

**THE TOWN OF DEEP RIVER
RINK SLAB REPLACEMENT
DEEP RIVER ARENA
2 CLUB HOUSE ROAD, DEEP RIVER, ON, K0J 1P0**

“ISSUED FOR PERMIT & TENDER”

Tender No.

BBA Project No. 25244

DATE March 17, 2026



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DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 11	Table of Contents	2
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DIVISION 01 – GENERAL REQUIREMENTS

01 00 60	List of Drawings	1
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	2
01 29 83	Payment Procedures for Testing Laboratory Services	2
01 31 00	Project Management and Coordination	3
01 32 00	Construction Progress Documentation	3
01 33 00	Submittal Procedures	4
01 35 13.53	Special Project Procedures for Occupied Buildings	4
01 35 43	Environmental Procedures	2
01 40 00	Quality Requirements	3
01 41 00	Regulatory Requirements	4
01 45 00	Quality Control	3
01 51 00	Temporary Utilities	3
01 52 00	Construction Facilities	2
01 56 00	Temporary Barriers and Enclosures	2
01 61 00	Common Product Requirements	4
01 70 03	Safety Requirements	4
01 71 00	Examination and Preparation	2
01 73 00	Execution Requirements	3
01 74 11	Cleaning	2
01 74 19	Construction Waste Management and Disposal	4
01 77 00	Closeout Procedures	2
01 78 00	Closeout Submittals	7
01 79 00	Demonstration and Training	2

DIVISION 02 – EXISTING CONDITIONS

02 41 19.13	Selective Building Demolition	10
-------------	-------------------------------	----

DIVISION 03 – CONCRETE

03 10 00	Concrete Forming and Accessories	5
03 20 00	Concrete Reinforcing	5
03 30 00	Cast-in-Place Concrete	12
03 35 00	Concrete Finishing	4

DIVISION 05 – METALS

05 50 00	Metal Fabrications	6
----------	--------------------	---

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 21 13	Building Insulation	3
07 92 00	Joint Sealants	5

DIVISION 08 – OPENINGS

08 33 00	Overhead Coiling Doors	7
----------	------------------------	---

DIVISION 09 – FINISHES

09 67 72	Concrete Floor Sealer	3
----------	-----------------------	---

DIVISION 13 – SPECIAL CONSTRUCTION

13 18 00	Dasherboards	8
----------	--------------	---

13 18 30	Ice Rink Piping	7
<u>DIVISION 31 – EARTHWORK</u>		
31 23 10	Excavating, Trenching and Backfilling	8
	Gradation Table: Material for Embedment of Brine Pipe System	1

End of Section

PART 1 GENERAL

Dwg. No.	Title	Issue No.	Rev. No.	Issue Date
STRUCTURAL				
S000	Cover Sheet	2	-	March 12, 2026
S101	General Notes & Typical Details	3	-	March 12, 2026
S102	Typical Details	3	-	March 12, 2026
S200	Overall Site Plan	3	-	March 12, 2026
S201	Ground Floor Demolition Plan	3	-	March 12, 2026
S202	Ground Floor Plan	3	-	March 12, 2026
S203	Rink Flooring Plan	3	-	March 12, 2026
S501	Sections and Details	3	-	March 12, 2026
S502	Sections and Details	3	-	March 12, 2026
S503	Sections and Details	3	-	March 12, 2026
S504	Sections and Details	3	-	March 12, 2026
S505	Sections and Details	3	-	March 12, 2026

End of Section

PART 1 GENERAL

1.1 Consultants

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

PART 2 PRODUCTS

3.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.2 Not Used

- .1 Not used

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.
- .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 that includes:
 - .1 Testing and Inspection
 - .2 Electrical Allowance

Project: 25244
Description: DEEP RIVER ARENA COMPLEX RINK SLAB REPLACEMENT
2 CLUB HOUSE ROAD, DEEP RIVER, ONTARIO

CASH ALLOWANCES
Section 01 21 13

- .3 Refrigeration Allowance
- .4 Sanitary Drain Repair Allowance

PART 2 PRODUCTS

2.1 Not Used

.1 Not used

PART 3 EXECUTION

3.1 Not Used

.1 Not used

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.
- .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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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 through the testing and inspection allowance.
- .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.
- .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 rink 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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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 Contractor will be responsible for taking minutes of the meeting and 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. The general contractor is responsible for recording the meeting minutes and distributing them to all involved attendees after the meeting.
- .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 Specifications.
 - .3 Addenda.
 - .4 Reviewed Submittals

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

PART 2 PRODUCTS

2.1 Not Used

.1 Not used

PART 3 EXECUTION

3.1 Not Used

.1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

.1 Not used

PART 3 EXECUTION

3.1 Not Used

.1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

.1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 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 prepared by Indoor Environmental Specialists dated April 4th, 2023 for a list of designated substances at the facility which must be considered as part of the project work where effected by the renovation work.
- .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 SDS 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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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.

1.12 Equipment and Systems

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

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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 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.

1.5 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.
- 1.6 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.
- 1.7 Temporary Communication Facilities
- .1 Provide and pay for temporary telephone, fax, data hook up, lines and equipment necessary for own use.

PART 2 PRODUCTS

2.1 Not Used

.1 Not used

PART 3 EXECUTION

3.1 Not Used

.1 Not used

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 must supply and install construction site trailers. The use of the existing facility dressing rooms or mechanical rooms will not be considered acceptable for

this this project.

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

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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.

.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.

PART 2 PRODUCTS

2.1 Not Used

.1 Not used

PART 3 EXECUTION

3.1 Not Used

.1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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 2015.
 - .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 personal protective equipment (PPE) 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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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 SDS 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.
- .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.

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 2-2008, 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

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

.1 Not used

PART 3 EXECUTION

3.1 Not Used

.1 Not used

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.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not used

PART 3 EXECUTION

3.1 Not Used

- .1 Not used

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 Town of Deep River.

- .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 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 Remove existing netting throughout the facility taking care not to damaged the low emmissivity ceiling system. All netting shall be replaced, connections at the ceiling can be re-used where feasible.
 - .6 Complete sawcutting, removal and disposal of refrigerated rink slab and apron slabs and rink refrigeration piping in accordance with regulatory requirements.
 - .7 Remove all disconnected, abandoned utilities.
 - .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 Reinstall 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 3/4" x 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.
- .2 Plain round bars: to CSA G40.20-04/G40.21-04 (R2009).
- .3 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.
- .4 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M-15. Tire wires for rink piping to chairs shall be coloured epoxy coated.
- .5 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.
- .6 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.

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 before addition of superplasticizer: 60 mm ± 20 mm
 - .4 Slump after addition of superplasticizer, at point of discharge: 180 mm ± 20 mm
 - .5 Maximum Aggregate Size: 14mm
 - .6 Maximum water-to-cement ratio: 0.45
 - .7 Water Reducing Admixture: to ASTM C494/C494M
 - .8 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 25 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 tie wire. Wire slab to be tied directly to chairs and bottom steel reinforcing mat at a grid of not more than 610mm x 410 mm c/c. At lap joints in the mesh extra ties shall be provided to ensure the wire mesh does not lift and encroach in minimum 19mm clear cover when concrete finishing is on-going.

- .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 Take special care not to walk on or exert any forces on piping.
- .9 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.
- .10 Verify that all piping has been pressure tested for leaks before commencing placement of concrete.
- .11 Ensure a constant pressure of a minimum of 50 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.
- .12 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.
- .13 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.
- .14 Pump concrete for rink slabs.
- .15 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.
- .16 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.
- .17 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.
- .18 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.
- .19 Do not add water to concrete mix on site.
- .20 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.
- .21 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.
- .22 Use mechanical screed and screed rails unless other methods have been pre-approved. Set screeds to ensure an even level surface.
- .23 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.
- .24 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.
- .25 Immediately prior to casting each new strip, re-vibrate edges of adjacent previous strip.
- .26 Apply liquid concrete surface densifier after concrete has set, in accordance with the manufacturer's written instructions.

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 SDS - 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 91 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.

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 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 VI 40 psi minimum compressive strength, 40psi (415KPa) 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 Compressive Strength: ASTM D1621 275 kPa.
 - .2 Flexural Strength: ASTM C203 480 kPa.
 - .3 Water Absorption: ASTM D2842 less than 0.6% by volume.
 - .4 Thermal resistance RSI: ASTM C518 0.88/25mm
 - .5 Blowing Agent Formulation: Zero ozone depleting.
 - .6 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).
- .2 Acceptable Product:
 - .1 Styrofoam HiLoad-40 Foam Insulation, as manufactured by Dupont Styrofoam Brand of Canada Ltd.
 - .2 Owens Corning Foamular 400

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 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.

3.4 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 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, oversized 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.

- .6 Sealant for expansion joint of rink slab shall be SIKAFLEX 2C EZ or approved equal.

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 05 50 00 Metal Fabrications

1.3 References

- .1 ASTM International (ASTM)
 - .1 ASTM D3363-22 Standard Test Method for Film Hardness by Pencil Test
 - .2 ASTM E84-23d Standard Test Method for Surface Burning Characteristics of Building Materials

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings: indicate material details, construction and accessory details, operating mechanisms and required clearances.
- .3 Submit sample of door section showing construction, workmanship and finish.
- .4 Operation and Maintenance Data: Provide operation and maintenance data for rolling metal door hardware and operators regarding adjustment, maintenance and troubleshooting for incorporation into operation and maintenance manual specified under Section 01 78 00.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturer Qualifications: ISO 9001:2015 registered and a minimum of five years experience in producing doors of the type specified
 - .2 Installer Qualifications: Manufacturer's approval

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 Manufacturers

- .1 Rolling metal doors as manufactured by the following are acceptable:
 - .1 Cookson Co Inc.
 - .2 Amstel Manufacturing Inc.
 - .3 Kinnear
 - .4 Richards Wilcox of Canada Ltd.

2.2 Products

- .1 Rolling Metal Doors:
 - .1 Cookson Model ESD20 or approved equivalent. Manually operated insulated rolling service door.
- .2 Curtain
 - .1 Fabrication
 - .1 Slat Material: No. 6F, (Listed Exterior/Interior):
 - .1 Galvanized Steel: Manufacturer recommended gauge based on performance requirements. Minimum 24/24 gauge, Grade 40, ASTM A 653 galvanized steel zinc coating.
 - .2 Insulation: 22 mm foamed-in-place, closed cell urethane
 - .3 Total Slat Thickness: 24 mm
 - .4 Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84
 - .5 R-value: 8.0
 - .2 Exterior Slat Finish: SpectraShield Coating System (Color Selected by Architect):
 - .1 SpectraShield Ultra – Ultra Powder Coat to be applied as a protective top coat over SpectraShield finish. Top coat is a polyester based structured wear resistant clear powder coat of 2.5-3.5 mils cured film thickness. ASTM D-3363 pencil hardness: 2H or better. Tested per ASTM B117. Base coating of SpectraShield colour as selected by Consultant from manufacturer's color range, more than 180 colors.
 - .3 Interior Slat Finish: GalvaNex Coating System:
 - .1 ASTM A653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and gray baked-on polyester enamel finish coat.

- .3 Endlocks: Fabricate interlocking sections with high strength nylon endlocks on alternate slats each secured with two 6.35 mm rivets. Provide windlocks as required to meet specified wind load.
- .4 Bottom Bar
 - .1 Insulated Bottom Bar: Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and thickness. Minimum 102 mm tall x 27 mm thickness.
 - .2 Finish to match slats
- .5 Guides
 - .1 Fabrication
 - .1 Minimum 4.76 mm structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.
 - .2 Top 420 mm of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.
 - .2 Finish: Powder Coat (Colour Selected by Consultant): Zirconium pre-treatment followed by baked-on polyester powder coat, minimum 0.065 mm cured film thickness; ASTM D3363 pencil hardness: H or better.
- .6 Counterbalance Shaft Assembly:
 - .1 Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 2.5 mm per meter of width
 - .2 Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 110 N. Provide wheel for applying and adjusting spring torque.
- .7 Brackets:
 - .1 Fabricate from minimum 5 mm steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures
 - .2 Finish: Powder Coat (Colour Selected by Consultant): Zirconium pre-treatment followed by baked-on polyester powder coat, minimum 0.065 mm cured film thickness; ASTM D3363 pencil hardness: H or better.
- .8 Hood
 - .1 Minimum 0.701 mm galvanized steel with reinforced top and bottom edges. Provide minimum 6.35 mm steel intermediate support brackets as required to prevent excessive sag.
 - .2 Finish: Powder Coat (Colour Selected by Consultant): Zirconium pre-treatment followed by baked-on polyester powder coat, minimum 0.065 mm cured film thickness; ASTM D3363 pencil hardness: H or better.

- .9 Weatherstripping
 - .1 Bottom Bar: Manually Operated Doors: Replaceable, bulb-style, compressible EDPM gasket extending into guides.
 - .2 Guides: Replaceable vinyl strip on guides sealing against both sides of curtain.
 - .3 Hood: Neoprene/rayon baffle to impede air flow above coil.
 - .4 Lintel Seal: Nylon brush seal fitted at door header to impede air flow.

- .10 Motor – Standard Use – Model MG (Industrial Duty Gear Head) Operator: The operator must not extend above or below the door coil when mounted front-of-coil. Rated for a maximum of 20 cycles per hour (not to be used for consecutive hours) cUL listed. Totally Enclosed Non Ventilated gear head operator(s) rated (1/2) or (3/4) hp as recommended by door manufacture for size and type of door, 208 Volts, 3 Phase. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, [emergency manual chain hoist] [provisions for auxiliary push-up operation] and control station(s). Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position. Operator shall be equipped with an emergency manual chain hoist assembly that safely cuts operator power when engaged. A disconnect chain shall not be required to engage or release the manual chain hoist. Operator drive and door driven sprockets shall be provided with #50 roller chain. Provide an integral Motor Mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided. Operator shall be capable of driving the door at a speed of up to 227 mm per second or as recommended for door size. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.

- .11 Control Station: Surface mounted: "Open/Close/Stop," push buttons with keyed lock-out, not masterkeyable; NEMA 4

- .12 Control Operation:
 - .1 Constant Pressure to Close:
 - .1 2-wire, electric sensing edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Provide a [retracting safety cord and reel] [self-coiling cable] connection to control circuit.
 - .2 Sensing/Weather Edge: Automatic reversing control by an automatic sensing switch within neoprene or rubber astragal extending full width of door bottom bar.
 - .1 Electric sensing edge device. Provide a wireless sensing edge connection to motor operator eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator.

- .13 Locking: None.

PART 3 EXECUTION

3.1 Examination

- .1 Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- .2 Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- .3 Commencement of work by installer is acceptance of substrate.

3.2 Installation

- .1 General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
- .2 Follow manufacturer's installation instructions.

3.3 Adjusting

- .1 Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion

3.4 Demonstration

- .1 Demonstrate proper operation and maintenance procedures to Owner's Representative.

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 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.

.2

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: Euco Diamond Hard by the Euclid Chemical Co.
- .4 Acceptable Alternate Manufacturers:
 - .1 BASF
 - .2 SIKA
 - .3 W.R. Meadows.

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 05 50 00 Metal Fabrications

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 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 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.
- .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.
- .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 42" high and not more than 8'-0" long with caprail, kickplate, ice dams and thresholds.
- .3 Spectator Shielding:
 - .1 Stanchion supported tempered glass at rink ends and curved sections.
 - .2 Stanchion supported tempered glass at rink sides.
- .4 Player, penalty and timekeepers boxes with glass surrounds, overhead roof systems, benches, shelves and raised floors.
- .5 3/4" Rubber mat flooring in players, penalty and timekeepers benches.
- .6 Hardware and accessories including anchor brackets.
- .7 Gates and hardware.
- .8 Advertising panels.
- .9 Anchor bolt system for securing to existing and new concrete rink slab.
- .10 Ice rink inserts for goal frames (Hockey). Provide shop drawings for goal post inserts for owner approval. Coordinate placement and levelness of goal post inserts during slab pour with all effected sub-trades.
- .11 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: $T_r = A_n \cdot F_y$; $T_r = 85 A_n \cdot F_u$
 - .2 Compression: $C_r = A \cdot F_c$
 - .2 Shear Resistance:
 - .1 $V_r = 0.60 A_w \cdot F_c$; $0.60 A_w \cdot F_y$; $hNWR$
 - .3 Moment Resistance:
 - .1 $M_r = S \cdot F_y$ (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 All overhead work is to be complete prior to the work of this Section commencing.
- .2 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.
- .3 Environmental Requirements: Ensure that installation takes place only when temperatures and other conditions are suitable for a safe and proper installation.
- .4 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.
- .5 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, 42" high.
- .5 The ice rink side of the arena panel shall be faced with 1/2" 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 1/4" 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 1/2" 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 1/4" 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 see plans.
- .7 Benches shall be as detailed. Removable bench supports shall be of a 1/4" 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 1/2" 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 boxes, 8" high with 3/4" rubber mat on top and exposed sides covered with 3/8" white HDPE where indicated on the drawings for coaches stand.

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. Gates where indicated on plan shall be complete with a drop bolt to secure the base of the gates for rigidity.
- .3 Hinge assemblies shall be constructed of 1/4" stainless steel. The hinge pins shall be minimum 5/8" diameter. Hinges on penalty and players benches shall have a self closing feature.
- .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 1/2" 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 Boards shall include seamless Acrylic Glass at rink end at lobby.
- .3 Boards shall be supported tempered glass at two (2) sides and back end of the rink.
- .4 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.
- .5 Glazing shall be mounted in the middle of the caprail.
- .6 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.
- .7 Shielding shall be 1800 mm high at sides and ends as indicated on drawings.
- .8 Shielding shall be 1800 mm high between benches and public aisle ways as indicated on drawings.
- .9 Shielding between timekeepers benches and penalty benches shall be 1220 mm high unless otherwise indicated.
- .10 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 1/2" 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 ½" above rink level.
- .3 Thresholds of public skating gates and players gates shall be 2 ½" 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 Advertising Panels

- .1 Advertising panels shall be 30" x 94" at straight board sections and 30" x 86" at curved sections.
- .2 Advertising panels shall consist of removable 1/8" clear polycarbonate sheets fastened to the ice side of the HDPE facing material and matching the HDPE in size. Panels shall be held in place with colour matched fasteners. Fasteners are to be a minimum of 12" O.C. about the perimeter and 24" O.C. elsewhere.
- .3 Provide advertising panels as follows:
 - .1 Eight (8) straight board panels (30"x94").
 - .2 four (8) curved board panels (30"x86").
 - .3 Location and orientation of ad panels will be completed with the owner through the shop drawing submittal based on the quantity and sizing above.

2.13 Accessories

- .1 Shield Removal Devices: Supply three (3) suction cup type glass lifting tools to facilitate removal and installation of shield glazing units.

2.14 Rubber Mat Flooring

- .1 Rubber mat flooring in players, penalty and timekeepers bench shall be 3/4" thick recycled rubber matting, colour black with longitudinal grooves at 3/4" centres on the underside for air circulation and as manufactured by Royal Mat Inc. or approved equivalent.

2.15 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 replaced with new as indicated for the extents on the drawings. Note: new netting extents exceed the existing facility netting extents.
- .2 Suspend netting from aircraft cable attached securely to a continuous 25 mm diameter galvanized steel conduit suspended and braced rigidly from the building structure. Alternative methods of suspension are not acceptable. Netting shall be minimum 3050 mm above top of glass. Provide all necessary aircraft cable complete with turnbuckles to secure top rail. Secure bottom edge of netting to arena shields using manufacturer's standard clip assembly.

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 Canadian Standards Association (CSA)
 - .1 CSA B52-13 Mechanical Refrigeration Code
- .2 Technical Standards & Safety Authority (TSSA)
 - .1 TSSA Operating Engineer's 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, 2015
- .5 American National Standards Institute (ANSI)
 - .1 ANSI B31.5-2001 Refrigeration Piping
- .6 Ontario Occupational Health & Safety Act for Industrial Establishments

1.4 Submittals

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings for complete ice rink refrigeration floor and piping including layout showing all venting, drains, connections, etc. Shop drawings for the refrigeration floor, piping, and connection must be stamped by a professional engineer registered to practice in Ontario.
- .3 Submit technical data sheets for pipe insulation and jacketing, polyethylene rink piping, rink pipe supports and valves, venting, etc.

1.5 Related Work Supplied and Installed by Other Divisions

- .1 The ice rink refrigeration contractor shall co-ordinate all phases of his work with the general contractor and all other 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 electrical conduits.
 - .2 Cutting of existing perimeter concrete for access box placement and routing of buried brine piping.
 - .3 All excavation, trenching, backfilling and compaction required for buried piping.
 - .4 All rink concrete slab subfloor excavation, sand compaction and leveling as required.
 - .5 All rink subfloor insulation and polyethylene slip sheet as required.

- .6 All reinforcing steel and welded wire mesh for rink floor construction.
- .7 All concrete placement and finishing for rink floor construction.
- .8 Expansion joint material and installation as required.
- .9 Temporary lighting, heating, 120V power and water shall be provided during construction stage.
- .10 Permanent water supply shall be available.
- .11 Disposal of the water used for flushing of the new brine piping.
- .12 Start-up and commissioning of existing refrigeration system equipment including compressors, evap. condenser and pumps.
- .13 Ice making or first sheet of ice on new refrigerated concrete slab will be completed by the Town of Deep River.

1.6 Quality Assurance

- .1 The refrigeration contractor shall use only skilled welders, each holding a current, active welding 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 Verify all existing site 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 sand layer.

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 two (2) year after acceptance by the Owner.

PART 2 PRODUCTS

2.1 Brine Piping

- .1 Supply and install all the necessary brine pipe and fittings for connection of cooling brine distribution headers to the existing pumps located in the refrigeration compressor room. Brine pipe shall be schedule 40 ASTM A53 grade A or B ERW steel pipe. Pipe fittings to be either carbon steel butt weld with identical wall thickness as the steel pipe.
- .2 The open ends of carbon steel pipe lengths to be shipped to the construction job-site shall be sealed with plastic protective caps.
- .3 Brine piping installed in an excavated trench shall be supported on 4"x4" composite lumber during the installation and prior to back-filling.

2.2 Cooling Brine Headers for Rink Floor

- .1 Supply and install factory fabricated 8" schedule 40 ASTM A53B steel pipe headers with $\frac{3}{4}$ " schedule 80 seamless steel 135 degree bent nipples welded and spaced at 8" centres. Ends of nipples shall not protrude into the 8" pipe.
- .2 The return and supply cooling brine header sections shall be mounted on and welded to structural steel supports suitable for placement on rigid insulation trench and for installation in thickened portion of concrete rink slab. New structural steel supports shall be provided in the header trench to provide support of the headers at the required elevations.
- .3 Connections for access / vent valve piping shall be welded on the job-site to suit.
- .4 New header replacement shall terminate in the engine room at the isolation valves. All existing PVC jacketing removed as part of the project to facilitate the work shall be replaced to match the existing.

2.3 Cooling Rink Floor Polyethylene Piping

- .1 All rink floor piping shall be 1.049" ID x 1.25" OD linear low density, virgin polyethylene resin, CSA approved pipe that has been specifically manufactured for rink use.
- .2 Rink floor cooling brine piping shall be installed on 4" 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 PVC, adequately supported to prevent twisting.
- .4 The rink cooling floor and header system shall be tested with water pressure at a minimum of 345 kPa (50 psig) for 48 hours, prior to pouring of concrete. Pressure shall remain on the floor and header piping for the duration of the rink concrete and pour.
- .5 Supply and install a rebar tie-back device at both ends of the rink floor for tensioning the rink piping. Secure the return bends to the rebar with wire ties.
- .6 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 3" [76mm] wide, 24 gauge steel base plate on the bottom. Rink pipe supports shall be fabricated to lift the polyethylene pipe to allow a maximum of 1-3/4" [44mm] thick concrete coverage over the top of rink piping.
- .2 Pipe chairs shall space the cooling rink floor piping on 4" centres and shall be placed in rows on 2'-0" [610 mm] centres down the length of the rink. Overlap chairs by one (1) pipe at the end of each chair.
- .3 If the top layer of reinforcing steel is welded wire mesh supported on M-Type top loading reinforcing support chairs tying of the mesh must be completed at increased intervals acceptable to the Owner and Consultant to prevent movement of the chair racks during pours.

2.5 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 structural steel or piping 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.

2.6 Pipe Covering and Insulation

- .1 All cooling brine steel pipe which is installed in an excavated trench and will be buried, shall be insulated with DOW SM rigid polystyrene insulation and covered with Henry WP200 Blueskin or equal self-adhering protective water proof membrane.
- .2 All cooling brine steel pipe which is installed above grade, shall be insulated with ITW Trymer 2000 rigid insulation and covered with Henry WP200 Blueskin and PVC jacketing.
- .3 All insulated piping to be painted with rust resistant primer after pressure testing and prior to insulation and jacketing. All exposed headers in the open header trench shall be insulated and jacketed with white PVC jacketing.

2.7 Temperature Sensors and Electrical Conduit

- .1 Provide new electrical conduit body and low voltage conductors for installation of new temperature sensors located in the concrete rink slab. Connect low voltage wiring to the existing refrigeration system temperature control system.
- .2 Install a new electrical conduit run in the buried piping excavated trench and terminate the wiring at the existing temperature controller and the rink floor temperature sensors.

2.8 Identification

- .1 All above grade brine piping 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 piping and make all allowances for connecting the new rink slab piping and headers to the existing refrigeration system equipment.
- .2 The general contractor to saw cut existing concrete slabs to expose existing buried piping. Disconnect and remove all existing refrigeration brine piping.
- .3 The general contractor to remove vestibule wall in the refrigeration compressor room adjacent to the existing brine piping. Remove the piping through the floor which will be replaced. Wall to be reinstated following completion of work.

3.2 Rink Floor

- .1 Rink slab as specified in Section 03 30 00.

3.3 Brine Charge

- .1 The existing calcium chloride brine solution charge shall be disposed and recharged.
- .2 Prior to beginning demolition of the existing concrete rink floor and brine mains, drain the calcium chloride brine charge from the cooling piping.
- .3 Pump out and store the existing brine charge in suitable tanks. Send a brine sample for analysis. Submit the report of the brine analysis to the general contractor for review.
- .4 Pressure test the new brine piping with water to a minimum of 345 kPa (50 psig) for 48 hours. Prior to charging of brine, drain the pressure test water to building drains.
- .5 Prior to charging the brine solution into the new piping, flush the new piping system with water.
- .6 Provide a suitable quantity of calcium chloride pellets for mixing additional brine to top up the existing brine charge. The top up brine charge will include solution for cold floor. Brine charge is to be introduced to the floor only with DI water. Allow for top up of existing brine charge using DI water. Adjust the pH level to suit.

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 the Owner's representative or qualified refrigeration mechanic including testing and adjusting all operating controls.
- .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. (not by refrigeration contractor)
 - .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 Provide demonstration and training of system operation with the Township Representatives.
 - .7 Owner's representative 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 existing rink slab sand fill.

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 OPSS 1010 Granular "M" fill. 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 Crushed Stone: Crushed stone shall be composed of clean, hard, durable coarse gravel, or crushed rock fragments such that 100% of the particles pass the 18 mm sieve and not more than 10% of the particles pass the No. 4 sieve. No clay or other objectionable materials shall be present.
- .5 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 subgrade.
- .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.

- .3 After the heating pipes have been placed by the Refrigeration Contractor, pressurized to the specified pressure, tested and approved by the Consultant, carefully place the uppermost lift of sand using hand or light rubber-tired equipment on plywood runways. Do not use motor-driven equipment directly on the heating piping.
- .4 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.
- .5 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