. See plan for extents of advertising boards.
- .9 Submit calculations certified by the professional engineer affixing seal to the shop drawings substantiating sizes for members and connections based on the design loads, before commencing fabrication
- .10 Submit duplicate 12" x 12" samples of each colour of plastic surfacing materials.
- .11 Submit duplicate 12" long samples of protective padding.
- .12 Submit a copy of the pre-installation survey for the rink surface, signed by an Ontario Land Surveyor.
- .13 Operating and Maintenance Data: Submit operating instructions and maintenance manuals for installed system outlining all required maintenance and cleaning procedures in accordance with the requirements of Section 01 78 00.

1.5 System Description

- .1 Dasherboard system shall be Pro XL Series Dasherboards by Sports Systems Unlimited DBA Athletica Sports Systems or approved equivalent.
- .2 Complete panelized arena board system of prefabricated lightweight removable modular panel sections having structural aluminum framing of welded or screwed construction, and high density polyethylene facing. Panelized sections shall be

48" high and not more than 8'-0" long with caprail, kickplate, ice dams and thresholds.

- .3 Dasher boards shall be installed on HDPE thermal bridge to isolate metal and concrete surfaces. Material shall be same width as board system.
- .4 Spectator Shielding:
 - .1 Seamless supported tempered glass at rink end at lobby side
 - .2 Stanchion supported glass at back of rink curved sections (except lobby see plans for extents).
 - .3 Stanchion supported tempered glass at rink sides.
- .5 Player, penalty and timekeepers boxes with glass surrounds, overhead roof systems, benches, shelves and raised floors.
- .6 3/4" Rubber mat flooring in players, penalty and timekeepers benches. Rubber matting to cover all exposed metal surfaces at floor level throughout areas above.
- .7 Hardware and accessories including anchor brackets.
- .8 Gates and hardware.
- .9 Anchor bolt system for securing to existing and new concrete apron slab.
- .10 Safety features as specified.

1.6 Design and Performance Requirements

- .1 Arena board systems shall be manufacturer's premium quality system.
- .2 Arena board systems shall be to sizes as indicated on the drawings.
- .3 The work of this Section shall be designed by a professional engineer licensed in the Province of Ontario.
- .4 There shall be no gaps in the dasherboard system sufficiently excessive to act as "stick traps" or "finger traps". The maximum gaps exposed to the playing side of the dasherboard system shall be no greater than 1/8".
- .5 Design aluminum members in accordance with CAN3-S157.
- .6 Design loadings (Specified):

- .1 Concentrated load $P = 2.7$ kN applied at mid span of top rail (i.e. top of arena board assembly).
- .2 Uniformly distributed load of $P = 2.7$ kN applied along top rail.
- .3 Uniformly distributed load of 4.8 kPa applied across the entire face of the arena board.

.7 Member Resistances (Factored):

- .1 Axial Resistance:
 - .1 Tension: $T_r = A_n F_y$; $T_r = 85 A_n F_u$
 - .2 Compression: $C_r = A F_c$
- .2 Shear Resistance:
 - .1 $V_r = 0.60 A_w F_c$; $0.60 A_w F_y$; $hNWR$
- .3 Moment Resistance:
 - .1 $M_r = S F_y$ (Class 2 Sections).

1.7 Quality Assurance

- .1 System manufacturer shall have a minimum 5 years of experience in the manufacture, design and installation of aluminum dasherboard systems.
- .2 Installation of complete dasherboard system shall be by manufacturer's own forces.
- .3 A copy of the manufacturers printed installation instructions shall be kept on site for the duration of the work of this Section.
- .4 Pre-Installation Conference: Arrange for a pre-installation conference, including Contractor, Consultant, Owner, concrete finisher, and the dasher board system manufacturer and installer to coordinate the design and installation of the dasher board system.
- .5 Welding shall be performed by trades persons certified by the Canadian Welding Bureau under CSA Standard W47.1.
- .6 The dasher board manufacturer shall have representative on site during the pouring of the refrigerated slab to ensure anchors are not damaged or moved during pouring and finishing of the refrigerated slab.

1.8 Shipping, Handling and Storage

- .1 Refer to Section 01 16 00 – Common Product Requirements.

- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.
- .3 Deliver materials to site in crates, with all seals and labels intact. Identify all materials with regards to locations and orientation.
- .4 Store materials, under cover, in designated area on site. Materials may not be stored in concentrated loads on the newly poured rink slab.
- .5 Store tempered glass arena shields vertically, on wood sleepers. Protect glass from work of other trades.

1.9 Site Conditions

- .1 Permanent lighting and power shall be installed and functional.
- .2 All overhead work is to be complete prior to the work of this Section commencing.
- .3 Perimeter apron slabs and ice surface slabs are to be in place prior to the work of this Section commencing. Verify tolerance requirements of systems manufacturer have been met and report any discrepancies to the Consultant.
- .4 Environmental Requirements: Ensure that installation takes place only when temperatures and other conditions are suitable for a safe and proper installation.
- .5 Field Measurements: Site verify dimensions of rink surface. Verify location and layout of arena gates, to align with aisles where required. Final arena board anchor insert locations shall be coordinated between Contractor, manufacturer, and ice floor installer.
- .6 Pre-Installation Survey: During and upon completion of apron slab construction, and prior to installation of the rink board anchor bolts, retain the services of a registered Ontario Land Surveyor to verify all dimensions and radii of refrigerated ice slab surface and apron slab. Make adjustments as necessary to eliminate or conceal gaps and similar defects. Provide remedial details for review and acceptance when requested by the Consultant. Refer to Section 01 45 00.

1.10 Shipping, Handling and Storage

- .1 Refer to Section 01 16 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.11 Mock Up

- .1 Supply and install a mock-up of the arena board system consisting of one flat section, 8'-0" long minimum, complete with glass shield supports, glass and coloured trim.
- .2 Accepted mock up shall represent the standard of quality for the remainder of the arena board system work.

1.12 Maintenance Materials

- .1 Supply, in addition to the quantities required for the Work, extra materials and products for the Owner's future use as follows:
 - .1 1 Glass storage Dolly.
 - .2 2 Typical glazing panels ½" thick, side board section
 - .3 2 Typical glazing panel 5/8" thick, end board section.
 - .4 2 Typical glazing panel 5/8" thick, curved end board section.
 - .5 2 Typical HDPE Panel, side board section.
 - .6 2 Typical HDPE Panel, end board section
 - .7 2 Typical HDPE Panel, curved end board section.
 - .8 Two Hundred (200) additional painted screws of each colour required for fastening of HDPE facing materials
 - .9 5m² additional rubber floor matting.
- .2 Deliver extra stock to Owner in cartons clearly labelled to identify contents as soon as permanent locking storage facilities are available. Place extra stock in designated storage areas.

1.13 Waste Management and Disposal

- .1 Refer to Section 01 74 10 – Cleaning.

1.14 Warranty

- .1 Guarantee that the entire work of this Section shall remain free from defects in materials and workmanship including warping, twisting, de-lamination, cracking, sagging of gates and other defects for a period of two (2) years from the date of Substantial Performance. Glass breakage is excluded.
- .2 The manufacturer's representative shall attend a walk-through of the dasherboard system at least one month prior to the end of the warranty period.

Part 2 Products

2.1 Manufacturers

- .1 The following manufacturers of aluminum dasher board systems are acceptable subject to approval of complete product specifications and details for manufacturer's premium system and on receipt of project references satisfactory to the Owner and Consultant:
 - .1 Sports Systems Unlimited Corp. DBA Athletica Sports Systems
 - .2 Riley Manufacturing.
 - .3 Welmar Recreational Products
 - .4 Sound Barriers
 - .5 Other manufacturers, meeting the requirements of this specification and complying with all provisions of the contract, approved by the Consultant prior to close of tenders.
- .2 Use of specific requirements set forth in the specification does not preclude the use of equivalent products by approved manufacturers, but are given for the purpose of establishing a standard of design, quality of materials, product content, construction and workmanship.

2.2 Materials

- .1 Aluminum Extrusions: CSA CAN3-S157 or ASTM B221, 6065-T5 or 6005A-T6 alloy and temper.
- .2 High Density Polyethylene (HDPE): High impact, integrally coloured, high density polyethylene, bright white and other colours as specified.
- .3 Tempered Safety Glass: CAN/CGSB-12.1-M90 or ASTM C1048, Type 2, clear, colourless, fully toughened, heat tempered safety glass. Tempered glass material shall come from same tempering furnace and shall be tempered to minimize distortion. Roll wave distortion shall not exceed 0.005" from peak to valley.
 - .1 Each piece of tempered glass shall bear the stamp of approval from a certified testing facility, proving the glass meets specified standard. The stamp shall be in a location that will be visible and legible after boards and shielding are installed.
- .4 Hardware: Stainless or galvanized mild steel.
- .5 Fasteners: Zinc plated steel unless indicated otherwise.
- .6 Anchors: Zinc plated steel.

- .7 Gap Closures: Provide 2-piece HDPE angle between the boards and all raised areas behind the boards and / or as shown on drawings.
- .8 Plywood: To CSA O121, Douglas Fir plywood, thickness as indicated or as required by manufacturer.
- .9 Sealants: to ASTM C920 sealing compound, low VOC type, one component, elastomeric chemical curing.

2.3 Fabrication

- .1 As far as practical, execute fitting and assembly in the shop with the various parts or assemblies ready for erection at the project site.
- .2 Accurately fit together all joints, corners and intersections. Match components carefully to produce continuity of line and design.
- .3 Provide devices for anchoring the assemblies to the substrate with adjustment to permit correct and accurate alignment.
- .4 Fabricate anchoring devices required to secure the work of this Section. Supply anchors and layout drawings where required to be built into work of other Sections.
- .5 System components shall be numbered for ease of installation, disassembly and reinstallation.

2.4 Arena Panels

- .1 Arena panels shall be factory prefabricated in demountable sections. The design of all panels whether straight, curved or in which a gate is located shall be similar. Each panel shall be made of extruded or rolled aluminum sections assembled into frames using high strength fasteners or welded joints. Frames shall allow for fastening of the HDPE facing and anchoring at base. Ensure flush mating of the HDPE facing at arena panel joints.
- .2 Typical sections shall consist of two vertical posts and minimum of three horizontal stringers. Frames shall be connected end to end with heavy duty bolts and shall be connected to rink slab concrete structure at the posts with aluminum anchor brackets.
- .3 Aluminum sections shall be isolated from the concrete slab with a HDPE facing material, full width of dasher board.

- .4 Standard size of straight arena panels shall be 8'-0" long, 4'-0" high.
- .5 The ice rink side of the arena panel shall be faced with ½" thick, high impact, integrally coloured white high density polyethylene (HDPE) facing. Both sides of the arena facing shall have smooth surfaces. Colour of arena facing shall be identical on both sides.
- .6 The spectator side of the arena panel, where indicated, shall be faced with 3/8" thick, high impact, integrally coloured white high density polyethylene (HDPE) facing.
- .7 HDPE facing shall be attached to the arena board framing with ¼" diameter screws. Heads of screws shall be painted to colour match arena facing, kickplate or caprail sill as appropriate. Spacing of the screws shall not exceed 8" on centre.
- .8 Colour extensions of red and blue lines shall be coloured HDPE strips inlaid flush to the HDPE facing and inlaid flush to the HDPE kickplate in conformance with Owner's layout requirements.
- .9 Provide a ½" thick colour impregnated HDPE caprail fastened to top horizontal framing member. Both edges of caprail shall have a smooth and radiused edge.
- .10 Colour of caprail shall be selected from manufacturer's standard colour range

2.5 Player's Penalty and Timekeeper Boxes and Benches

- .1 Boxes shall consist of arena board enclosures similar to rink arena boards.
- .2 Interior finish of boxes shall be of similar construction as ice-side of arena boards, utilizing 3/8" thick white HDPE. Framing shall be similar construction as arena boards. Install 3/8" thick white HDPE flush to top of mid stringer height to act as a water bottle shelf.
- .3 Player' boxes, penalty boxes and access gates shall be as indicated.
- .4 Official's box and access gates shall be as indicated.
- .5 Scorer's table shall be 1'-8" deep for the full width of the box and constructed of minimum 1 ¼" thick solid or laminated HDPE surfacing material. Wood tables are not permitted. Provide lockable storage in the Timekeepers Table. (For storing electrical components)

- .6 Scorekeeper booth shall be complete with walls and pass through gates to the penalty boxes and roof enclosure see plans.
- .7 Benches shall be as detailed. Removable bench supports shall be of a ¼" steel base plate with minimum 2 2/7" diameter steel post at a maximum of 48" o.c. All steel components shall be hot dip galvanized. Benches shall be fabricated from 1 ½" x 10" solid or laminated white HDPE surfacing material. Wood benches are not permitted. Bench base plates and bolts are to be protected to prevent skate blade contact.
- .8 Provide raised floor at players, penalty and timekeepers boxes, 8" high with ¾" rubber mat on top and exposed sides covered with 3/8" white HDPE.

2.6 Gates

- .1 All gate sizes and direction of swing shall be as indicated on drawings.
- .2 Gate latches shall be a single latch type with rink and spectator or bench side access. A flush mounted push-button latch shall be incorporated in the caprail on the ice entrance gates to the penalty boxes and ice access gates where shields would otherwise prevent latch operation. The button shall be approximately 3" in diameter. The push-button shall be designed to be simple to operate yet prevent accidental opening.
- .3 Hinge assemblies shall be constructed of ¼" stainless steel. The hinge pins shall be minimum 5/8" diameter.
- .4 Equipment gates shall be double gates with a minimum 10'-0" overall opening width. The threshold top to be 1" stress relieved white Polypropylene and the bottom 1 ½" to be galvanized steel tubing.
- .5 Each equipment gate unit shall be equipped with one locking clamp or sliding bar and two retractable flush bolts into the threshold or floor.
- .6 Each equipment gate and all gates over 36" width shall be equipped with adjustable heavy duty spring loaded casters, with the direction of travel fixed to the arc of the door.
- .7 Provide gate levelling screws at all gate locations to allow gates to be realigned with the ice in place.
- .8 Provide hold open latches at gates between player's benches and vomitories where indicated.

- .9 All gate hardware shall be stainless steel.

2.7 Spectator Shielding Supports

- .1 Spectator shielding system shall be Pro Series Dasherboards by Sports Systems Unlimited DBA Athletica Sports Systems or approved equivalent.
- .2 Provision for attachment of shielding glazing to the vertical supports shall be by means of an extruded, mill finish aluminum shield support. This aluminum support shall run continuously to within 12" of the top of the glazing; an extruded face plate will slot into aluminum support with no screws. Plastic "U" shaped gaskets protect the glass edges. At the gates only, the support is a two piece with a screw -applied face plate. The shield support system must facilitate the replacement of shields from the ice side without requiring additional support or securing of the adjacent shields.
- .3 Shielding and supports shall be designed for easy removal without tools for events when arena boards will remain in place but shielding and shielding supports are to be removed, including the gates.

2.8 Spectator Shielding Glazing

- .1 Tempered Safety Glass: ½" thick at glass areas to 48" height above the top of the boards, and 5/8" thick at glass areas to 72" height above the top of the boards.
- .2 Three edges of the tempered glass shall be seamed edges channel sides and flat ground on the top side, and the two top corners shall have a ½" radius.
- .3 Glazing shall be mounted in the middle of the caprail.
- .4 At any interruption of the protective shielding, at glazing terminations and corners, there shall be protective non-branded high quality, vinyl covered urethane foam padding to prevent the injury of the players.
- .5 Between players boxes, install aluminum termination posts that are attached only to the shielding that runs perpendicular to the perimeter boards. Posts to be set back from the perimeter boards not less than 18". Posts to be covered on 3 sides by vinyl covered urethane foam padding.

2.9 Kickplates

- .1 Kickplates shall be fabricated of 5/8" thick HDPE colour impregnated sheets in 8" x 8'-0" segments.
- .2 Colour of kickplate shall be selected from manufacturer's standard range of colours.
- .3 The kickplate shall be fastened to the bottom of the arena panel using colour matched screws.

2.10 Thresholds

- .1 Player gates and access gate thresholds shall have a 1" thick white HDPE covering that can be removed and replaced when wearing occurs.
- .2 Thresholds of equipment and access gates shall be 1 1/2" above rink level.
- .3 Thresholds of public skating gates and players gates shall be 2 1/2" above rink level.

2.11 Board Anchors

- .1 The dasher board manufacturer shall be responsible for supply, locating and installation of anchors.
- .2 All arena boards shall be tightly fastened to the refrigerated slab by means of zinc plated bolts.
- .3 Provide removable board sections as indicated with concealed or removable anchor bolts to allow access. Provide snap-in covers with flush tops to fill the anchors when the boards are removed.
- .4 Anchors shall be embedded in the apron slab

2.12 Accessories

- .1 Shield Removal Devices: Supply three (3) suction cup type glass lifting tools to facilitate removal and installation of shield glazing units.

2.13 Rubber Mat Flooring

- .1 Rubber mat flooring in players, penalty and timekeepers bench shall be ½" thick recycled rubber matting, colour black with longitudinal grooves at ¾" centres on the underside for air circulation and as manufactured by Royal Mat Inc. or approved equivalent.

2.14 Finishes

- .1 All aluminum sections shall have a manufacturer's standard anodized or mill finish.
- .2 Anodizing shall be clear anodized finish equivalent to Aluminum Association designation AA M12C22A31 with 0.0002 inch minimum coating thickness.
- .3 Plating: All precision ferrous hardware such as hinge pins, latches, casters, and miscellaneous nuts, bolts and fasteners shall be clear zinc electroplated or cadmium plated to allow for smooth operation.

PART 3 EXECUTION

3.1 Inspection

- .1 Before commencing erection and installation, examine the work of other Sections to which the work of this Section will be attached.
- .2 Examine apron slab.
- .3 Report immediately in writing to the Consultant, all discrepancies in accuracy and suitability, conditions that will adversely affect the installation and permanency of the work of this Section.
- .4 Ensure that openings and recesses to receive the work of this Section are within acceptable tolerances. Remove dust and other loose material from openings.

3.2 Preparation

- .1 Supply all anchors and similar items, required to be installed in the work of other Sections. Provide instruction for proper installation and arrangement.
- .2 Setting of base plates shall be done under the direct supervision of a representative of the dasherboard manufacturer. Supply all necessary templates and instructions to ensure a satisfactory installation. The dasherboard

manufacturer shall be responsible for verifying the base plate layout on the concrete forms prior to pouring concrete.

- .3 Space anchors at centres specified on the manufacturer's shop drawings.
- .4 Fabricate panelized dasher board sections off site.

3.3 Installation

- .1 The finished rink shall have dimensions as indicated. Site verify all dimensions including corner radii prior to preparation of shop and erection drawings.
- .2 All dimensions shall be site verified prior to preparation of shop drawings.
- .3 Install the arena board system in accordance with drawings and specifications.
- .4 Ensure a complete arena system with all arenas and spectator shielding straight and true to line and properly braced. Set work level, plumb, square and true with uniform joints.
- .5 Fasten the work securely as erection progresses. Provide all units with suitable temporary braces, shores, and stays to hold them in position until permanently secured.
- .6 The flat top surface of the sill and 2" down the face of the dasherboards on the spectator side shall be encased in 0.22" thick plastic material secured with colour matched fastenings. Colour of sill to Owner's selection.
- .7 Install surfacing material to inside surfaces of players, penalty and timekeepers boxes, including gates.
- .8 Install surfacing material on spectator side of arena boards, at all raised floors, bleachers, aisles and stairs and wherever else indicated.
- .9 All exposed edges of board surfacing materials shall be chamfered, rounded, ground or otherwise machined for safety.
- .10 Adjust as necessary to ensure no openings or gaps in surfacing materials exceed 1/8" in width.
- .11 Install advertising panels where indicated on reviewed shop drawings.

- .12 Coordinate installation of wiring, conduit and devices for timekeeper's areas and goal lights and for general service electrical outlets at rink perimeter.

3.4 Player's, Penalty and Timekeeper Boxes and Benches

- .1 Provide team boxes, penalty boxes and timekeeper's area and benches as specified and indicated on drawings.
- .2 Provide raised floors in player's benches, penalty boxes and timekeeper's box, 8" high.
- .3 Install rubber mat flooring in players, penalty and timekeeper's benches in accordance with manufacturer's instructions. Install rubber matting to fit over base plates and anchor bolts at player's benches and penalty boxes.

3.5 Gates

- .1 Provide access gates as indicated on the drawings.
- .2 Access gates shall be to sizes indicated. Fabricate gates with aluminum tubular framing similar to board sections.
- .3 Bevel edge of gate and jamb at latch side of gate. Allow minimum 3/8" clearance.
- .4 Install and adjust hardware.
- .5 Replace existing power lift gate with new, see electronic lift gate specifications for additional information.

3.6 Spectator Shielding

- .1 Lay out glass shields to minimize number of sizes required.
- .2 Install support framing in accordance with the manufacturer's instructions.
- .3 Spectator shielding glazing shall not be installed in front of team boxes. At shielding external corners on ice side, an easily replaceable protective corner bumper pad shall be provided for full mullion height.
- .4 Between players boxes, install aluminum termination posts that are attached only to the shielding that runs perpendicular to the perimeter boards. Posts to be set back from the perimeter boards not less than 18". Posts to be covered on 3 sides by foam padding covered by a vinyl outer layer that has been tested and certified by engineers.

- .5 Spectator shielding shall be installed behind, alongside and in front of the penalty boxes.
- .6 Spectator shielding shall be installed behind, alongside and in front of the timekeeper's box.
- .7 Install tempered glass shields into support system. Provide EPDM gaskets at all supports.
- .8 At timekeeper's benches, provide glass shields with 3 ¼" diameter "speak holes", located 66" above refrigerated slab surface on front panel and 51" above floor slab on side panels (penalty boxes).

3.7 Protective Netting

- .1 Existing protective netting is to be removed and new netting installed as indicated on the plans to the new dasherboard system.

3.8 Sealants

- .1 Upon completion of the dasherboard installation, and prior to placement of ice surfaces, seal entire perimeter of dasherboards at base to prevent leakage.

3.9 Adjusting

- .1 Upon completion of the work of this Section, inspect, test and adjust installation.
- .2 Test all operable elements and ensure easy and smooth operation

3.10 Cleaning

- .1 Proceed in accordance with Section 01 74 10 – Cleaning.
- .2 Upon completion of the work of this Section, remove all scrap materials from the site and leave premises in a neat and tidy condition.
- .3 Prior to Substantial Performance, wipe down plastic surfacing materials and clean all marks in accordance with the manufacturer's directions.
- .4 Clean glass in accordance with manufacturer's directions.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1

1.2 Related Sections

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 03 30 00 Cast-in-Place Concrete
- .4 Section 07 21 13 Building Insulation
- .5 Section 07 26 00 Vapour Retarders
- .6 Section 31 23 10 Excavating, Trenching and Backfilling

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM A53/A53M-22 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- .2 CSA Group (CSA)
 - .1 CSA B51-14 Boiler, Pressure Vessel, and Pressure Piping Code
 - .2 CSA B52-18 Mechanical Refrigeration Code
- .3 Technical Standards & Safety Authority (TSSA)
 - .1 TSSA Operating Engineers Act
 - .2 TSSA Piping Systems Design Registration
 - .3 Technical Standards and Safety Act, 2000, S.O. 2000, c. 16
- .4 The American Society of Mechanical Engineers (ASME)
 - .1 ASME Boiler and Pressure Vessel Code, 2004 Section VIII, Pressure Vessel, Div. 1
- .5 American National Standards Institute (ANSI)
 - .1 ANSI B31.5-2001 Refrigeration Piping
- .6 Electrical Safety Authority (ESA)
 - .1 The Ontario Electrical Safety Code (OESC)

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings for complete ice rink refrigeration piping including layout showing all access and service boxes.

1.5 General Scope of Work

1. Utilizing a refrigeration Ammonia pump out trailer, remove Ammonia charge for disposal
2. Pump out brine from rink floor and dispose. Owner to provide waste generation number.
3. Demolish the following refrigeration equipment;
 - a. Two (2) reciprocating compressors
 - b. One (1) evaporative condenser
4. Supply & install two (2) reciprocating compressors
5. Supply & install one (1) evaporative condenser c/w;
 - .1 Hand rails
 - .2 Ladder and safety cage
 - .3 Sleepers and shims as necessary to seat on the existing roof supports.
 - .4 Restore all flashing and make the existing roof system water tight.
6. Re-use existing ammonia, glycol and water pipe and fittings. Replace as required to place new equipment.
7. Supply & install a set of cold brine headers
8. Supply & install cold rink floor materials for the replacement rink
9. Disconnect and reconnect wiring for compressor and condenser. Reuse conduit and wiring.
10. Supply & charge new Ammonia & brine
11. All necessary power & control wiring between starter panel and refrigeration equipment
12. Install new Ammonia and brine insulation.
13. Replace all insulation to match existing which was damaged or effected by the replacement work.
14. Start-up & commissioning

15. One (1) year warranty

1.1 Reuse the Following Equipment

1. The following refrigeration equipment shall be reused;
 - .1 Shell & tube chiller
 - .2 Starter panel and all starters/VFD
 - .3 Ammonia fire box
 - .4 Compressor jacket cooling system including pumps, piping, expansion tank, etc
 - .5 Refrigeration ventilation system
 - .6 Ammonia leak detection system
 - .7 Dehumidification system

1.2 Design Criteria

| | |
|-------------------------------|--|
| Primary Refrigerant | Ammonia |
| Nominal Chiller Capacity | 60 Tons of Refrigeration |
| Cooling Secondary Refrigerant | 21% Calcium Chloride |
| Evaporating Temperature | 10.0°F |
| Condensing Temperature | 95.0°F |
| Wet Bulb | 76.0°F |
| Rink Brine Inlet Temperature | 20.4°F |
| Rink Brine Outlet Temperature | 18.0°F |
| Power: | 3/60/575 volt (Power), 1/60/120 volt (Control) |

1.3 Related Work Supplied and Installed by Other Divisions

- .1 The ice rink refrigeration contractor shall co-ordinate all phases of his work with the Contractor and all subcontractors including related work as listed. Overall project coordination is the responsibility of the general contractor.
- .2 General:
 - .1 Cutting, patching, sleeving, sealing and fireproofing of floor, wall and ceiling openings for all refrigeration system piping and related electrical conduits is required but not limited to;
 - .2 Necessary cutting and patching of all refrigeration piping penetrations through building roof is required but not limited to;
 - .3 Breaking up and removal of existing concrete bases, piers and rubble is required but not limited to;
 - .1 Two (2) compressor housekeeping pads
 - .2 One (1) cold floor brine pump housekeeping pad

- .4 Temporary lighting, heating, 120V power and water. Should the refrigeration contractor require additional light, heat or power, he shall provide it in order to complete his work.
 - .5 Refrigeration Room to be constructed in accordance with current edition of the CSA B52 Mechanical Refrigeration Code.
 - .6 Refrigeration Room exhaust and fresh air make-up to meet the current CSA B52 Mechanical Refrigeration Code.
 - .7 Heat for Refrigeration Room to maintain minimum 18.3oC [65°F] room temperature. Open flame heater is not acceptable.
 - .8 Forming, steel re-enforcing and pouring of level concrete housekeeping pads for refrigeration equipment is required but not limited to;
 - .1 Two (2) reciprocating compressor package
 - .2 One (1) cold brine pump
 - .9 Floor drain relocation in Refrigeration Room if necessary.
 - .10 Necessary electrical interlock wiring from refrigeration starter panels to Refrigeration Compressor Room exhaust fan control circuit.
 - .11 Necessary partitions around construction areas for dust control.
 - .12 Specialty valves such as a back flow preventer required by the local Public Utilities.
 - .13 Subgrade prepared per recommendations of soils engineer and structural engineer.
 - .14 Polyethylene vapour barrier on top of the sand
 - .15 Extruded polystyrene board insulation, installed in two layers with staggered joints and levelled to +/- 3/16"
 - .16 Polyethylene slip sheet over rigid insulation
 - .17 Concrete slab including concrete, rebar and/or welded wire mesh steel reinforcing levelled to concrete section tolerances [cooling floor system]
 - .18 Cleaning of concrete surface prior to commissioning of ice rink system.
 - .19 A permanent water supply shall be available for the rink floor piping system pressure test, concrete rink floor pour, and flushing.
 - .20 All excavation and forming of trenches, including backfilling and compaction for any buried portions of refrigeration system piping.
-
- .3 Pack clearance spaces between pipes and sleeves on all piping in the refrigeration room with Thermafibre Firestopping. Caulk with Fireblock 350 fire resistant, resilient waterproof compound.
 - .4 Necessary ice paint and logos for installation of first sheet of ice
 - .5 The owner must make the application to the T.S.S.A. and for final registration of the pressure vessels supplied as part of the refrigeration system installation. All T.S.S.A. fees for the vessel registration are an owner obligation.

1.4 Demolition of Existing Refrigeration Equipment

- .1 Refrigeration equipment, piping, valves, hangers, etc are to be removed and disposed by the refrigeration contractor unless otherwise specified below. The refrigeration equipment demolition list specified is a required but not limited to;
 - .1 Two (2) reciprocating compressors
 - .2 One (1) cold brine pump
 - .3 One (1) evaporative condenser
 - .4 One (1) condenser water pump
 - .5 One (1) condenser water tank
 - .6 One (1) cold brine expansion tank
 - .7 All Ammonia and brine refrigerants. Owner to provide waste generation number.

1.5 Refrigeration Package Equipment

- .1 Manufactures and equipment specified below are for the purposes of setting a minimum standard of capacity and quality of equipment for the performance of the ice rink system. The refrigeration contractor is responsible for ensuring that the new equipment design and installation is capable of providing a properly functioning refrigeration system. The manufacturing firm must be certified and authorized to manufacture pressure vessels carrying the U-Stamp certification and standards. Alternate equipment can be submitted complete with the selection data sheet(s) for review and approval after tender.

- .1 Compressor # 1 Reciprocating Package
 - One (1) Mycom A Series Reciprocating Compressor
 - Nominal Capacity: 33.8 TR
 - Mycom N6WA Series
 - a) 50 HP NEMA premium motor
 - b) Cutout panel mounted c/w the following gauges and safety controls, pre-wired in series:
 - i. LP Gauge R717
 - ii. Oil Pressure Gauge
 - iii. Low Pressure Cutout
 - iv. High Pressure Cutout
 - v. Oil Failure Switch
 - vi. High Oil Temperature Switch

- .2 Compressor # 2 Reciprocating Package
 - One (1) Mycom A Series Reciprocating Compressor
 - Nominal Capacity: 19.7 TR
 - Mycom N4WA Series

- c) 30 HP NEMA premium motor
- d) Cutout panel mounted c/w the following gauges and safety controls, pre-wired in series:
 - vii. LP Gauge R717
 - viii. Oil Pressure Gauge
 - ix. Low Pressure Cutout
 - x. High Pressure Cutout
 - xi. Oil Failure Switch
 - xii. High Oil Temperature Switch

.3 Evaporative Condenser

One (1) Evaporative Condenser

Evapco LSCB-80

Capacity: 833 MBH

Horsepower: 7.5HP

Overall Dimensions: 4'-5/8" x 5'-11 7/8" x 8'-7"

Overall Operating Weight: 4,280 lbs

Unit shall come complete with the following accessories;

- a) Ladder
- b) 3' ladder extension
- c) Safety cage
- d) Safety cage extension
- e) CRN coils

1.6 Quality Assurance

- .1 The refrigeration contractor shall use only skilled welders, each holding a current, active certificate with TSSA.
- .2 Workmanship throughout shall conform to standard of best practice; labour employed shall be competent to do the work.
- .3 The refrigeration contractor shall be able to provide warranty service work to the equipment after installation for the warranty period specified.
- .4 Site verify all existing conditions.
- .5 Pre-Construction Conference:
 - .1 Arrange a rink slab pre-installation conference with the Owner, Consultant, General Contractor, reinforcing installer, floor finishing contractor, concrete supplier, manufacturer of admixture products, refrigeration contractor, and independent testing agency, to establish correct procedures and methods for

placing concrete rink slabs. The meeting will be held within seven days prior to the placing of rink slab concrete.

1.7 Shipping, Handling and Storage

- .1 Refer to Section 01 16 00 – Common Product Requirements.
- .2 Deliver, handle and store materials in accordance with manufacturer's printed instructions.

1.8 Waste Management and Disposal

- .1 Refer to Section 01 74 10 – Cleaning.

1.9 Warranty

- .1 The refrigeration contractor shall warrant the material and installation specified hereunder against original defects in manufacture and workmanship for a period of one (1) year after acceptance by the Owner.

Part 2 Products

2.1 Brine Piping

- .1 Supply and install all necessary brine and water piping. Brine and water pipe shall be schedule 40 ASTM A53 grade A or B ERW pipe.

2.2 Rink Floor Brine Headers

Header pipes shall be schedule 40 ASTM A53 grade A or B ERW pipe. Nipple pipes shall be ¾" schedule 80 ASTM A106 grade A or B seamless pipe welded at 4" centres. All pipes shall be new, straight and true before fabrication. Nipples shall not protrude into the headers. Headers shall be factory fabricated, pressure tested and painted.

Exposed headers shall be wrapped with a jacketed insulation around supply return ends of piping.

2.3 Rink Floor Polypropylene Piping

- .1 All rink floor piping shall be 26.6 mm ID x 31.75 mm OD linear low density, virgin polypropylene resin, CSA approved pipe that has been specifically manufactured for rink use.

- .2 Rink floor cooling piping shall be installed on 100 mm centres. The only permitted connections or joints in the cooling floor piping, shall be at the headers and at the 180° return bends. Pipes shall be fastened to the header and return bends via stainless steel clamps & screws, two (2) clamps per pipe connection.
- .3 Return bends shall be PVC.
- .4 The rink cooling floor and header system shall be tested with water pressure at a minimum of 345 kPa for 48 hours, prior to pouring of concrete. Pressure shall remain on the floor for the duration of the rink pour.
- .5 Return bend wire ties are to be cut after the concrete floor pour, through the perimeter side of the expansion joint to permit the floor slab to contraction during operation.

2.4 Rink Cooling Pipe Supports

- .1 Supply and install rink pipe support chairs made of steel rod fabricated with a 76mm wide, 0.701 mm steel base plate on the bottom. Rink pipe supports shall be fabricated to provide a polypropylene pipe lift to allow a maximum of 44mm thick concrete coverage over the top of rink piping.
- .2 Pipe chairs shall space the cooling rink floor piping on 100 mm centres and shall be placed in rows on 610 mm centres down the length of the rink. Overlap chairs by one (1) pipe at the end of each chair.

2.5 Refrigerant Piping and Valves

- 1. All Ammonia refrigerant piping shall conform to the latest edition of the ASME B31.5 Refrigeration Pressure Piping Code and CSA B52 Mechanical Refrigeration Code
- 2. All refrigerant piping 1" and larger shall be socket welded or butt-welded. All refrigerant piping up to and including ¾" shall be threaded or socket welded
- 3. All Ammonia pressure relief valves shall be sized and piped to a suitable location as defined in the CSA B52 Mechanical Refrigeration Code
- 4. Replace the following Ammonia refrigerant piping;
 - .1 Ammonia high stage discharge line from compressor to condenser
 - .2 Ammonia condenser drain line from condenser to engine room
 - .3 Ammonia relief header from engine room to roof

5. Ammonia high stage suction between compressor and surge drum can be reused. Any modification to this line if required is the responsibility of the contractor.

2.6 Brine, Water Piping and Valves

1. Brine and water piping shall be schedule 40 ASTM A53 grade A or B ERW pipe
2. Supply and install all necessary rink cold brine piping from plate & frame heat exchanger chiller to exposed trench headers.
3. Supply and install two (2) isolation butterfly valves on each pump for safe, convenient operation and maintenance. Butterfly valves shall be full lug type with trim selection compatible with fluid being handled. All butterfly valves shall have lever handle operator. Butterfly valves to be Challenger. On piping 2" and smaller full port steel ball valves shall be used
4. Cold brine pump isolation valves can be reused.
5. Condenser water supply and return line shall be replaced with steel
6. Condenser water pump isolation valves shall be replaced
7. Replace cold brine mains from headers to the isolation valves in the engine room

2.7 Pressure Gauges and Thermometers

1. Supply and install new pressure gauges for each brine/water pump. Provide 2 ½" diameter pressure gauges. Gauges shall be Weiss and constructed of material compatible with fluid being measured. All pressure gauges shall be liquid filled and come complete with isolation ball valves
2. Supply and install new thermometers on brine/water piping. All thermometers shall be Weiss with solar powered digital display, adjustable stem angle and separable wells

2.8 Refrigerant

1. Supply and install complete operating charge of Ammonia
2. Reuse existing cold brine floor charge
3. Refrigerant grade oil to be supplied as recommended by the compressor manufacture for the initial oil charge

2.9 Electrical Wiring

1. Provide all power and control electrical field wiring from the refrigeration starter panel to the refrigeration equipment motors, switches, controls and remote temperature sensors. All electrical wiring must conform to CSA and local codes. Power wiring to refrigeration starter panel is by the General Contractor

2.10 Pipe and Vessel Insulation

1. All piping within the refrigeration room which will have temperature loss of sweat during normal operation must be insulated with preformed polyisocyanurate (PIR) ITW Trymer 2000xp insulation with tongue and groove horizontal joints & ship lap end joints. Vapour barrier to be ITW saran film 560CX. Insulated pipe & fittings must be covered with a 0.020" minimum white PVC jacket over vapour barrier. Seal joints with white perma weld glue
2. Armaflex insulation & DOW SM will not be accepted for any interior pipe insulation
3. Insulated pipe must be protected by galvanized sheet metal shields that precisely match the curvature of the outer jacketing surface at all clevis hangers or steel trapeze pipe supports

2.11 Painting

- .1 All shop fabricated piping shall be painted with one coat of industrial finish enamel. Touch up any abrasions as required after equipment is installed and construction is complete.
- .2 All field-fabricated steel shall be painted with a rust resistant primer.
- .3 All un-insulated steel piping shall be painted with industrial machinery enamel paint with colours to match accepted trade standards.

2.12 Identification

- .1 All brine and water lines installed under this specification shall be identified after painting and insulation with the fluid in the pipe and the direction of the flow. All lines penetrating walls or roofs must be immediately identified on either side.

Part 3 Execution

3.1 Preparation

- .1 Carefully inspect the condition and arrangement of existing refrigeration ice plant and make all allowances for connecting the new rink slab piping to existing.
- .2 Perform excavation, removal and disposal of the existing area.
- .3 Disconnect and remove all existing refrigeration piping. Prepare existing headers for new installation.

3.2 Rink Floor

- .1 Rink slab as specified in Section 03 30 00.

3.3 Brine Charge

- .1 Existing Brine is to be disposed and replaced with new charge.
- .2 The brine charge will include the cold floor grids. Brine charge is to be introduced to the floor only with DI water. Allow for top up of existing brine charge using DI water.

3.4 Start Up and Ice Making

- .1 After the concrete is cured and the rink slab pull down procedure is completed, the owner's personnel shall install the first sheet of ice on the new rink floor.

3.5 Refrigeration System Commissioning

- .1 The ice refrigeration contractor shall be solely responsible for charging of brine (as per article 3.3). The refrigeration system shall be commissioned by a qualified refrigeration mechanic including testing and adjusting all operating controls. The refrigeration contractor shall instruct the Owner's representative in the operation and control of all the equipment on the refrigeration system.
- .2 The procedure for the initial rink concrete slab controlled temperature reduction and making of the first sheet of ice is as follows:
 - .1 A minimum 28-day cure period is required on the concrete prior to reducing the floor temperature.

- .2 The new concrete slab should be thoroughly cleaned and rinsed. A non-oil based detergent type soap, can be applied by a power scrubber or hand mopped. Ensure any traces of petroleum-based distillates have been removed.
- .3 Reduce the concrete slab temperature down to 0 °C. The full compressor capacity of the system will be used to minimize the time required to reduce the floor concrete slab temperature to 0 °C.
- .4 Maintain the concrete slab temperature at 0 °C for 24 hours.
- .5 Reduce the concrete slab at a rate of 2 °C per day until a temperature of approximately -7 °C is reached.
- .6 Owner begins ice-making process.

3.6 Cleaning

- .1 Proceed in accordance with Section 01 74 10 – Cleaning.

End of Section

Part 1 General

1.1 General

- .1 Conform to the requirements of Division 1.

1.2 Related Sections

- .1 Section 03 30 00 Cast-In-Place Concrete
- .2 Section 07 21 13 Building Insulation

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - .2 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CSA-A300, Cementitious Materials for Use in Concrete.
- .3 Ontario Ministry of Transportation
 - .1 Ontario Provincial Standard Specifications (OPSS)
 - .2 Ontario Provincial Standard Details (OPSD)
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water:
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices
- .5 Ontario Building Code.
- .6 The Workplace Health and Safety Act.

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings of shoring and bracing required in connection with excavation. Drawings to show clearly procedural sequence to be followed.
- .3 Submit test and gradation results for rink slab sand fill.

- .4 Submit a 20 kg sample of rink slab sand fill for testing to ensure compliance with standards specified.

1.5 Examination

- .1 Examine the building site and determine the nature and extent of the materials to be removed or the additional fill required to provide depths and levels indicated on drawings. Field check the site to review existing conditions. Verify locations of all existing utilities and services that will affect the work.
- .2 Before tendering the work, examine the site and ascertain the extent and nature of the material it may be necessary to remove to provide for the depths, levels, and grades required. Refer to civil, architectural and structural drawings for all building and site development details.

1.6 Geotechnical Report

- .1 A soils report is not available.
- .2 During examination of the site, carry out such investigations as necessary to determine subsurface conditions to be encountered in constructing the Works.
- .3 Notify the structural engineer and the inspection and testing company when excavation work commences for inspection and verification of soil conditions.

1.7 Setting Out Work

- .1 The drawings indicate the building components location, and proposed and final grades. Be responsible to construct the work according to levels and locations shown on the drawings. Report any errors or discrepancies to the Consultant before commencing work.
- .2 Commencement of any part of the work shall constitute acceptance of drawings as being correct.
- .3 Employ a competent instrument man and provide all lines and levels, limit lines and boundary stakes for the execution of the work as required. All bench marks shall be carefully protected.
- .4 Provide all Subcontractors with, and be responsible for, all lines, levels and dimensions which such trades require to relate their work to the work of the

Contractor or other trades. All trades shall be notified that all such levels and dimensions must be obtained from the Contractor.

1.8 Quality Assurance

- .1 Conform to the applicable requirements of the Ontario Provincial Standard Specifications (OPSS).

1.9 Inspection and Testing

- .1 Provide proper and sufficient samples, ample opportunity and access at all times for the Consultant or Testing Agency to inspect materials, operations and completed works carried out under this Section.
- .2 Sample and test excavated material prior to shipping to landfill off the site. Samples shall be tested for compliance of acceptable material for landfill. Furnish to the Owner the results of all testing and location of landfill site used. This testing will not be undertaken by the Owner's Inspection and Testing Agency.
- .3 Provide 24 hours of notice to inspection laboratory and request tests as follows:
 - .1 Sieve Analysis: Proposed fill materials will be tested to confirm stability for intended use and conformity with specifications.
 - .2 Density Test: Tests will be conducted on compacted fill, to ASTM D698.
 - .3 Frequency Test: Excavated Surfaces: When existing compacted fill surface is being prepared, make a series of three tests of surface for each 500 m² area.
 - .4 Fills under Slabs on Grade: make three tests for every two lifts of compacted fill for each 500 m² area.

1.10 Standards

- .1 Carry out all work in accordance with the applicable OPSS and OPSD. The applicable Ontario Provincial Standard Specifications are listed hereafter.
- .2 The following shall apply:
 - .1 OPSS180 Management and Disposal of Excess Material, Nov. 2005

1.11 Protection of Existing Services

- .1 Before starting the work, verify the location of all known underground services and utilities occurring in the work site area.
- .2 Notify the Owner, Public Utility or Municipal authorities in advance of planned excavations adjacent to their services.

- .3 Take care not to damage or displace encountered known and unknown services.
- .4 When such services are encountered during the execution of work, immediately notify the Consultant and protect, brace and support active services. Where repairs to these services become necessary use the following procedure:
 - .1 Known services, repair at no expense to the Owner.
 - .2 Unknown services, forward to the Consultant a complete breakdown of the estimated cost of such work. Proceed only upon written authorization.
- .5 In the case of damage to, or cutting off of an essential service, notify Consultant, the Owner, and Public Utility or Municipal authorities immediately and repair the service under the Consultant's direction.

1.12 Shoring and Bracing

- .1 Shoring and trench timbering, in addition to requirements of local authorities, shall be carried out in accordance with the requirements of The Occupational Health and Safety Act, "November 1992 Ontario Regulation 213/91" and Regulations for Construction Projects by Ontario Ministry of Labour and to Construction Safety Association brochure "Trenching Safety April 1994".
- .2 Erect necessary shoring for excavations in such a manner that:
 - .1 Whenever a trench or excavated face is necessary, shore and brace to prevent failure. Engage a registered Professional Engineer fully qualified in this line of work to design, stamp shop drawings and assume responsibility for the shoring and bracing. All shop drawings shall be submitted to the Consultant.
 - .2 It will properly retain the banks of the excavations and prevent caving-in or displacement or damage to surrounding or adjacent buildings or other property.
 - .3 All other work in connection with this Contract, including the Mechanical and Electrical Trades, may be carried out while it is still in place if necessary.
 - .4 It will be entirely free of footings, foundation walls or other such work so that it may be removed entirely or in sections when it is no longer required or when directed, without causing any damage or injury to the structural work that has been completed.

1.13 Dewatering

- .1 Keep excavations and backfill dry at all times.

Part 2 Products

2.1 Materials

- .1 Type A Fill: Class "A" material conforming to OPSS Division 10, latest edition.
- .2 Type B Fill: Class "B" material conforming to OPSS Division 10, latest edition.
- .3 Sand Fill: All sand fill shall be clean, well graded compactable sand to the attached gradation chart. Sand fill for the refrigerated slab warm glycol pipe sand zone shall be well graded, compactable sand conforming to the gradation requirements of Table M-1 attached.
- .4 Engineered Fill: fill placed below Type A and Type B fill to bring excavation to the design elevations. To be Type B fill or approved fill, approved in writing by the Consultant.

Part 3 Execution

3.1 Preparation

- .1 Clearing - Refer to Section 31 10 00 - Site Clearing.
- .2 Lines and Levels - refer to Section 01 71 00 - Examination and Preparation.
- .3 Stock Piles - Materials shall not be stockpiled on the site except with the prior approval of the Consultant. Where permitted, stockpile materials in a manner to prevent segregation and contamination. Piles not to exceed 6' in height. Stockpile materials in a location and manner not interfering with ongoing operation and use of the site and building by the Owner.

3.2 Examination

- .1 Refer to Owners reference drawings for layout of existing subsurface systems and structures below the rink slab and including under slab drainage. Locations shown are approximate and must be verified on site by the contractor as the work proceed.
- .2 No conduit is permitted to be installed below the rink slab.

3.3 Excavation Work

- .1 Remove existing rink slab, refrigerant piping, subfloor insulation and any other obstructions of whatever nature encountered in the course of excavation and haul away off the site.
- .2 Excavate to elevations and dimensions indicated or required by the work, plus sufficient space to permit erection of forms, shoring and inspection. Excavation shall be made to clean lines to minimize quantity of fill material required.
- .3 Unauthorized Excavation - Excavation to greater than required depth shall be corrected by the Contractor at his own expense in a manner as directed by the Consultant. Fill over-excavated areas under structure bearing surfaces and footings with concrete as specified for foundations.
- .4 Remove all concrete, masonry, rubble or other construction debris encountered during the work.
- .5 Keep excavation free of water by bailing, pumping or a system of drainage as required and provide pumps, suction and discharge lines or well points of sufficient capacity and maintain until such time as the permanent drainage system is installed or until the Consultant's approval of removal of equipment is obtained. Take all necessary measures to prevent flow of water into the excavation.
- .6 Protect the bottom and sides of excavated pits and trenches from freezing. Protect also from exposure to the sun and wet weather to prevent cave-ins and softening of the bed upon which concrete or drains rest.
- .7 Hand excavate around concrete grade beams where necessary.
- .8 Excavations must not interfere with the normal 45 degree plane of bearing from the bottom of any footing.
- .9 Keep bottoms of excavations clean and clear of loose materials levelled and stepped at changes of levels with exception of excavations made for drainage purposes and those to slope as required.
- .10 If the excavations reveal seepage zones, springs or other unexpected sub-surface conditions which may necessitate revisions or additions to any drainage system, inform the Consultant immediately so that remedial action can be taken.

.11 If removal of earth causes displacement of adjacent earth, the earth so disturbed shall be removed at no additional cost to the Owner.

.12 Conditions of Excavated Surfaces

- .1 Excavate to a depth sufficient to expose firm undisturbed subsoil, free of organic matter and to the Testing Agency's approval.
- .2 Remove soft, wet or unconsolidated ground and organic material encountered in excavating.
- .3 Should the nature of the sub-soil at the depths shown prove to be unsatisfactory to the Consultant for the placing of the concrete work, then upon the Consultant's written order, the Contractor shall excavate to greater depth until a satisfactory bottom is reached.

.13 Tolerances: General excavation shall be to the elevations shown on the drawings, plus or minus 1".

3.4 Backfilling

- .1 Proceed promptly with backfilling as the building progresses, and as work to be backfilled has been inspected and approved by the Consultant. The backfill in areas where settlement cannot be tolerated, e.g. service and footing trenches under the floor slab, should be compacted to at least 100 per cent of its Standard Proctor Maximum Dry Density.
The backfill should be placed in lifts not greater than 8" thick in the loose state, each lift being compacted with a suitable compactor to the specified density.
- .2 Do not commence backfilling operations until mechanical and electrical services, and perimeter and underslab insulation have been inspected and approved by Consultant and authorities having jurisdiction. Existing floor and rink slab subgrade must be proof rolled before backfilling.
- .3 Withdraw shoring material during backfill. Lumber left in place without the Consultant's approval will not be paid for by the Owner.
- .4 Backfill evenly on both sides of foundation walls to avoid unequal fill pressures on walls.
- .5 Place fill around foundation walls and footings so that footings will have a minimum of 48" coverage, measured at an angle of 45 degrees from bottom of footing to protect against frost until final grading is complete.

- .6 Where fill is placed adjacent to structures or vulnerable building components or in restricted areas, the fill shall be compacted to the same degree as specified by suitable equipment approved by the Consultant. Avoid damage to or displacement of walls, columns, piers, underground services, and process/ production equipment.
- .7 Add water in amounts required only to achieve the optimum moisture content, in accordance with ASTM D1557.
- .8 Backfill shall be free of snow and ice, topsoil, construction debris and oversized boulders greater than 6".

3.5 Rough Grading

- .1 Preparation and Layout
 - .1 Establish extent of grading by area and elevation.
 - .2 Prior to commencement of grading work, establish location and extent of all underground utilities occurring in work areas. Maintain, reroute or extend as required. Pay all costs for this work, except costs borne by utilities companies.
 - .3 Slope grade away from building as indicated on drawings.
 - .4 Cut temporary drainage swales and create containment ponds and structures for temporary surface run-offs, until storm sewer system is installed.
 - .5 Regrade all areas that retain or pond water.
 - .6 Rough grade all areas to tolerance of plus or minus 2"

3.6 Fills Unders Concrete Slab

- .1 The fill shall be deposited in layers of such thickness that the equipment being used for compacting can produce the specified density but in no cases, more than 8" thickness. If lumps are present in the material each layer shall be continuously disced in order to ensure proper compaction.
- .2 The exposed subgrade shall be proof rolled to ensure its integrity. If the subgrade consists of engineered fill, the fill shall be compacted to at least 98% of its maximum Standard Proctor Dry Density for native materials or 100% compaction for Granular "A" and "B" materials, using equipment approved by the Consultant. Any loose, wet or deleterious material shall be sub-excavated and replaced by the Contractor with Type B Engineered fill which must be compacted to 98% Standard Proctor Maximum Density.

- .3 Immediately after levelling, each layer of fill shall be thoroughly compacted by the use of approved mechanical equipment.

3.7 Rink Slab Sand Base

- .1 Proof-roll and compact the existing subgrade material to remain to 100%SPMDD.
- .2 Place and compact sand in layers of such thickness that the equipment being used for compacting can produce the specified density but in no case should any lift be more than 8" thickness
- .3 Accurately level and compact the upper layer to the underside of the insulation layer in preparation of placement of the vapour barrier. Accurate levelling of the sand base using a mechanically laser guided screed is required to achieve a high quality slab installation. Use a surveyor's level or laser system to check the elevation on a 5'-0" x 5'-0" grid.
- .4 Place sand layer and insulation to the following tolerances:
 - .1 3 m straight edge.....4.5 mm
 - .2 2 m straight edge.....3 mm
 - .3 Overall variation of 4.5 mm +/-

3.8 Compaction Density

- .1 Use approved equipment for compaction. Maintain materials at optimum moisture content to obtain required compaction. Special care shall be taken to prevent disturbance of the existing subgrade and adjacent structures and equipment.
- .2 Be responsible for damage to the subgrade and installed materials due to improper compaction methods. Make good to approval of the Consultant.
- .3 The minimum density of fill in place shall be the following values of Standard proctor densities for corresponding locations in accordance with A.S.T.M. D698-(STD).
 - .1 Type A Fill: To 100% Standard Proctor Maximum Density.
 - .2 Type B Fill: To 100% Standard Proctor Maximum Density.
 - .3 Engineered Fill: To 98% Standard Proctor Maximum Density.
- .4 If during progress of work, tests indicate that compacted materials do not meet specified requirements, remove defective work, replace and retest at own expense.

- .5 Ensure compacted fills are tested and approved before proceeding with placement of surface materials.

3.9 Fill Locations

- .1 Type B Fill:
 - .1 Around all footings, foundations, grade beams and walls up to the underside of sand fill.
 - .2 From top of approved compacted subgrade to underside of concrete slabs (interior or exterior) but not less than 8" thickness.
 - .3 At all areas on the site indicated to be paved with asphalt.
- .2 Sand Fill:
 - .1 Below all mechanical or electrical services, minimum 6" deep.
 - .2 Above all mechanical or electrical pipes and trenches, from springline to 12" above pipe obvert.
 - .3 Below the refrigerated Rink Slab
- .3 Engineered Fill: All fill locations up to the underside of Type B fill and where required to fill up to design elevations.

3.10 Water on Prepared Surfaces

- .1 Promptly remove, by approved methods, water rising from seeping of the soil or resulting from rainfall wherever such water is on the surface of sub-grade soil and compacted fill.
- .2 Where proper drainage and pumping is not carried out as specified herein, and any prepared sub-grade soil for under structural work, and any compacted fill for under concrete slabs, is softened or disturbed by water due to improper drainage and pumping, the Contractor shall remove the unsatisfactory soil and fill, and bear all incidental costs in connection with additional excavation and placing and compacting of granular fill under floor slabs.

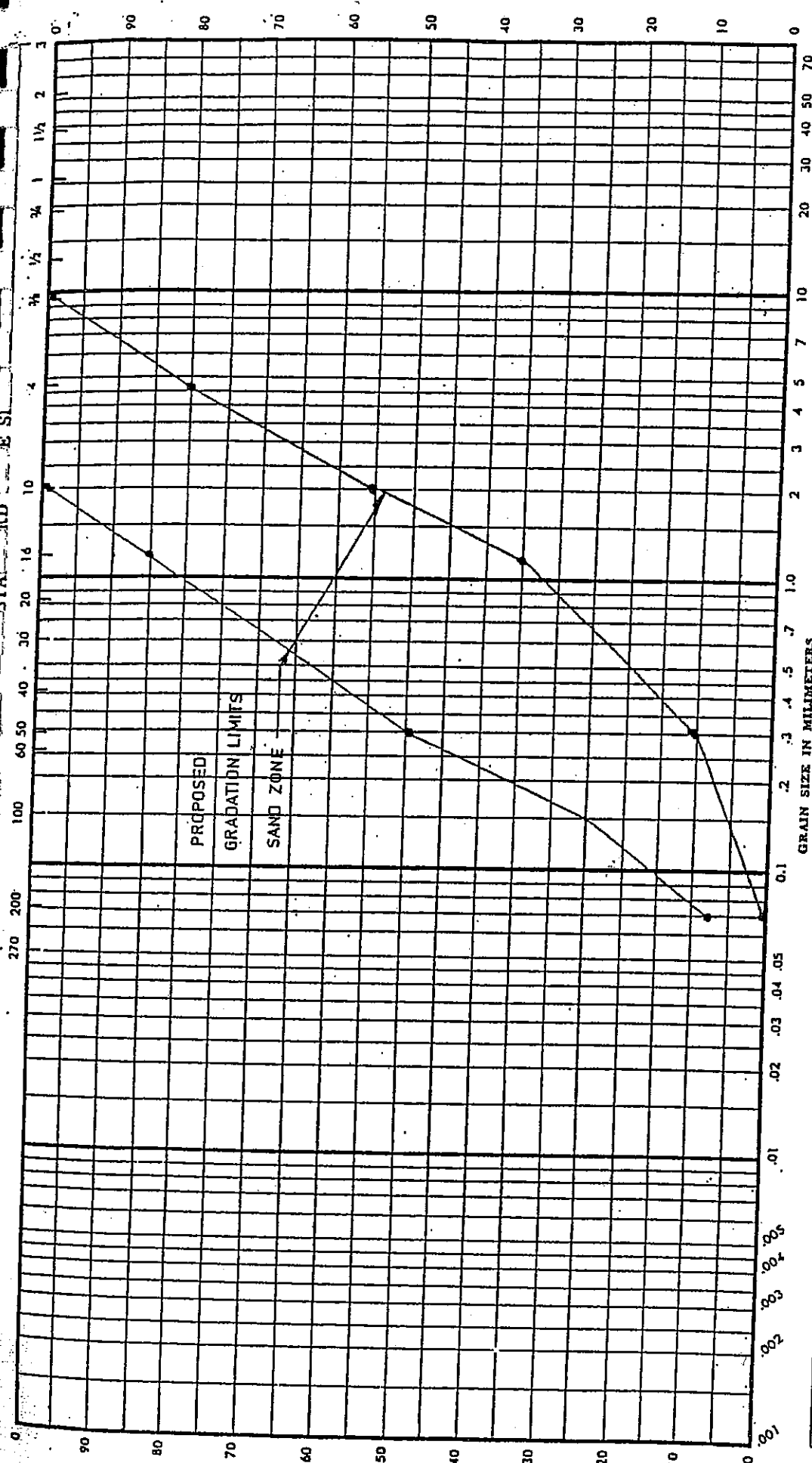
3.11 Surplus Soil Disposal

- .1 Surplus soil and excavated material shall be promptly removed and disposed of off the site at legal dump sites. Conform to OPSS 180 and local bylaw requirements for trucking and disposal. Complete testing as described in Part 1 of this specification.

3.12 Cleaning

- .1 Proceed in accordance with Section 01 74 10 – Cleaning.
- .2 As excavation proceeds, keep roads and aisles clean of dirt and excavated material.
- .3 Clean up and wash down to remove all dirt and excavated materials caused by the work of this section daily.

End of Section



| Clay | | Silt | | V. Fine Sand | | Fine Sand | | Medium Sand | | Coarse Sand | | Fine Gravel | | Gravel | |
|------|-----------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|---------------|-------------|---------------|--------|--------|--------|
| Clay | Fine Silt | Medium Silt | Coarse Silt | Fine Sand | Medium Sand | Coarse Sand | Medium Sand | Coarse Sand | Fine Gravel | Coarse Gravel | Fine Gravel | Coarse Gravel | Gravel | Gravel | Gravel |

U.S. BU OF SOI UNIFIE SYSTEM M.I.T. SYSTEM

JOB NO. _____ LOCATION _____ AREA _____

REMARKS _____ Material for embankment of brine pipe system

DATE _____ TECH _____

SAMPLE No. _____ HOLE No. _____ DEPTH _____

FMC(w) _____ %, L.L. _____ %, P.L. _____ %, P.I. _____ %

% Gravel _____, % Sand _____, % Very Fine Sand & Silt _____

% Silt _____, % Clay _____, Unified Soil Symbol _____

**Electrical
Specifications**

for

**Orono Arena and Community Centre
2 Princess Street
Orono, Ontario**

HCC PROJECT #23153

HCC ENGINEERING LIMITED

40 Eglinton Avenue East

Suite 600

Toronto, Ontario

M4P 3A2

Tel: (416) 932-2423

Issued for Construction

February 1, 2024

Project: 22119B
Description: Orono Arena and Community Centre
2 Princess Street, Orono, ON

Supplementary Tender Form
Section 00 00 00

SUPPLEMENTARY TENDER FORM

PROJECT: Orono Arena and Community Centre
2 Princess Street,
Orono, Ontario

REFERENCE NO: Tender No. T-23153

Submitted By: _____

Of: _____
(Address)

(Telephone)

Date: _____

1. Having carefully examined the:

Tender Documents including the Project Description, Terms and Conditions, Instructions to Bidders, Drawings, Schedules and Specifications for the supply and installation of the Electrical System for Town of Clarington and the Amendments numbered ____ to ____ in accordance with the Specifications and Drawings, and having visited and investigated the site and examined all conditions affecting the work, the undersigned offers, if notified in writing of the acceptance of the Tender within ninety (90) days of the time set for the delivery of the Tenders, to furnish all plant, equipment, labour and material and perform all duties and services required, excluding all harmonized services taxes, for the lump sum price of:

dollars (\$_____).

Amount of HST excluded from the
lump sum Tender Price stated above is _____

2. PRICE SCHEDULE AND VALUATION OF CHANGES

- .1 We will submit, for approval, a complete breakdown of labour and material costs for all changes.
 - .2 The man hour labour units for changes are to be based on labour units from column 1 of the NECA Manual of Labour Units.
 - .3 Total mark up including overhead and profit on the **material** shall be limited to 10%.
 - .4 Unit hourly composite cost to be used on all changes for labour, as required. The unit hourly composite cost shall contain all provincial taxes, overhead (ie: supervision, financing, estimating, project management, CADD, administration, parking, mileage, clean up, safety, truck fees, ESA fees, etc.), **profit** and associated costs for the work involved, excluding taxes. Unit hourly composite cost to remain in effect throughout the duration of this project.
1. Provide unit hourly composite cost for an electrician/technician to be on site during the times listed below:

Regular Time (7:00 am to 4:00 pm) \$ _____

Premium Time (Evenings/Weekends) \$ _____

SECTION 26 05 00: GENERAL CONDITIONS.

1.1 Project Description:

1. The project encompasses the 2 Princess Street, Orono facility. In general, the work shall include, without being limited to the following:
 1. Provide new 120/208 Volt and 347/600 Volt utility power service.
 2. Provide new 347/600 Volt EPS power service.
 3. Provide electrical distribution, communications conduit systems, lighting, lighting control system, fire alarm system, etc., as shown on the drawings.
2. The electrical contractor shall provide a comprehensive Methods of Procedures (MOPs) four weeks prior to each and every power shutdown. MOPs must include a detailed sequence of operations to be completed during the respective shutdown as well as a back out plan. MOPs must be approved by client and the electrical engineer prior to any work taking place.

1.2 Sub-Contractors:

1. The Contractor may not assign or sub-contract any work without the prior written consent of the Construction Manager or his designated representative. A list of sub-contractors must be submitted with the tender response.

1.3 Substantial Completion Of Contract

1. All the equipment and wire must be cleaned and tested, before acceptance by the consultant.
2. This Contractor shall guarantee all equipment and work furnished under this Division for a period of two (2) years (including all prepurchased and prequalified equipment) or such longer periods as may be provided in the warranty of the manufacturer of individual components, whichever is longer from the date of final acceptance by the Engineer. This contractor shall correct all defects developing as a whole or in part, due to defective workmanship, materials or defective arrangement of the various parts or materials damaged as a result of these defects or repairs. All defects shall be made good to the satisfaction of the Engineer at this Contractor's expense.
3. Replace, at no cost, all incandescent lamps burned out during a thirty (30) day period, all burned-out fluorescent and HID lamps for a period of ninety (90) days and all burned out LEDs based on a 70% lumen maintenance within a 5 year warranty period after date of issuance of certificate of Substantial Performance for the contract of this building.
4. Additional requirements as detailed in Section 26 05 00, paragraph 1.7, sentence 9.

1.4 Inquiries

1. Bidders shall direct their questions or other inquiries in writing to:

HCC Engineering Limited
40 Eglinton Avenue East
Suite 600
Toronto, Ontario
M4P 3A2
Tel: (416) 932-8393
Email: hcohen@hccengineering.com
Attention: Howard Cohen, P. Eng., RCDD/LAN, MBA

2. All inquiries will be responded to in writing and will be distributed to all bidders. No questions or inquiries will be answered within 24hrs of the closing period of a bid.

1.5 Site Meeting

1. The site meeting will be scheduled during the tender period by the construction manager.
2. Please note that the bid package will be returned unopened if site meeting is not attended.

1.6 Examination of Premises and Work

1. Visit and examine the site where the work is to be done. Become familiar with all features and characteristics of the site and/or any existing structure before submitting a bid. No allowances will be made by the Owner for any difficulties encountered by this Contractor due to any peculiarities of the site, surrounding public or private property that existed when the Tender was submitted.
2. This Contractor shall examine the structural, mechanical, architectural, electrical and any other drawings issued to satisfy himself that the work can be satisfactorily carried out. Before commencing work or prefabrication, examine the work of other trades and report at once any defect or interference affecting the work of the electrical trade.
3. Where variances occur between the drawings and the specifications, or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the contract sum. The Engineer will decide on the item and manner in which the work shall be installed.
4. All bidders shall familiarize themselves with and adhere to the design builder's / property manager's building standards and guidelines.

1.7 Terms And Conditions

1. DEFINITIONS

1. The term Owner shall be understood to refer to Town of Clarington.
2. The term consultant shall be understood to refer to Howard Cohen, P. Eng., RCDD/LAN, MBA.
3. The term project manager shall be understood to refer to Town of Clarington.
4. The term electrical contractor shall be understood to refer to the successful bidder to this specification for the electrical systems.
5. The term Contract shall be understood to refer to all items and conditions of this specification, Drawings, the complete tender package, the Contractor's tender submission and any other future contractual arrangements. All such items and conditions shall be binding unless agreed otherwise by the Contractor, Consultant and Owner.
6. The term Project shall be understood to refer to the complete supply and installation of the Electrical System and components, as defined in this specification and Drawings.
7. Wherever the words "equal", "equivalent", "approved", or "approved equal" are used, it shall be understood to mean, "equal", "equivalent", "approved", or "approved equal" in the opinion of the Consultant only.
8. Wherever the words "install", "provide", or "supply and install", are used it shall be understood to mean "provide and install, inclusive of all labour, materials, installation, testing, and connections" for the item to which referred.

9. "Concealed" is defined as "out of sight" in "normal" viewing conditions, and includes buried in concrete, above acoustic tile or gypsum board ceilings, within masonry or gypsum board constructed walls, within cable trays of below raised access floors.
2. These specifications or the drawings shall not be used alone. Any item or subject omitted from one, but mentioned or reasonably implied in the other, shall be provided. Misinterpretation of any requirements of either the specification or drawings shall not result in any additional charge after submission of Tender. This Contractor shall, by careful study of the total requirements, include all necessary components to make each system workable. The consultant shall be contacted for written clarification on any point before the submission of Tenders.
3. All terms and conditions of the specifications, tender documents and accompanying Drawings shall be strictly adhered to by the Contractor, unless otherwise noted. Any inability to comply with these requirements must be stated in writing, in detail, with the response submission. Otherwise, it shall be understood that the Contractor is bound to compliance with the stated terms and conditions.
4. The Contractor shall co-operate fully with the Owner, Consultant, landlord and landlord's agent and all contractors, sub-contractors and other persons working on the site.
5. The Contractor shall do the complete installation in accordance with the latest editions of the Ontario Building Code, Electrical Safety Code, CSA, NFPA, or other Codes or governing authorities of competent jurisdiction. In case of discrepancies with this or the manufacturer's specifications, the Contractor shall notify the Consultant immediately.
6. Obtain and pay for permits (note: Building Permit obtained by owner) and inspections required for work performed. Provide Certificate(s) of Acceptance from the Authorities Inspection Department, upon completion of work.
7. Submit required Documents and shop drawings to authorities having jurisdiction in order to obtain approval for the Work. Copies of Contract Drawings and Specifications may be used for this purpose. Prepare any additional information, details and drawings which these authorities may require.
8. The Contractor must comply with all requirements of the Occupational Health & Safety Act.
9. In order to meet the requirements of substantial completion the electrical contractor must complete the following:
 1. Installation and successful testing of all electrical system devices as per mutually agreed to tests and commissioning plan.
 2. Submission of all coordination and permit documentation for the Consultant's review.
 3. Submission of all record and As-built documentation.
 4. Correction of any deficiencies in the electrical system.

1.8 Schedule

1. All work including testing and commissioning of the 'Utility', 'EPS' and 'UPS' electrical systems must be completed as per the schedule provided by the project manager. Refer to schedule provided by the project manager for additional details. Include for all necessary overtime required to carry out the project. The successful contractor will not be permitted claims as a consequence of this requirement. The successful contractor to submit a full construction schedule before starting any work.
2. Sufficient manpower, materials, equipment, appliances and services are to be kept on site at all times to maintain the scheduled completion of work.
3. All work required to be done after office hours and weekends (including x-raying, core drilling and power shutdowns), shall be included in the tender price. Note: All x-raying and core drilling shall be provided by the electrical contractor.
4. Work associated with power shutdowns (including switching services from permanent, portable or temporary generator distribution back to utility power) and with testing and commissioning of electrical systems (including load bank testing of UPS and EPS) **must be carried out between Sunday @12:01am and 4:00am**. All shutdowns must be approved by Owner.

1.9 Contract Drawings

1. The Drawings for the electrical system work are diagrammatic performance Drawings, intended to convey the scope of work and indicate the approximate sizes and locations of equipment and outlets. The Drawings do not intend to show Designer's Architectural, Mechanical or Structural details.
2. Do not scale or measure Drawings, but obtain information regarding accurate dimensions, from the dimensions shown or by site measurements. Follow the Drawings for laying out the work.
3. Make, at no additional cost, any changes or additions to materials and equipment necessary to accommodate Structural conditions (offsets around beams, columns, etc.).
4. Alter at no additional cost, the location of materials and/or equipment as directed, provided that the changes are made before installation, and do not necessitate additional materials.
5. Change location of termination panels and devices at no extra cost providing cable length increase resulting from relocation does not exceed 3m (10') and information is given before installation.
6. Confirm at the site the exact location of equipment.
7. Any miscellaneous materials, hardware, devices, wiring, etc., not specifically described, but required for the installation and operation of the electrical system, shall be provided and included as part of the Bid.

1.10 Materials And Equipment

1. All materials and equipment shall be completely new and unused products of only the most recent manufacturer model or version number, CSA or UL certified, and manufactured to the Standards specified.
2. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from the local Inspection Department.
3. No damaged, chipped or marked equipment or materials will be accepted and must not be installed.

1.11 Substitutes

1. All tenders must be based on specified items. Substitutes will not be permitted.

1.12 Operation And Maintenance Manuals

1. Provide three (3) hard copy sets of operation and maintenance manuals for equipment and products supplied.
2. Provide three (3) soft copy scanned sets of operation and maintenance manuals for equipment and products supplied. Media shall be USB drives.
3. Include the following information in the Operation and Maintenance manuals:
 - Names and address of local suppliers for the items included.
 - Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature is not acceptable.
 - Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of the installation.
4. Review information provided in the maintenance instructions and manuals with the Owners' operating personnel to ensure a complete understanding of the electrical equipment and systems and their operation.

1.13 Progress Payments

1. Submit a complete breakdown of the Contract with each progress billing, indicating percentage of work complete, in a form acceptable to the Owner/Consultant.
2. The amount of monies to be allocated for close out documents must be 3% of contract value. This does not include monies allocated for studies, testing, measurement and verification, commissioning, etc.

1.14 Shop Drawings

1. Submitted Shop Drawings must indicate details of construction, dimensions, capacities, weights and electrical performance and flame spread characteristics of equipment or materials, as well as specification reference Section number and project name.
2. Shop Drawings shall be provided with sufficient space on the front for all Consultant's and Contractor's "review" stamps.
3. Work affected by submittal shall not proceed until review is complete.
4. Review submittal prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of the work and Contract Documents and bears the Stamp of Communications Contractor.
5. Changes made to the Shop Drawings by the Consultant will not affect the Contract Price.
6. Submit Shop Drawings for all material and equipment referred to in contract document.

1.15 Field Supervision

1. Throughout the duration of the Project, a properly qualified Electrical Field Supervisor must be available at all times. The Supervisor who starts the work must not be changed unless requested by the project manager, or written permission from the project manager is obtained.
2. In addition, provide proper office supervision of the work. The person responsible for office supervision must visit the site as often as necessary, to ensure work is properly performed, and attend weekly site meetings when so requested.

1.16 Site Responsibilities

1. Maintain work areas to be free of construction debris and waste. The disposal of all materials shall be the responsibility of the Contractor.
2. Make all necessary arrangements to transport materials and equipment to and within the site. The Contractor shall be responsible for arranging for the use of any hoists, lifts, pulleys, winches, cranes or service elevators.
3. The Contractor is responsible for complete storage, handling, delivery, and installation of all materials used in the performance of the work.
4. Obtain a copy of the Landlord's leasehold design manual and ensure that all requirements are complied with.

1.17 Deliveries / Access

1. Coordinate all deliveries to site with the Building Manager. Book loading dock and service elevators 72 hours in advance. Contractor must pre-arrange all site access and authorization for all site personnel and subcontractor personnel with the Building Project Manager or his representative

1.18 Testing and Commissioning

1. Provide testing and commissioning as per Testing and Commissioning Plan to be reviewed and approved by the Consultant and Project Manager for all items and their related components.
2. Supply all required equipment maintenance and operations manuals, for owner's staff use.
3. Provide all required software for monitoring, annunciation and control/dispatch applications

1.19 Other

1. The tender documents shall remain the property of the Project Manager. Bidders are required to return the tender documents to the Project Manager with their bids.
2. It is the responsibility of the Contractor to perform all cutting, patching and repair related to the electrical system work.
3. Work by the electrical contractor shall be protected during erection against disfigurement, contamination or damage by mechanical abuse or harmful materials. Protective covers shall be installed where exposure to potential damage is likely. The contractor shall ensure that no eating, drinking or smoking is carried out in the finished areas. Damages resulting from a breach of these requirements shall be repaired at the cost of the electrical contractor.
4. Existing and adjacent finishes, work and structures shall be protected from damage resulting from work of this project.

1.20 Record and As-Built Drawings

1. The Contractor shall maintain two sets of drawings on site. Clearly mark on these drawings all changes and deviations from the contract drawings and in particular mark the actual location of all feeder conduit locations.
2. All deviations from the contract drawings shall be recorded on the "as-built" drawings, including those changes due to Addenda, Site Instructions or Change Orders.
3. After the date of Substantial Performance, obtain from the Consultant, a set of the most recent Electrical System Drawings in AutoCAD Version 2021 format. These Drawings shall be marked up to record clearly, neatly, accurately and promptly all locations of Electrical System deviations as a result of Change Orders, Consultant's or Owner's Instruction, site conditions, etc. Utilize normal recognized CAD procedures that match the original drafting methodology. Submit the revised As-Built AutoCAD files and full-sized drawings (three sets) with changes clearly indicated to the Consultant for review and final presentation to the Owner.
4. For the disk drawing submission described above, the contractor must **include as part of the base bid price \$450.00** to have HCC Engineering supply the AutoCAD Version 2021 floor plans denoted as 'Issued for Tender' through file transfer site.

1.21 Drawings

1. For exact details and quantities, refer to the later sections of this document and to drawing E-1.1, E-1.2, E-2.0, E-2.1, E-3.1, E-5.1, E-6.1 and E-7.1 denoted as 'Issued for Tender November 10, 2023.'

1.22 Contract

1. Conform to the conditions stated in the Contract Form, Document CCDC-2.
2. A confidentiality agreement will form an integral part of the contract and will be provided to the successful contractor.

1.23 Cleaning

1. It is the responsibility of the Contractor to dispose of all waste related to this project.
2. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
3. On a daily basis, remove waste materials, rubbish, tools, equipment, machinery, surplus materials and clean all sight exposed surfaces.
4. All materials must be stacked neatly and safely.
5. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

6. Cleaning operations shall include those areas used for temporary site access or used on a temporary basis to facilitate work.
7. The contractor will remove all garbage from site on a daily basis at his own expense.
8. Failure to provide housekeeping and/or maintain a clean work area to the satisfaction of the project manager will result in the project manager providing the necessary housekeeping and/or maintenance service with all related costs, including mark-up's, being charged to the electrical contractor.

1.24 Demolition

1. Disconnect and remove existing conduit and wiring in partitions to be demolished and existing 'BX' cables, conduit and wire in ceiling where existing outlets, lighting fixtures, devices and mechanical equipment are to be removed.
2. Remove all branch circuit wiring and raceways originating from the existing receptacle panels. Wiring and raceways shall be removed back to the source panel. Circuits utilized to feed existing to remain mechanical equipment and other 120/208 volt sources to remain must be maintained.
3. Remove all existing electrical outlets and light switches as well as the associated wiring and raceways not being reused and/or not required for new layout (note: existing outlets and switches to be removed are not shown on the drawings). Provide blank coverplates at all locations where electrical and/or communications devices were removed in which partitions are not being demolished.

1.25 Digital Photos

1. Provide digital photos of all progress to date on a weekly basis. Each photo submission must be reviewed and approved by the consultant prior to continuing with the installation.

End of Section

SECTION 26 05 01: COMMON WORK RESULTS - ELECTRICAL.

PART I - GENERAL

1.1 Reference:

1. This section forms part of every section of Division 26.

1.2 Access Doors:

1. Not Required.

1.3 Cleaning:

1. Clean devices and other surfaces that have been exposed to construction dust and dirt. Clean the insides and outsides of panels and other electrical equipment and completely remove all debris and tools from the project.

1.4 Codes and Standards:

1. Complete the installation of the work in accordance with latest editions of the Ontario Building Code, Electrical Safety Code, CSA, ULC, NFPA or other codes, as required.
2. Comply with Electrical Bulletins in force at time of Bid submission. While not identified and specified by number in this Division, they are to be considered as forming part of related Standards.
3. Abbreviations for electrical terms are as per CSA Z85.

1.5 Finishes:

1. All shop finished metal equipment and enclosure surfaces, must be prepared by removal of rust and scale from the raw metal, degreasing, cleaning, application of rust resistance primer inside and outside, and at least two coats of finish enamel paint. Use factory standard colours unless otherwise specified. Colour reference numbers are Sico.
2. Paint exterior surfaces of indoor electrical equipment to manufacturer's standard.
3. Clean and touch-up (to Consultant's acceptance) surfaces of shop-finished equipment that is scratched or marred during shipment or installation, so as to match original paint.
4. Leave with the Owner, 0.22 gal. of paint of each colour used, in the form of liquid or spray, to allow for future touch-up of damaged areas.

1.6 Inserts, Hangers and Sleeves:

1. Provide hangers, inserts, sleeves and supports as required.
2. Inserts are to be of lead shield type.
3. Hangers must not be welded to structural steel members and burning of holes in structural steel is prohibited.
4. Sleeves are to be of a type suitable for the application and be sealed and made watertight. Sleeves through concrete shall be sized for free passage of conduit, and installed flush with underside of concrete slab and extend 100mm (4") above finished floor unless otherwise shown.

1.7 Intent:

1. It is the intent of these drawings and specifications that the Contractor provide complete and operational systems as required.
2. Where differences occur, the maximum condition shall govern.
3. Any miscellaneous items, hardware, devices, wiring, etc., not specifically described, but required for the operation of the system, must be provided and included as part of the Bid.

1.8 Mounting Heights:

1. Mounting height of equipment is from finished floor to center line of equipment unless specified or indicated otherwise.
2. If mounting height of equipment is not indicated, verify with Consultant before proceeding with installation.

1.9 Owners Instruction and Trial Usage:

1. Instruct the Owner's operating personnel in the startup, operation, care and maintenance of all the equipment. All equipment to be tested, operational and commissioned before instruction. Provide sheets for signatures of Owner's representative and operating personnel present at each instruction period.
2. Arrange and pay for the service of the manufacturer's factory service Engineer/Technician to supervise the start-up of his equipment installation, and to check, adjust, balance and calibrate components.
3. Provide these services for such period, and for as many visits as necessary to ensure that the Owner's operating personnel are conversant with all aspects of its care and operation.
4. When commissioning is included in the contract:
 1. Prior to any instruction sessions, commissioning coordinator shall submit check lists of each system or equipment indicating their operation status for acceptance by the Owner.
 2. Coordinate all instruction sessions to suit Owner's operation personnel schedule. Submit proposed instruction session schedule c/w training agenda three weeks prior to session start date to Owner for review.
5. The Owner's operating personnel must be permitted to operate the systems under the contractor's supervision for a reasonable period of time prior to Substantial Completion of Contract. This use shall not be misconstrued as acceptance of the equipment.

1.10 Plywood Backboard:

1. Supply and install all plywood backboards required for the work of this Division. Plywood to be highest quality fire retardant fir. 1200 mm wide x 2400 mm high (4'-0" wide x 8'-0" high), 19mm (3/4") thick unless otherwise specified. Prime and paint backboards on both sides with fire retardant paint, equal to CGSB spec. #1-GP-151M, of a colour to match the equipment and services mounted thereon as defined in "Finishes" above. **Do not paint over fire rated stamps.**
2. Plywood backboards are to be provided for mounting the following surface wall mounted equipment:
 - Cabinets.
 - Contactors.
 - Control Panels
 - Disconnect Switches.
 - Junction Boxes 600mm (2') square and larger.
 - Pull Boxes.

- Panel Boards.
- Splitters
- Transient Voltage Surge Suppression Units.
- External Breakers

3. Where practical, group devices on a common backboard.

1.11 Protection:

1. Protect exposed live equipment during construction for personnel safety.
2. Shield and mark live parts "LIVE 600 VOLTS", or with appropriate voltage in English.

1.12 Sealing:

1. Where cables or conduits pass through non fire-rated floors, walls or roof, provide internal and external sealing thereto.
2. Retain the service of a specialty sealant contractor for the work required.
3. Comply with manufacturer's installation instructions for all sealant applications.
4. For non-fire rated locations, Sealant shall be silicone, that meets requirements of CGSB 19-GP-23, for the size of the joint required, and the types of materials being bonded.
5. For fire rated locations, the fire stop shall meet the requirements of UL with regards to the type of assembly and the fire separation.
6. Provide architecturally approved air barrier seals and vapor barrier seals to electrical items passing through or terminating within walls, roofs and decks, humidity controlled areas and pressurized areas.
7. All materials used for fire stopping of penetrations must be Hilti Limited manufactured product only.

1.13 Sprinkler Proofing:

1. All areas of this building are protected by a wet sprinkler system. **All electrical equipment** to be configured for installation in such an environment.

1.14 Warning Signs:

1. Provide warning signs, as specified to meet requirements of Department of Labor Safety Inspection, Inspection Department, Authorities having jurisdiction and Consultant.
2. Use decal signs, in English minimum as required by Authorities.

1.15 Wire Pulling Lubricant:

1. Lubricant to be non-corrosive and NFPA 70 approved for the type of cable used.
2. Lubricants to be soap or wax based, depending upon application. Use soap based for short runs and for semi-conducting insulated wires, and wax based for long runs.

End of Section

SECTION 26 05 20: WIRE AND BOX CONNECTORS (0-1000V).

PART I - GENERAL

1.1 Work Included:

1. Provide all wire and box connectors required for a complete electrical system installation.

PART II - PRODUCTS

2.1 Materials:

1. Pressure type wire connectors are to be manufactured to CSA C22.2 No.65. Clamps and connectors are to be manufactured to CSA C22.2 No. 18.
2. Building Wire Connectors shall be:
 1. For wire sizes up to #6 AWG - Ideal "Wing Nut" or Gardner - Bender "Wing Gard".
 2. For Wire Sizes #4 AWG and larger:
 - End to end splices - Burndy YS.
 - Parallel splices - Burndy YC & YH (CU) or YHO & YHD (CU / AL).
 - At studs and bus bars - Burndy YA (CU) or YA-A (CU / AL).
 - Two or three conductors in parallel - Burndy KA-U (CU / AL).
3. Cable connectors shall be:
 1. For armored TECK cables, watertight type, with open compounded head - T&B series "Spin-on 2" with corrosion resistant boot.
 2. For armored cables steel type with nylon insulated throat - T&B "TITE-Bite".
 3. Clamps or connectors for armored cable, flexible conduit non-metallic sheathed cable shall be as required.

PART III - EXECUTION

3.1 Installation:

1. Remove insulation carefully from ends of conductors and:
 1. Install connectors and tighten as recommended by manufacturer.
Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
2. Install bushing stud connectors in accordance with NEMA 1Y-2.

End of Section

SECTION 26 05 21: WIRE AND CABLES.

PART 1 - GENERAL

1.1 Work Included:

1. Provide building wire as detailed below and as required for a complete electrical installation.

PART II - PRODUCTS

2.1 Materials

1. Wire in Conduit:

1. Conductor material to be annealed commercial grade, copper, 98 percent conductivity, up to #10 AWG solid, with RW90 insulation, #8 and larger, stranded, with RW90 insulation, unless noted otherwise, 300V rating for fire alarm, security and other low voltage circuits, 600V rating for 120 / 208V circuits, 1000V rating for 230 / 400V circuits, 1000V rating for 277 / 480V circuits, 1000V rating for 347 / 600V circuits.

2. Colour Coding (must be approved by ESA Field Inspector):

1. Two conductor, 1 phase: 1 black, 1 white
Three conductor, 1 phase: 1 red, 1 black, 1 white
Three conductor, 3 phase: 1 red, 1 black, 1 blue
Four conductor, 3 phase: 1 red, 1 black, 1 blue, 1 white

2. Ground wires: green.

3. Low voltage Armored Cables Type AC-90:

1. Type to be AC-90, Multi-conductor, with solid, annealed commercial grade 98 percent conductivity tinned copper conductors and cross-linked polyethylene with R90 insulation, 600 volt rating, on #10 and #12 size only.

2. Colour Coding:

- Two conductor, 1 phase: 1 black, 1 white
Three conductor, 1 phase: 1 black, 1 red, 1 white

3. Grounding to be uninsulated, solid copper, with impregnated paper separator.

4. Low voltage Armored Cables - TECK:

1. Type to be TECK, single conductor with annealed. Class B, stranded copper conductors and cross linked polyethylene, RW90 insulation, 1000 volt rating for #8 AWG and larger.
2. The inner and outer jackets to be PVC "Flamenol" suitable for -40°C, with mylar tape separator and aluminum strip, armour helically wound and interlocked.

5. Two Hour Fire Rated Cable - Mineral Insulated

1. Mineral Insulated Cables:

1. Mineral insulated cables shall be manufactured to CSA C22.2 No. 124.
2. Conductors are to be solid, bare, soft annealed copper, sized as required.
3. Insulation to be compressed powdered magnesium oxide, to form compact homogeneous mass throughout entire length of cable.
4. Overall covering to be annealed seamless copper sheath, type LW MI, rated 600 volt, 250°C.

PART III - EXECUTION

3.1 Installation:

1. General:

1. Wire shall be installed in conduit and sized for the connected load(s) and protection as required, unless otherwise specified.
2. Provide a dedicated #12AWG neutral from panel board to wiring devices ran with each of Phase 'A', 'B', 'C' conductors (ie: dedicated neutral per phase). Minimum power conductor wire size shall be #12 AWG.
3. Minimum power conductor wire size shall be #12 AWG, unless otherwise stated. Home runs in excess of 30 m (90') for circuits protected by a 15A over current device, shall be #10 AWG.
4. The current carrying capacity of the feeders, subfeeders and branch circuit conductors shall be sized to equal or better than shown on the drawings. If wire or cable sizes with equivalent current carrying capacity other than that specified is used, ensure that the voltage drop shall not be more than 2%.
5. The number of wires indicated for various systems is intended to show the general scheme only. The required number and type of wires shall be installed in accordance with the manufacturer's diagrams and with the requirements of the installation.

2. Wire in Conduit:

1. Provide pigtails at all outlets for wiring devices. All neutrals and branch circuits shall be connected in each outlet box to avoid a break in the neutral or the circuit wire when fixture or wiring device is disconnected.
2. At each junction, pull and outlet box make a 360 degree loop of the stripped uncut ground conductor under the ground screws.

3. Low Voltage Armored Cables - (Feeders):

1. Do not directly bury in or below concrete slabs or walls.
2. Do not encircle single conductor cable with ferrous metal.
3. No splices will be permitted.
4. Single conductors of the three or four wire circuit shall be run with uniform spacing of not less than one cable diameter throughout the feeder length.
5. Use wood throated cable clamps to ensure proper and uniform cable spacing.
6. Where cables are installed on walls, provide mechanical protection over them up to 2.4m (8') above finished floor, using a 12 gauge U section aluminum cover.

7. Cable connections to all enclosures, boxes and panels shall be by means of a watertight malleable aluminum connector.
4. Mineral Insulated Cable:
 1. Run cable exposed as required, securely supported by straps.
 2. Make cable terminations by using factory made kits.
 3. Use thermoplastic sleeving over bare conductors at cable terminations.
 4. Do not splice cable.
 5. MI cables must be rigidly supported at maximum spacing of 1m (3'). Do not use aluminum products for support.
 6. MI cables shall be used for emergency system feeders and branch circuits requiring a one (1) hour fire rating.

End of Section

SECTION 26 05 27.00: GROUNDING

PART I - GENERAL

1.1 Work Included:

1. Provide all grounding to conform with the Canadian Electrical Code and the latest instructions of the Inspection Authority, with any further requirements as noted herein.

PART II - PRODUCTS

2.1 Materials:

1. All grounding conductors stranded copper, bare or insulated as indicated on Drawings or in Specifications.
2. All ground wires are to be FT-4 rated factory green. Green tape, spray paint or any other means to alter the colour of the conductor is not permitted.
3. Use Cadweld or Burndy Thermoweld process for all weld connections. AMP of Canada Ltd. Wrench-Lok grounding connectors are an acceptable equivalent to welded connections.
4. All ground connectors to be designed and approved for grounding purposes.

PART III - EXECUTION

3.1 Installation:

1. Ground all conduit, and all non-current carrying metal parts, equipment cases, frames, bases, brackets, etc.
2. Grounding of all trays, AFCRs, racks, cabinets, etc. provided by the electrical contractor.
3. Ground each piece of fixed equipment back to the panel feeding that equipment, by one of the following methods:
 1. Conduit shall **not** be utilized for the ground return conductor.
 2. Where the conduit is flexible, install a separate bare soft drawn copper ground inside the conduit. At the switchboard or distribution panel, provide a grounding bushing, loop the ground conductor through the bushing, and connect to the switchboard ground bus. At the fixed equipment, connect to an internal ground bus, or connect to the inside of the metal enclosure utilizing approved screws and connectors (remove all paint).
 3. Run a separate (dedicated) insulated ground wire in all conduits to all devices and fixtures.
 4. Where equipment is fed by a multi-conductor power cable, provide a ground conductor in the cable. At the switchboard or panel, connect to the ground bus. Use a grounding connector on the cable for positive grounding of the metallic sheath. Loop the ground wire to the grounding connector.
 5. Run a separate ground wire in all flexible conduits. Connect each end to ground bus or lug or connector.
 6. Where mechanical protection is required for insulated grounding conductors install in rigid conduit.

7. Provide weld connection or wrench type grounding connectors for:
All connections between grounding conductors.
All connections to building steel.
All connections between grounding conductors and cable lugs.
8. Arrange grounding to provide the minimum impedance paths for ground fault currents. Provide any additional grounding required for approval by the inspecting authorities.

3.2 Equipment Grounding

1. Install grounding connections to typical equipment including non-current carrying metal parts of transformers, generators, motors, circuit breakers, cable sheaths, raceways, pipe work, screen guards, switchboards, meter and relay cases, any exposed building metal and building structural steel.

End of Section

SECTION 26 05 29: HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS:

PART I - GENERAL

1.1 Work Included:

1. Provide Hangers and Supports for Electrical Systems as required for a complete electrical system installation.

PART II - PRODUCTS

2.1 Support Channels:

1. U shape pre-galvanized steel, size 41 mm x 41 mm x 22 mm (1-5/8" x 1-5/8" x 7/8"), for surface mounting, suspending, or inserting into poured concrete walls and ceilings as required.
2. All channel fittings to suit channel type.
3. All other fittings to suit equipment weight, location and surface as required.

PART III - EXECUTION

3.1 Installation:

1. Secure plywood backboards, channels, luminaires, equipment and fittings to wood with wood screws, to solid masonry, tile and plaster surfaces with lead anchors, to poured concrete with self-drilling expandable inserts, and to hollow masonry walls with toggle bolts.
2. All ceiling mounted equipment shall be independently supported from the structure. Do not support equipment from ceiling support system.
3. Support equipment, conduit or cable using clips, spring loaded bolts, or cable clamps designed as accessories to basic channel members.
4. Fasten exposed conduit or cables to building using:
 1. Two-hole steel straps to secure surface conduits and cables 50 mm (2") and smaller.
 2. Two-hole steel straps for conduits and cables larger than 50 mm (2").
 3. Beam clamps to secure conduit to exposed steel work.
5. For suspended support system:
 1. Support individual cable or conduit runs with 6 mm (1/4") diameter threaded rods and spring clips.
 2. Support two or more cables or conduits on channels support by 6 mm (1/4") diameter threaded rod hangers where direct fastening to building construction is impractical.
 3. Support suspended luminaire using two or more lengths of Weldless "Single Jack", bright zinc plated steel chain, American Standard #10 gauge, 13 links per foot.
6. Provide metal brackets, frames, hangers, clamps and related type of support structure where indicated or as required to support conduit and cable runs.
7. Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

8. Do not use wire lashing or perforated strap to support or secure raceways or cables.
9. Do not use supports or equipment installed for other trades for conduit or cable support except with permission and approval of Consultant.
10. Install Hangers and Supports for Electrical Systems as required for each type of equipment, cable and conduits, and in accordance with manufacturer's installation recommendations.

End of Section

SECTION 26 05 31: SPLITTERS, JUNCTION BOXES, PULL BOXES AND CABINETS.

PART I - GENERAL

1.1 Work Included:

1. Provide splitters, junction boxes, pull boxes and cabinets as shown on the drawings and as required for a complete electrical installation.

PART II - PRODUCTS

2.1 Splitter Troughs:

1. Splitter trough construction is to be based on CSA C22.2 No. 76.
2. They shall have sheet steel enclosure, with welded corners and formed hinged cover suitable for locking in closed position.
3. Connection bars are to match required size and number of incoming and outgoing conductors as indicated.
4. Provide at least three spare terminals on each set of lugs in splitter troughs less than 400A and feed through lugs where required.
5. Provide double lugs for neutrals where required.
6. Enclosures shall be CSA/EEMAC Type 1 modified to sprinkler proof enclosure.

2.2 Junction and Pull boxes.

1. Junction and pull boxes construction is to be based on CSA C22.2 No. 40.
2. They shall be suitable for surface mounting and be of welded steel construction with screw-on flat covers.
3. For flush-mounted pull and junction boxes, provide covers with 25 mm (1") minimum extension all around.

2.3 General Cabinets:

1. Type D or E to be sheet steel, for surface mounting, complete with screw on cover (D) or hinged door (E), and return flange overlapping sides, handle and catch.

PART III - EXECUTION

3.1 Splitter Installation:

1. Install splitter troughs where required. Mount plumb, true and square to the building lines.
2. Extend splitters for full length of equipment arrangement except where indicated otherwise.
3. Provide **watertight connections** for all services entering the top of the splitter trough.

3.2 Junction, Pull Boxes and Cabinet installation:

1. Install junction, pull boxes and cabinets in inconspicuous but accessible locations.
2. Only certain junction and pull boxes are indicated. Provide pull boxes so as not to exceed 30 m (100') of conduit run between boxes, and after every two (2) 90 degree bends.

3.3 Identification:

1. Install nameplates.

End of Section

SECTION 26 05 32: OUTLET AND CONDUIT BOXES AND FITTINGS.

PART I - GENERAL

1.1 Work Included:

1. Provide outlet and conduit boxes and fittings as required for a complete electrical system installation.

PART II - PRODUCTS

2.1 Outlet and Conduit boxes - General

1. The construction of outlet boxes, conduit boxes and fittings is to be based on:
 - Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
 - Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, [ferrous alloy] [aluminum], Type FD, with gasketed cover.
 - Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C
2. Boxes shall be suitable for the utilization voltage.
3. Combination boxes shall have barriers where outlets for more than one system are grouped.
4. Recessed 100 mm (4") square or larger outlet boxes shall be complete with single or ganged plaster rings to suit application.

2.2 Sheet Steel Outlet boxes:

1. Electro-galvanized steel single and multi-gang device boxes for flush installation, shall be minimum size 75 mm x 50 mm x 37 mm (3" x 2" x 1-1/2") unless otherwise specified or required. 100 mm (4") square outlet boxes shall be used when more than one conduit enters one side, with extension and plaster rings as required.
2. Boxes for door switches and push buttons shall be sized as required.
3. Utility boxes for connection to surface mounted EMT conduit, shall be minimum 100 x 54 x 48 mm (4" x 2-1/8" x 1-7/8") size.
4. Square or octagonal outlet boxes for lighting fixture outlets, shall be minimum 100 mm (4") size.
5. Square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster or tile walls, shall be minimum 100 mm (4") size.

2.3 Masonry Boxes:

1. Electro-galvanized steel masonry single and multi-gang MBD boxes shall be used for flush mounted devices in exposed block walls.

2.4 Concrete boxes:

1. Electro-galvanized sheet steel concrete boxes shall be used for flush mounting in concrete, with matching extension and plaster rings as required.

2.5 Conduit Boxes:

1. Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet shall be used for outlets connected to surface mounted rigid conduit.

2.6 PVC Boxes:

1. F series and octagon boxes shall be moulded type, with fastening ears and screwed secured covers as required.

2.7 Fittings - General:

1. Bushing and connectors shall be with nylon insulated throats.
2. Provide knock-out fillers to prevent entry of foreign materials.
3. Use conduit outlet bodies for conduit up to and including 32 mm (1-1/4") and pull boxes for larger conduits.
4. Provide double locknuts and insulated bushings on sheet metal boxes.

PART III - EXECUTION

3.1 Installation:

1. Support boxes independently of connecting conduits.
2. Fill boxes with paper, foam sponges or similar approved material to prevent entry of construction material.
3. Size box wiring chambers in accordance with Electrical Safety Code.
4. Gang boxes together where wiring devices are grouped.
5. Provide matching blank cover plates for boxes without wiring devices.
6. Use combination boxes where outlets for more than one system or voltage are grouped.
7. For flush installations, mount outlets flush with finished wall using plaster rings to permit wall finish to come within 5mm (1/4") of opening.
8. Provide correct size of openings in boxes for conduit and armored cable connections. Reducing washers are not allowed.

End of Section

SECTION 26 05 34: CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS.

PART I - GENERAL

1.1 Work Included:

1. Provide conduits, conduit fastenings and conduit fittings as detailed below and as required for a complete electrical installation.

PART II - PRODUCTS

2.1 CONDUITS

1. Rigid and epoxy coated conduit shall be threaded, galvanized steel and shall be manufactured to CSA C22.2 No. 45.
2. Electrical metallic tube (EMT) conduit and couplings shall be manufactured to CSA C22.2 No. 83.
3. Flexible metal conduit and liquid tight - flexible metal conduit shall be manufactured to CSA C22.2 No. 56.

2.2 CONDUIT FASTENINGS

1. Conduit straps shall be steel, double hole for rigid or EMT conduit. **Single hole straps are not acceptable.**

2.3 CONDUIT FITTINGS

1. Fittings for conduits shall be manufactured to CSA C22.2 No.18. Provide coatings as per conduit.
2. Fittings for rigid conduit shall be steel threaded type.
3. Fittings for EMT conduit to be steel set screw type fittings.
4. Fittings for flexible conduit and exposed conduit outdoors to be liquid-tight type, straight or angled threaded for rigid and compression for EMT conduit.
5. Expansion fittings for rigid or EMT conduits shall be of the watertight type, with an integral bonding assembly, suitable for deflection in all directions.

2.4 PULLING CABLES

1. Pulling cables shall be 1/4" diameter polypropylene and of a strength suitable for tension to be pulled.

2.5 WATERPROOF MEMBRANE

1. Conduits penetrating waterproof membranes shall be PEM #6372.

PART III - EXECUTION

3.1 INSTALLATION (GENERAL)

1. The conduits for the following circuits and systems shall be run separately:
 - 120/208 volt utility power distribution.
 - 347/600 volt utility power distribution.
 - 120/208 volt emergency power distribution.
 - 347/600 volt emergency power distribution.
 - Normal power to luminaries.
 - Emergency power to luminaries and exit signs.
 - Fire alarm system multiplex loop devices.
 - Fire alarm system signaling devices.
 - Access Control and CCTV System devices.
 - Telephone and data systems.
 - Control wiring.
 - Net Status devices.
2. All conduits to be surface mounted (exposed, EMT) in mechanical and electrical service spaces and rooms and concealed elsewhere unless otherwise shown.
3. Wiring in ceiling spaces and in all partitions shall be EMT.
4. Exposed conduits shall be installed to conserve headroom and cause minimum interference in spaces through which they pass.
5. Use rigid conduit up to 2.4 m (8' -0") above finished floor where exposed indoors
6. **Use RGS conduit PVC coated galvanized rigid steel Robroy Permacote in all outdoor locations and in areas that are not environmentally controlled.**
7. Use electrical metallic tubing (EMT) above grade, and above 2.4 m (8' -0") above finished floor where exposed indoors.
8. Use flexible liquid tight metal conduit for connection to motors, and transformers.
9. Bend conduit without heating. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
10. Mechanically bend conduit over 20mm (3/4") diameter.
11. Field threads on rigid conduit must be of sufficient length to draw conduits tight.
12. Install pulling cables in all conduits that are to remain "empty".
13. A maximum of two (2), 90 degree bends, or equivalent up to 180 degrees, will be permitted without installation of a pull box. Radius of bends must be no less than ten (10) times the conduit diameter.
14. Conduits must be dry, before installing wires.
15. Support all branch conduits from building structure. Do not clip conduits to ceiling hangers, sprinkler pipes, plumbing or BAS wiring hangers.

3.2 SURFACE CONDUITS

1. Surface conduits shall be run parallel or perpendicular to building lines.
2. Conduits located near any heat producing equipment shall have 1500 mm (5') clearance.
3. Conduits adjacent to structural steel, beams or columns shall be run within the flanged portion, unless otherwise shown.
4. Group exposed conduits on surface or suspended channels.
5. Do not pass conduits through structural members except where indicated and approved by landlord.
6. Do not locate conduits less than 75 mm (3") parallel to steam or hot water lines. Provide a minimum clearance of 25 mm (1") at crossovers.

3.3 CONDUIT SIZE

1. The minimum conduit size shall be 19 mm (3/4").
2. All undimensioned conduits in the drawings are 19 mm (3/4").

3.4 EXPANSION FITTINGS

1. Conduit expansion fittings shall be provided on all conduits crossing expansion joints, and at maximum of 60 m (200') spacing.
2. Install expansion fittings perpendicular to expansion joint.
3. Refer to structural drawings for location of expansion joints.

End of Section

SECTION 26 05 34: WIRING DEVICES.

PART I - GENERAL

1. Provide all wiring devices indicated on drawings and described below.

PART II - PRODUCTS

2.1 Standards:

1. Construction of manually operated general purpose AC switches is to be based on CSA C22.2 No. 111, snap switches on CSA C22.2 No.55, and receptacles, plugs and similar wiring devices on CSA C22.2 No. 42.
2. Devices shall be Specification Grade and of one manufacturer throughout

2.2 Switches:

1. Switches shall be suitable for the voltage and load controlled and shall be single pole or three way as indicated.
2. They shall have terminal holes approved for No. 10 AWG wire, silver alloy contacts, and urea or melamine moldings for parts subject to carbon tracking.
3. They shall be suitable for back and side wiring, and rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
4. White decorator style switches shall be used for 120V circuits, in all finished areas.
5. White decorator style switches shall be used for 347V circuits in all areas.

2.3 Receptacles:

1. Duplex receptacles shall be NEMA Type 5-15R, 125 volt, 15 Amp, U ground and NEMA Type 5-20R (T Slot), 125 volt, 15/20 Amp, U Ground.
2. They shall be decorator style.
3. They shall be suitable for No. 10 AWG, back and side wiring, have break-off links for use as split receptacles and shall have eight (8) back wired entrances, four (4) side wiring screws and double wipe contacts with riveted grounding contacts.

2.4 Coverplates:

1. Coverplates shall be white in finished areas and stainless steel in unfinished areas.
2. Use die cast aluminum coverplates for wiring devices mounted for surface mounted FS or FD boxes, and pressed steel coverplates for utility surface boxes.
3. Use weatherproof spring-loaded, cast aluminum coverplates complete with gaskets for exterior mounted single receptacles and switches, or where indicated.

PART III - EXECUTION

3.1 Installation:

1. Switches:
 1. Install single throw switches with lever in “UP” position when switch closed.
 2. Install switches in gang type outlet box when more than one switch is required in one location.
2. Receptacles:
 1. Install receptacles in gang type outlet box when more than one device is required in one location.
3. Coverplates:
 1. Protect coverplate finish until painting and other work is finished or install after painting is complete.
 2. Do not use flush type coverplates on surface mounted boxes.

End of Section

SECTION 26 28 13.01: FUSES

PART I - GENERAL

1.1 Work Included:

1. Supply and install fuses in disconnect switches, etc. as required to complete this contract.

PART II - PRODUCTS

2.1 Fuses - General:

1. Plug and cartridge fuses shall be manufactured to CSA C22.2 No. 59.
2. HRC fuses shall be manufactured to CSA C22.2 No. 106 and to have interrupting capability of 200,000A symmetrical.
3. Fuses shall be the product of one manufacturer.
4. Fuse type reference L1, L2, J1, R1, etc. have been adopted for use in this specification.

2.2 Fuse Types:

1. HRCI - J fuses.
 1. Type J1, time delay, capable of carrying 500% of its rated current for 10 seconds minimum.
 2. Type J2, fast acting.
2. HRC - L.
 1. Type L1, time delay, capable of carrying 500% of its rated current for 10 seconds minimum.
 2. Type L2, fast acting.
3. HRC - R fuses (For UL Class RK1 fuses, peak let-through current and I^2t values not to exceed limits of UL 198E table 10.2.)
 1. Type R1, (UL Class RK1), time delay capable of carrying 500% of its rate current for 10 seconds minimum, to meet UL Class RK1 maximum let-through limits.
 2. Type R2, time delay, capable of carrying 500% of its rated current for 10 seconds minimum.
 3. Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.
 4. HRCII - C fuses.

PART III - EXECUTION

3.1 Installation:

1. Install fuses in mounting devices immediately before energizing circuit.
2. Ensure circuit fuses fitted to physically matched mounting devices. Install Class R rejection clips for HRCI-R fuses.
3. Ensure correct fuses fitted to assigned electrical circuit.
4. Fuses protecting motor loads and transformers to be type J1 for up to and including 600A and L1 for ratings above 600A.
5. Fuses protecting feeder circuits to be type J2 for up to and including 600A and type L2 ratings above 600A.
6. Fuses protecting other services or equipment shall be of the type required for that purpose.

End of Section

SECTION 26 28 23: DISCONNECT SWITCHES - FUSED AND NON-FUSED

PART I - GENERAL

1.1 Work Included:

1. Provide all disconnect switches shown on the drawings and as required for motors.

PART II - PRODUCTS

2.1 Equipment

1. Fuseholder assemblies to CSA C22.2 No. 39
2. Fusible and non-fusible disconnect switches shall be installed in CSA enclosures.
3. Provide for padlocking in "OFF" switch position by one lock.
4. Provide a mechanically interlocked door to prevent opening when handle in "ON" position.
5. Provide fuses sized as required.
6. Fuseholders in each switch shall be suitable without adapters, for type of fuse as specified.
7. Provide quick make, quick break action.
8. Provide ON-OFF switch position indication on switch enclosure cover.
9. Enclosures shall be CSA/NEMA Type 1 modified to sprinkler proof enclosure.

PART III - EXECUTION

3.1 Installation:

1. Install disconnect switches with or without fuses as required.
2. Provide **watertight connections** for all services entering the top of the disconnect switches.

End of Section

SECTION 26 51 00: INTERIOR LIGHTING.

PART I - GENERAL

1.1 Work Included:

1. Provide lighting fixtures as shown on the drawings and described below.

PART II - PRODUCTS

2.1 Lamp Standards:

1. Incandescent lamps shall be manufactured to CSA C22.2 No. 84.
2. Fluorescent lamps shall be manufactured to ANSI C78.
3. Incandescent, fluorescent and HID lamps shall be of 1 (one) manufacturer, either in total, or in groups defined by lamp type.
4. Ballast and lamps provided under this contract must be an approved combination by both respective manufacturers.

PART III - EXECUTION

3.1 INSTALLATION

1. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
2. Lamp and Driver / Ballast Installation:
 1. Refer to luminaire schedule and drawings, for lamp and driver / ballast requirements.
 2. Install lamps only when the luminaires are clean.
 3. Ensure that lamps are suitable for luminaires before energization and lamp length and colours are that as specified. Report any discrepancies to the consultant.
3. Luminaire Installation:
 1. Install luminaires accurately and carefully aligned complete with all mounting hardware. Ensure any suspension rods are vertical.
 2. All luminaires shall be supplied with accessory items such as yokes, plaster rings, frame adjusters, etc., where required for proper installation.
 3. At the time of date of "Substantial Completion" all luminaires, lenses, louvers and lamps must be clean and the lamps illuminated.
4. Luminaire Support:
 1. All fixtures in finished ceilings must be chained by 2 points directly to main structure such that they are supported independently of the ceiling system.
 2. All fixtures in exposed ceiling areas (no T-bar or Drywall) shall be mounted on 1-5/8" unistrut, running the full length of the run of fixtures. The unistrut is to be suspended from the ceiling deck by 3/8" threaded rod from unistrut between the joists. Do not puncture ceiling deck.
 3. All lighting feeds for suspended fixtures shall be dropped from the deck or slab straight down into the fixture or raceway. Fixture to fixture conduits will not be permitted. Conduit must go to the deck then to the next fixture.

5. Cleaning:

1. All luminaires must be cleaned before lamping and installing lenses or louvres.
2. Use dry, clean, soft cloths if luminaires are dusty. Use mild solvents to clean soiled luminaires.

3.2 FIELD QUALITY CONTROL

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
2. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

End of Section

SECTION 26 60 01: ELECTRICAL IDENTIFICATION.

PART I - GENERAL

1.1 Work Included:

1. Identify electrical equipment as specified herein.

1.2 Manufacturer's Nameplates:

1. Have the manufacturer's nameplates affixed to each item of all equipment showing the size, name of equipment, serial number and all information usually provided, including voltage, cycle, phase, horsepower, etc., and the name of the manufacturer and his address. Ensure that all stamped, etched or engraved lettering on plates is perfectly legible. Ensure that nameplates are not painted over. Where apparatus is to be concealed, attach the nameplate in an approved location on the equipment support or frame.
2. Ensure that panels and other apparatus which have exposed faces in finished areas do not have any visible trademarks or other identifying symbols. Mount nameplates behind doors.

PART II - PRODUCTS

2.1 Lamacoid Plates:

1. Green background with black engraved letters 10 mm (0.4") high or 25 mm (1") high as noted for normal power distribution.
2. Red background with black engraved letters 10 mm (0.4") high or 25 mm (1") high as noted for EPS power distribution.

2.2 Conductor Markers:

1. Cable diameter less than 13 mm (1/2") - Electrovert type Z.
2. Cable diameter 13 mm (1/2") and larger - Electrovert #510 strap-on.
3. Colour - white with black markings except fire alarm and life safety system which shall be white with red markings.

PART III - EXECUTION

3.1 Conduit Services - Power:

1. Locate identification:
 - Behind each access door.
 - At each change of direction and at junction boxes.
 - At not more than 10 m (40') apart in straight runs of conduit behind removable enclosures such as lay-in type ceiling, but on both sides of sleeves through walls or floors.
 - Above each floor or platform for vertical exposed conduits, preferably 1500 mm (60") above floor or platform.
 - Use stencils and stencil paint or lamacoid plates on all conduits.
 - Use minimum 25 mm (1") high letters.
 - The identification shall describe system voltage and service, i.e., "120 / 208 volt lighting to panel AA".

3.2 Conduits and outlet boxes:

1. Identify conduits and outlet boxes for the various systems by the use of the following distinctive colour paints. Apply a small area of paint to the inside of each outlet box, pull box and panel as it is being installed. Identify junction boxes in suspended ceiling areas with colour on both inside and outside.
 1. 120 / 208 volt system. -Black
 2. Fire Alarm systems. -Red
 3. 347/600 volt system. -Blue
 4. Security Alarm system -Orange
2. Use the colour coding as defined in NEC Section 210.
3. Where the existing colour coding differs from these Specifications, notify the Consultant of colours used and maintain existing colour coding.

3.3 Equipment Nameplates:

1. Identify all equipment listed below with lamaroid plates, letters 10 mm (0.4") high, unless otherwise noted.
 1. Lighting and Power Panels - Plates to be on outsides of door. Typical identification: "Lighting Panel C 120/208V, 3PH, 4 W MAINS 225 AMP 18KA RMS. Supplied from Panel BB".
 2. Disconnect switches and starters - Plates to be mounted externally on switch cover. Typical identification: "Fan S4, 208V, 3PH".
 3. Transformers - Plates to be mounted externally on case. Typical identification: "Transformer TR-UPSA 225 KVA/416/120/208V, 3PH / 4W fed from Panel UPS A".
2. Secure with mechanical fastening devices except on the inside of panel doors where gluing will be acceptable.

3.4 Wiring Colour Code:

1. Power and Lighting Conductors:
 1. Phase A - Red
 2. Phase B - Black
 3. Phase C - Blue
 4. Neutral - White
 5. Ground - Green
2. For sizes available in black only, use coloured tape markers at junction boxes and terminal points to match phase coding described above.
3. Band green isolated ground conductors with yellow tape.
4. Control conductors - Orange
5. Fire Alarm System Conductors.
 1. Alarm initiating devices and manual pull stations - red and blue.
 2. Alarm signaling devices - black and white.

3.5 Conductor Markers:

1. For power feeders, install markers at either end of the conductors where terminated inside of equipment to match wiring diagram conductor identification or panelboard circuit numbers. Typical identification Panel AA circuits - 21; use "AA-21". For a three phase circuit provide identification on phase A conductor only. For a single phase circuit provide identification on the phase conductor.
2. For Branch circuits supplying single phase and three phase devices such as receptacles and connections to equipment identify conductors at panel and in device outlet box. Install marker on phase conductor inside outlet box. Typical identification if device is connected to Panel B - circuit 14, marker identification "B-14".

End of Section

SECTION 26 60 02: TESTING AND COMMISSIONING OF ELECTRICAL SYSTEMS.

PART I - GENERAL

1.1 Description:

1. Include in work of this section, the testing and commissioning of all new electrical and component systems.
2. Include any specific testing of equipment required by the Hydro Inspection or Supply Authorities.
3. The complete costs of the site, load bank and factory testing and commissioning witnessing of Electrical Equipment is to be included in the Bid price.
4. Inform manufacturers of all factory and site testing requirements and include all their costs in the Bid price.
5. At their own discretion, testing is to be witnessed by the Owner and the Electrical Consultant.

1.2 Scope:

1. Include factory testing and approved certification, where required.
2. Coordinate with the equipment manufacturer, notify the Electrical Consultant in writing, 10 (ten) days before any factory testing to confirm Consultant's desired presence, and be present for all site testing.

1.3 Completion of Work:

1. All electrical systems and equipment shall be totally commissioned and operating before date of "Substantial Completion".
2. Coordinate with other trades and the building operations staff for work which affects the operation of the electrical systems, before submitting request for testing and commissioning. Failing to comply, bear all costs including Consultant's time cost, incurred for re-testing and re-commissioning.

PART II - PRODUCTS

2.1 Materials:

1. Provide all tools, equipment, labour and materials required to perform electrical testing and commissioning as specified. Provide the test results report (s).

2.2 Temporary Load Bank:

1. For testing of the UPS systems, provide resistive variable load banks.
2. Load banks must be complete with breakers to protect UPS systems from cable faults.

PART III - EXECUTION

3.1 General:

1. Perform site testing and commissioning only after all equipment is installed and operational.
2. Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
3. Provide four (4) copies of certificates of all factory and site testing in complete detail bearing in each case, the seal of the engineer responsible for the tests.
4. Submit all test results for Consultant's review.
5. All equipment or system deficiencies identified by factory or site testing procedures, to be corrected by the Contractor prior to obtaining a "Certificate of Substantial Completion".
6. Submit report, at completion of measurements, listing phase and neutral currents on panelboards, dry-type transformers and motor control centres, operating under normal load. Include hour and date on which load was measured, and voltage at time of test.
7. General operations: energize and operate electrical circuit and item. Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system.
8. Test systems and obtain written confirmation from manufacturers that components have been installed correctly and system functioning as intended. Submit certification for power distribution, communications systems and emergency power to Owner's Consultant.
9. Provide labour, instruments, apparatus and pay expenses required for testing. Owner's Consultant reserves right to demand proof of accuracy of instruments used.
10. Perform the following tests on completed power systems:
 1. Supply voltage: measure line voltage of each phase at load terminals of main breakers and report results in writing to Owner's Consultant. Perform test with majority of electrical equipment in use.
 2. Motor loading: measure line current of each phase of motors with motor operating under load, and report results in writing to Owner's Consultants.
 1. Upon indications of imbalances or overloads, thoroughly examine electrical connections and rectify defective parts or wiring.
 2. If electrical connections are correct, report overloads due to defects in driven machines in writing to Owner's Consultant.
 3. Insulation resistance tests:
 1. Megger circuits, feeders and equipment up to 350V with a 500V instrument for at least one (1) minute.
 2. Megger 350-600V circuits, feeders and equipment with a 1000V instrument for at least one (1) minute.
 3. Check resistance to ground before energizing.
 4. Coordinate and carry out motor testing at same time as driven equipment is being tested. In addition to motor loading tests, provide labour and instruments to read and record motor load readings required to supplement tests on driven equipment through various load sequences, as required by driven equipment tests.
11. Immediately prior to occupancy, test entire electrical system by performing loss and return of utility power test. Demonstrate operation of:
 1. Low voltage service equipment and metering
 2. Exit and emergency lighting
 3. Restabilization of systems after power return. Attach report printouts as evidence of expected operation on systems.
 4. User equipment shut-down and auto-restart.

3.2 Field Tests

1. Provide advance notice to Owner's Consultant of proposed testing schedule.
2. Perform tests at time of acceptance of work.
3. Conduct and pay for field tests:
 1. Power distribution, including phase voltage, grounding and load balancing.
 2. Circuits originating from branch distribution panels.
 3. Lighting and lighting control. Motors, heaters and associated control equipment, including sequenced operation.
 4. Emergency Power Systems
4. Perform tests in presence of Owner's Representative.
 1. Provide instruments, meters, equipment and personnel required to conduct required tests.
 2. Test systems to verify operation as specified.
5. Conduct di-electric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment

3.3 General Testing:

1. With the system completely connected, perform the following tests:
 1. Control and Switching - all circuits shall be tested for the correct operation of devices, switches and controls.
 2. Polarity Tests - all sockets shall be tested for correct polarity.
 3. Voltage Test - a voltage test shall be made at the last outlet of each circuit. The maximum drop in potential permitted will be 2% on 120 and 208 volt branch circuits and on 208 volt feeder circuits. Any deficiency in this respect shall be corrected.
 4. Phase Balance - measure the load on each phase at each splitter, and lighting and power panelboard and report the results in writing to the Consultant. Rearrange phase connections as necessary to balance the load on each phase as instructed by the Consultant, with the re-arrangement being restricted to the exchanging of connections at the distribution points mentioned in this paragraph. After making any such changes, make available to the Consultant drawings or marked prints showing the modified connections.
 5. General Operations - energize and put into operation each and every electrical circuit and item. Necessary repairs, alterations, replacements, tests and adjustments required shall be made for complete and satisfactory operating systems.

3.4 Sealing:

1. Ensure and verify that all penetrations of electrical equipment have been properly sealed with appropriate material and to the manufacturer's requirements.

3.5 Noise and vibration:

1. Ensure and verify that all isolation equipment has been installed where required and to the manufacturers' recommendations. Include the locations of and measurements of static deflection of spring isolators.

3.6 Coordination Study

1. For the entire electrical distribution system provided as part of this contract and for the existing high voltage base building switchgear and low voltage base building switchgear, supply a report from an independent test agency of the short circuit, protection, co-ordination study of the electrical distribution system. An existing coordination study is not available for contractor's use.
2. Procure (coordinate and pay for) the services of Brosz Technical Services Inc. Kyle Bunte kbunte@brosz.net to prepare the coordination study and arc flash analysis.

Co-ordination of Protective Devices:

- .1 Ensure circuit protective devices such as overcurrent trips, relays, circuit breakers and fuses are installed to values and settings so as to provide protection by means of opening the closest device to the fault.
- .2 Submit a short circuit, protection and co-ordination study as follows:
 1. Obtain and organize all electrical protection data for all the equipment. This will consist of obtaining the relay types and settings, transformer impedances, cable sizes, fuse sizes and types, motor data, etc., required to carry out the short circuit.
 2. Perform a short circuit analysis to determine short circuit current levels at all critical points in the distribution system, having obtained the available short circuit current available from the Hydro Supply Authority.
 3. Generate appropriate settings for all relays and protective devices from the level of the Hydro Supply Authority feeder protective devices to the largest downstream device on all the feeder secondary distribution levels.
- .3 Provide a complete, comprehensive report at the conclusion of the short circuit, protection and co-ordination study consisting of the following:
 1. A set of time current curve characteristics of all protective devices in the system plotted on log/log graph paper with corresponding short circuit current levels.
 2. Time current damage curves for all transformers, large motors and cables are also to be plotted.
 3. Provide a complete schedule of all main protective relays, fuses and other protective device listing device locations, function number, manufacturer, model number, size, range, setting, etc.
 4. The complete study will illustrate and ensure that the settings and sizes of all protective devices for each voltage level have been chosen to ensure maximum or optional protection and co-ordination during electrical fault or overload conditions.
 5. These generated settings will then be applied by "in-field" testing methods to the respective devices.

3.7 Ground Fault Protection System

1. Inspect relays visually for condition and clean where necessary.
2. Check all connections for tightness.
3. Apply settings to each relay as specified in the short circuit, protection and co-ordination study and test operation by means of a relay test set.
4. Verify each protective system by means of a primary current injection through the zero phase sequence transformer. This will provide correct operation of both the transformer and relay as well as proper functioning of the circuitry through to the breaker tripping elements.

3.8 Arc Flash Analyses

1. For the entire electrical distribution system provided as part of this contract and the existing electrical distribution system shown on the drawings, conduct an electrical arc flash hazard analysis as prescribed under NFPA 70E (CSA Z462-18) and provide a written report summarizing the findings and recommended control measures to be taken. The arc flashing analysis results must be deemed acceptable prior to the equipment purchase.
2. The power systems software utilized to perform the study must be SKM Powertools.
3. Provide appropriate labels for all equipment (including all prepurchased equipment and equipment supplied by owner). The labels shall warn a qualified worker who intends to open the equipment for analysis or work that a serious hazard exists and that the workers should follow appropriate work practices and wear appropriate personal protection equipment (PPE) for the specific hazard.
4. An existing coordination study is not available for the electrical contractor's use.
5. Procure (coordinate and pay for) the services of Brosz Technical Services Inc. Kyle Bunte kbunte@brosz.net to prepare the coordination study and arc flash analysis.

3.9 Emergency Light Level Measurements

1. As part of this scope of work procure the services of a third party professional engineer to measure and record emergency lighting levels in foot candles throughout the scope of work areas with a calibrated light meter. Readings shall be taken based on a minimum of one reading for every 20' center in open office areas, equipment rooms and corridors / hallways and one reading in each closed office, meeting room, boardroom and stairwell.
2. All light level readings are to be taken during non-daylight hours.
3. Provide a letter identifying light level readings and stating that the emergency lighting levels meet the requirements of the Ontario Building Code (OBC). Notify Owner and Consultant at least ten (10) days prior to proposed testing date and schedule testing at time and date acceptable to Owner and Consultant.

3.10 Test Results

1. Submit test results to Owner's Consultant for review.
2. Testing methods and test results: to CSA, NEC 2017 and authorities having jurisdiction.
3. Remove and replace conductors found damaged with new materials.
4. Provide required labour and tools, if during testing the Owner's Representative requests equipment be opened and removed from their housings to examine equipment, terminations and connections.

End of Section

SECTION 28 13 00: ACCESS CONTROL.

PART I – GENERAL

1.1 Work Included:

1. All power, wiring and conduit work required and /or shown on drawings related to security system (ie: for electric strike hardware, maglocks, door release button, etc..) shall be included in the tenant electrical contractor's tender price. Provide all conduit, wiring and junction boxes and all necessary accessories and devices to facilitate the complete installation of the security system. Obtain exact requirements for the tie into the security system (including power requirements) from the security contractor. Installation shall be under the direct guidance of, and to the manufacturer's recommendations.

End of Section

SECTION 28 31 00.01: MULTIPLEX FIRE ALARM SYSTEM – BASE BUILDING

PART I – GENERAL

1.1 Work Included:

1. All work required and /or shown on drawings related to life safety systems (ie: fire alarm, EVAC speakers, etc) shall be included in the tenant electrical contractor's tender price. Employ and pay for the services of the landlord's contractor to provide all conduit, wiring, devices, final connections, modifications and provision of new interfacing devices in existing system control panels (ie: modules, relays, sub-panel, etc). Ensure new devices to be used are compatible with the existing system. Maintain the integrity of the existing supervised circuits when new devices are to be connected. The system shall be tested and certified for proper operation upon completion of the work. Employ and pay for the services of the landlord's verification contractor.
2. Employ and pay for the services of the landlord's contractor to update the base building active graphic software system with all devices provided, deleted and relocated as part of this scope of work and with fire alarm system zone changes as part of this scope of work.
3. Employ and pay for the services of the landlord's contractor to update the base building passive graphics with all devices provided, deleted and relocated as part of this scope of work and with fire alarm system zone changes as part of this scope of work.
4. Employ and pay for the services of the landlord's contractor to provide additional power boosters, amplifiers and all other controls and accessories as required to ensure that the existing fire alarm system can accommodate all signaling devices shown on the drawings.
5. In **addition** to the field devices indicated on the drawings to be provided under this contract, include in the tender price to supply and install the following quantities of additional devices throughout the scope of contract floors, complete with 75'-0" of conduit and wiring, programming, testing and certification, labeling, verification and 100% repeat verification for each device post City Fire Department inspection. Reverify all existing fire alarm devices.

| Quantity of Devices | Device Type |
|----------------------------|--------------------------------|
| 1 | Fire Alarm System Bell |
| 1 | Fire Alarm System Strobe Light |

6. Test and verification in conformance with CAN/ULC S1001, Integrated Systems Testing Of Fire Protection And Life Safety Systems. Provide a satisfactory Integrated Testing Report. As part of the base bid price, electrical contractor must procure (engage, coordinate and pay for) an Integrated Testing Coordinator, responsible to develop and implement the Integrated Testing Plan.

End of Section

Project: Orona Arena and Community Centre

Panelboard: RP-E

Voltage (V):

Phase/Wire:

Bus and Lugs Rating (A):

| CCT NO | Load | Breaker | | | CCT NO | Load | Breaker | |
|-----------|------------------------------|---------|------|--|-----------|--------------------------|---------|------|
| | | Amp | Pole | | | | Amp | Pole |
| 1 | ROOM 114/115 MISC RECEPTACLE | 20 | 1 | | 2 | DOOR OPERATOR | 15 | 1 |
| 3 | ROOM 115 HAND DRYER | 15 | 1 | | 4 | DOOR OPERATOR | 15 | 1 |
| 5 | ROOM 115 GFI RECEPTACLE | 20 | 1 | | 6 | FIRE ALARM BOOSTER PANEL | 15 | 1 |
| 7 | ROOM 114 HAND DRYER | 15 | 1 | | 8 | | | |
| 9 | ROOM 114 GFI RECEPTACLE | 20 | 1 | | 10 | | | |
| 11 | ROOM 117/122 MISC RECEPTACLE | 20 | 1 | | 12 | | | |
| 13 | ROOM 117 GFI RECEPTACLE | 20 | 1 | | 14 | | | |
| 15 | ROOM 122 GFI RECEPTACLE | 20 | 1 | | 16 | | | |
| 17 | ROOM 117 HAND DRYER | 15 | 1 | | 18 | | | |
| 19 | ROOM 122 HAND DRYER | 15 | 1 | | 20 | | | |
| 21 | ROOM 121/116 MISC RECEPTACLE | 20 | 1 | | 22 | | | |
| 23 | ROOM 121 GFI RECEPTACLE | 20 | 1 | | 24 | | | |
| 25 | ROOM 121 HAND DRYER | 15 | 1 | | 26 | | | |
| 27 | ROOM 116 GFI RECEPTACLE | 20 | 1 | | 28 | | | |
| 29 | ROOM 116 HAND DRYER | 15 | 1 | | 30 | | | |
| 31 | ROOM 113 GFI RECEPTACLE | 20 | 1 | | 32 | | | |
| 33 | ROOM 113 HAND DRYER | 15 | 1 | | 34 | | | |
| 35 | ROOM 113 MISC RECEPTACLE | 20 | 1 | | 36 | | | |
| 37 | HOUSEKEEPING RECEPTACLE | 20 | 1 | | 38 | | | |
| 39 | | | | | 40 | | | |
| 41 | | | | | 42 | | | |

Project: Orona Arena and Community Centre

Panelboard: RP-E

Voltage (V):

Phase/Wire:

Bus and Lugs Rating (A):

| CCT NO | Load | Breaker | | | CCT NO | Load | Breaker | |
|-----------|------|---------|------|--|-----------|------|---------|------|
| | | Amp | Pole | | | | Amp | Pole |
| 43 | | | | | 44 | | | |
| 45 | | | | | 46 | | | |
| 47 | | | | | 48 | | | |
| 49 | | | | | 50 | | | |
| 51 | | | | | 52 | | | |
| 53 | | | | | 54 | | | |
| 55 | | | | | 56 | | | |
| 57 | | | | | 58 | | | |
| 59 | | | | | 60 | | | |
| 61 | | | | | 62 | | | |
| 63 | | | | | 64 | | | |
| 65 | | | | | 66 | | | |
| 67 | | | | | 68 | | | |
| 69 | | | | | 70 | | | |
| 71 | | | | | 72 | | | |
| 73 | | | | | 74 | | | |
| 75 | | | | | 76 | | | |
| 77 | | | | | 78 | | | |
| 79 | | | | | 80 | | | |
| 81 | | | | | 82 | | | |
| 83 | | | | | 84 | | | |

Project: Orona Arena and Community Centre

Panelboard: PP-A

Voltage (V):

Phase/Wire:

Bus and Lugs Rating (A):

| CCT NO | Load | Breaker | | | CCT NO | Load | Breaker | |
|--------|---------------------------------------|---------|------|--|--------|---------------------|---------|------|
| | | Amp | Pole | | | | Amp | Pole |
| 1 | | | | | 2 | EXISTING CCT | 15 | 1 |
| 3 | | | | | 4 | EXISTING CCT | 15 | 1 |
| 5 | | | | | 6 | EXISTING CCT | 15 | 1 |
| 7 | | | | | 8 | | | |
| 9 | | | | | 10 | | | |
| 11 | | | | | 12 | | | |
| 13 | | | | | 14 | | | |
| 15 | | | | | 16 | | | |
| 17 | | | | | 18 | | | |
| 19 | | | | | 20 | | | |
| 21 | | | | | 22 | | | |
| 23 | EXISTING CCT | 15 | 1 | | 24 | | | |
| 25 | EXISTING CCT | 15 | 1 | | 26 | | | |
| 27 | EXISTING CCT | 15 | 1 | | 28 | | | |
| 29 | EXISTING CCT | 15 | 1 | | 30 | | | |
| 31 | EXISTING CCT | 15 | 1 | | 32 | | | |
| 33 | LIGHTING CCT / EMERGENCY BATTERY UNIT | 15 | 1 | | 34 | EXISTING CCT | 15 | 1 |
| 35 | | | | | 36 | EXISTING CCT | 15 | 1 |
| 37 | | 70 | | | 38 | | 100 | |
| 39 | EXISTING CCT (TR-SP-B) | | | | 40 | EXISTING CCT (PP-D) | | |
| 41 | | | 3 | | 42 | | | 3 |