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## MUNet Specification

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### 3.11 Labelling

#### 3.11.1 General

All distribution panels, cross-connects, cables and faceplates will be marked with appropriate labels, approval by Computing and Communications, in accordance with the Cable Schedule.

Labels will be installed as follows:

One label at each end of each cable prior to pulling. These labels will not survive stripping back the cable sheath

One label at each end of the cable sheath after stripping.

One label on the inside of each outlet box, plus labelling on the outside of each faceplate in the space provided.

#### 3.11.2 Implementation:

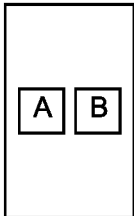
The labelling system used for all drops is a ten character alpha numeric string (10 for buildings with two character identifiers, 9 for buldings with one character identifiers). The label is formatted in the following manner, **L51-5001A**, and contains embedded information to allow easy identification of the following items:

Building	<b>L</b>	this may consist of one or two characters and conforms to the MUNet Building identification plan.
Closet	<b>51</b>	closets are identified by their own floor and sequence number.
Field Separator	<b>-</b>	
Floor	<b>5</b>	floor on which drop is located
Sequence	<b>001</b>	three digit sequence number
Field	<b>A</b>	this may be either A or B and is the termination field identifier in closet. The majority of MUNet faceplates support two drops, each of which is terminated on a separate patch field in the closet

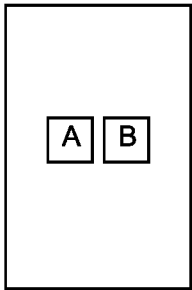
The drop labels consist of a two section white label with black lettering. The first section contains the Building and Closet information. The second section contains the Floor, Sequence and Field information. The total label size is approximately 1/2 x 1-1/2 inches (12 x 38 mm).

The following diagram illustrates the MUNet faceplate types and the typical label locations for each type.

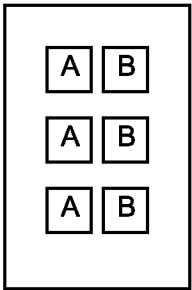
**MUNet Specification**



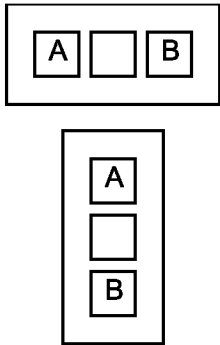
Surface Mount  
- Dual



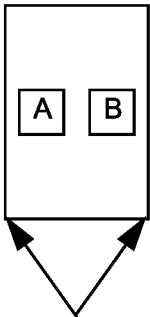
Flush Mount  
- Dual



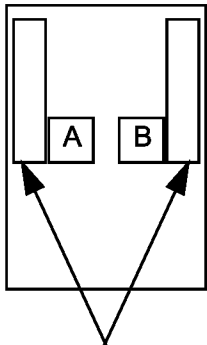
Flush Mount  
- Six



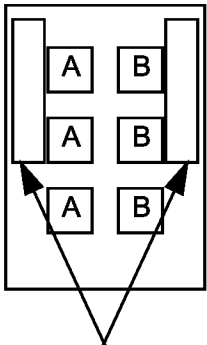
DECO Mount  
- Dual



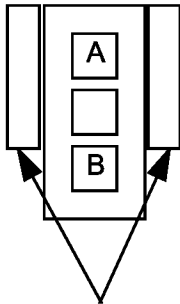
Label to be located on sides.



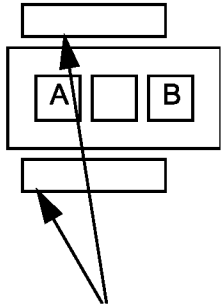
Label locations.



Label locations.



Label to be located on mounting assembly.



Label to be located on mounting assembly.

## ***ADDENDUM A***

January 30, 2008

The attached addendum supersedes the original Information and Specifications regarding the MUNet Specification Revision B dated 18 March 1997, where it adds to, deletes from, clarifies or otherwise modifies them. All other conditions and previous addendums shall remain unchanged.

### **1.1 General**

The overall objective of the original MUNet Specification hasn't changed. It was intended to supply information to various personnel involving minor alterations to the existing MUNet Cable Plant where changes are made to existing installed infrastructure.

New infrastructure requirements are still to be considered outside the objective of this publication, but in saying that some updated information will be supplied within this addendum.

### **1.2 Notice**

Some Recommendations should be addressed.

- Never assume, always check
- Follow recommendations outlined in MUNet Specification
- Use BICSI TDMM manual guidelines
- Follow proper cabling standards
- Approval from Computing & Communications Department

### **1.3 Description of Work**

Nordx/CDT IBDN Cabling is still an approved manufacturer to supply products to be used in the MUNet cable plant. Other manufacturers must adhere to the strict manufacturing guidelines followed by top tier suppliers such as Nordx/CDT. These manufacturers must meet approval from the Department of Computing & Communications.

#### **1.4.2 Qualification of System**

The certification supplied from the manufacturer must now reflect a Category 6 level that must be capable of Gigabit Transmission over the full design criteria of 100M.

#### **2.2.1 Backbone**

The use of Radio links and Wireless Transmission are not accepted as a means to supply backbone support to buildings seeking MUNet services. Where dedicated Fiber optic services are deemed not cost effective other services may be supplied

with the approval of the Department of Computing and Communications.

The backbone system will consist of two 24 Singlemode fiber connections supplied in redundant fibers using a redundant path configuration. These backbone cables and routing must be done in coordination the Department of Computing & Communications.

The purpose of this backbone fiber will be considered for sole use of the MUNET cable system, additional service requirements by other interests should be considered in addition to and in coordination with interested parties.

### **2.2.2 Riser**

The riser closets shall be connected to the building entrance closets using a 12 strand Singlemode configuration wired in a physical star arrangement.

### **2.2.3 Horizontal Distribution**

New building or new closet builds should reflect the advancement of cabling technologies. Horizontal cables should consist of at least two four pair Unshielded Twisted Pair (UTP) Category 6 Cables terminated in accordance with CSA T529 and EIA/TIA 568B-2006 using the preferred 568A pinout wiring. These wires will be considered exclusively for MUNet purposes and any extra services (eg Telephone or fax services) must include additional cables.

Patch Panel layout and placement must be approved by the Department of Computing and Communications prior to installation.

### **2.5.2 Design Guidelines**

Fill rates should now reflect the use of Category 6 cabling and its increased diameter.

### **2.8.2 Cabling Design Guidelines**

Design Guidelines should now reflect the use of Category 6 UTP cabling in its criteria.

### **2.8.3 Entrance Facilities**

All entrance facilities and riser closets must be provided with a connection to a UPS system that will be designed and installed in coordination with both the Department of Facilities Management and the Department of Computing and Communications. This system must also be connected to the Emergency power grid or provided some source of emergency power.

### **3.2.2 Products**

Products should reflect the use of Category 6 UTP Cabling.

### **3.4.3 Execution**

Products should reflect the use of Category 6 UTP Cabling.

### **3.7.2 Products**

Products shall be Category 6 specification. This includes the following items:

- Bulk Cable
- Patch Panels
- Faceplates
- Data jacks
- Patch Cables
- Interbay panels

### **3.7.3 Execution**

Products should reflect the use of Category 6 UTP Cabling.

### **3.9.1 General**

Products shall conform to exceed performance of listed products. Variances from the products listed may be granted at the discretion of the department of Computing and Communications.

### **3.10.2 Test Data**

Testing shall be in accordance with the ANSI/TIA/EIA 568-2006 specification. Labeling shall be in accordance to the ANSI/TIA/EIA 606 (A) standard and the MUNet scheme outlined in the MUNet Specification. Testing of Category 6 cabling shall be accomplished using level IIe or higher field testers and measured to be able to Pass Gigabit 1000baseT transmission requirements. Testing of Multimode fiber cabling should be done in accordance with the ANSI/EIA/TIA-526-14A:OFSTP-14A procedure guidelines. Testing of Singlemode fiber cabling should be done in accordance with the ANSI/EIA/TIA-526-7 procedure guidelines.

## **4.0 Conclusion**

### **4.1 Consideration**

Although the premise of this document is to provide a guideline to parties involved in duties which may include providing access to the MUNet Cabling system, it should not be treated as a building design tool. All products and procedures outlined in the preceding document are in reference to a Data network named MUNet and should be considered as just that. Although the provisions for this network can be placed in conjunction with the overall building design procedures, it should be treated as an "entity" upon itself. Overall building network installations should follow the TIA/EIA 568B-2006 standard and those illustrated in the BICSI TDMM (Telecommunications Distribution Methods Manual).

### **4.2 Emerging technologies**

With the advent of new technologies such as VOIP (Voice over internet protocol), POE (Power over Ethernet), IPVideo (Video over Ethernet) and various Wireless Ethernet protocols consideration should be given on a case by case scenario. Each has associated with them various standards and guidelines of their own which may need to be considered when merging with the MUNet Cabling System. The Department of Computing and Communications can assist further if any of these technologies are being considered.

**Important note:**

This document should be treated as a living document and is to be amended as technologies change. Please send your suggestions to:

Derek Greenland RCDD  
Computing and Communications  
[dgreenla@mun.ca](mailto:dgreenla@mun.ca)

**PART 1**      **GENERAL**

**1.1**            **SECTION INCLUDES**

- .1      Description of Work.
- .2      Contractor use of premises.

**1.2**            **WORK COVERED BY CONTRACT DOCUMENTS**

- .1      Work of this Contract comprises a major renovation and extension project at Memorial University's Aquarena facility to prepare for the 2025 Canada Games swimming, diving, and artistic swimming competition.

- .1      The Aquarena is located at 17 Westerland Road, St. John's, NL.
- .2      The existing building was originally constructed in 1975 and there have been numerous renovation and expansion projects constructed during the past 48 years.
- .3      The building contains a 18 x 65 meter main pool, an 8 x 15 meter tot pool, diving boards and platforms, a fitness centre, offices and multipurpose rooms, change rooms and other ancillary spaces.

- .2      This Work of this Contract includes, but is not limited to:

- .1      The demolition and removal of the following:
  - .1      A 127 m<sup>2</sup> wood-frame lean-to structure on the east elevation.
  - .2      All post-1975 build-up on the pool deck for spectator seating, offices, multipurpose rooms, storage, etc. leaving only the original steel and concrete mezzanine structure, and concrete block walls.
  - .3      Two fiberglass and plastic waterslides, including all supporting structure and piping.
  - .4      Approximately half of the east exterior wall.
  - .5      A portion of the diving mezzanine.
  - .6      All mechanical ventilation systems serving the pool area.
  - .7      Two aluminum truss pool bulkheads.

- .2      Construction of a new structural steel, two-storey, 624 m<sup>2</sup> extension on the east side of the building to house a family change room, washrooms, offices, staff areas, a multipurpose room, spectator seating, and mechanical space.

- .3      The reinforcing of the existing main roof steel superstructure and concrete foundations within and adjacent to the renovation and expansion area.

- .4      Sitework to accommodate foundation excavation, demolition work and new services.

- .5      Revisions to the existing diving tower to incorporate an extended 10-meter platform and to install a new 3-meter platform.

- .6      The supply and installation of two new stainless steel movable pool bulkheads.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 11 00 – Summary of Works

Page 2 of 4

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- .7 The supply and installation of a new waterslide (the exact design to be determined – see Section 01 21 00 Allowances).
- .8 Mechanical work includes:
  - .1 The complete replacement of the sprinkler system within the renovation area and main pool space, and zoning of the system elsewhere in the building.
  - .2 Replacement of the domestic and sprinkler water entrance.
  - .3 Supply and installation of a domestic plumbing system for the renovation area.
  - .4 Installation of the following equipment procured in advance by the Owner:
    - .1 Two pool dehumidifiers and associated dry coolers.
    - .2 A pool recirculation pump.
    - .3 Refer to Section 20 05 01 – Common Work Results for Mechanical for more information.
  - .5 Replacement of all ductwork within the pool area and new ductwork for the extension and other renovation areas.
  - .6 The supply and installation of an air handling and VRF system for the extension area.
- .9 Electrical work includes:
  - .1 Coordination with Newfoundland Power to relocate the service entrance and provide new poles and a new transformer.
  - .2 Replacement/revision of the service entrance, including the installation of equipment procured in advance by the Owner.
    - .1 Refer to electrical drawings and Section 26 05 00 – Common Work Results for Electrical for more information.
  - .3 Installation of power distribution and branch circuit wiring.
  - .4 New lighting and modifications to existing lighting, including some work in the Field House.
  - .5 Modifications to the existing security, communications, emergency lighting, exit lighting and fire alarm systems, including all new devices within the renovation area.
- .10 Commissioning activities related to the abovementioned work.
- .3 This project is not registered with the Canada Green Building Council and will not follow LEED requirements or practices.
- .4 Refer to the complete set of Contract Documents for more information.

### **1.3 SCHEDULE**

- .1 The period of Work up to Substantial Completion is as follows:
- .2 Full Substantial Completion: May 31, 2025

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 11 00 – Summary of Works

Page 3 of 4

---

- .3 Partial Substantial Completion for pool area: September 1, 2024.
  - .1 Partial Substantial Completion for pool area will involve turning over the 65-meter pool, new bulkheads, diving platforms, and changeroom facilities for use by the Owner for the purpose of allowing athletic training.
  - .2 All HVAC, electrical, plumbing, sprinkler, fire alarm and other life safety systems must be completed within the areas noted above and those areas must be suitable for occupancy as approved by the Owner's Representative, Service NL, and the St. John's Regional Fire Department.
  - .3 If construction activities are on-going adjacent to and within the same enclosed space as the 65-meter pool and diving platform areas, then a temporary hoarding wall or other suitable barrier must be constructed to separate the spaces.
- .4 Waterslide installation: after completion of the 2025 Canada Games. Exact installation date to be determined.

**1.4 CONTRACTOR USE OF PREMISES**

- .1 Coordinate use of premises under direction of Owner's Representative.
- .2 Upon award of the Contract, the Contractor will have unrestricted use of the site up to the time of Partial Substantial Completion of the pool area, as described above.
- .3 After Partial Substantial Completion of the pool area, the Contractor will have restricted access to the area of the building turned over to the Owner and any access required into that area must be coordinated with the Owner's Representative and will be scheduled at the Owner's convenience.
- .4 The Contractor will have full use of the existing asphalt parking area on Westerland Road, south of the access point adjacent to the pedway structure for laydown and staging.
- .5 Lambs Lane is a public road and must remain free of obstructions for the duration of the project.
- .6 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .7 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Owner's Representative. This includes damage to the asphalt parking area, surrounding concrete curbs and sidewalks, and underground infrastructure such as catch basins and manholes, within the Contractor's hoarded laydown and staging area.

**1.5 RELATED WORK**

- .1 The following specification sections are referenced to indicate work responsibilities as specified and carried in other versions.
  - .1 Section 21 05 01 – Common Work Results - Mechanical.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 11 00 – Summary of Works**

**Page 4 of 4**

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- .2 Section 21 13 13 – Wet Pipe Sprinkler Systems.
- .3 Section 23 05 15 – Common Installation Requirements for HVAC.
- .4 Section 26 05 00 – Common Work Results – Electrical.

**1.6 ON-SITE DOCUMENTS**

- .1 Maintain at job site documents as indicated in Section 01 31 00 – Project Management and Coordination.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            CASH ALLOWANCES**

- .1      Refer to General Condition 2.39 Cash Allowance.
- .2      Expend each allowance as directed by Owner's Representative.
- .3      Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage installation and other authorized expenses incurred in performing Work.
- .4      Each cash allowance will be adjusted to actual cost as defined hereunder and contract price will be amended accordingly by written order.
- .5      Contract Price will be adjusted by written order to provide for an excess or deficit to each cash allowance.
- .6      Progress payments for work and material authorized under cash allowances will be made in accordance with contract terms of payment. Progress payments on accounts of work authorized under cash allowances shall be included in monthly certificate for payment.
- .7      The contractor shall be responsible for planning, supervising, overseeing all work undertaken in the allowance.
- .8      A schedule shall be prepared by the Contractor within 3 weeks of Contract Award and approved by the Owner's Representative to show when items called for under cash allowances must be authorized by Owner's Representative for ordering purposes so that progress of work will not be delayed.
- .9      All schedules and critical path planning developed for the completion of the project shall include all works being completed as an allowance.
- .10     Obtain pricing for cash allowance scope as directed by Owner's Representative with any pricing being received in sealed bid enveloped opened in presence of the Owner, if requested by the Owner's Representative.

**1.2            TESTING CASH ALLOWANCE**

- .1      Include \$75,000 for Testing and Laboratory Services. The scope of these services will be discussed during the initial project meeting.

**1.3            NEWFOUNDLAND POWER CIAC**

- .1      Include a \$25,000 allowance for a Contribution in Aid of Construction (CIAC) related to the revision of aerial utility routing and the provision of a new transformer by Newfoundland Power.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 21 00 – Allowances

Page 2 of 3

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**1.4 WATER SLIDE**

- .1 Include \$325,000 for the supply and installation of a new waterslide feature.
- .2 The design of the waterslide will be discussed after contract award.
- .3 The waterslide is not intended for installation until after the 2025 Canada Games event is finished.

**1.5 EMCS INTEGRATION**

- .1 Include a \$75,000 allowance for integration of the specified new controls systems with the existing Honeywell EBI control system.
- .2 Refer to Section 25 05 01 – EMCS: General Requirements, 1.6 System Description for further information.

**1.6 CHUBB FIRE ALARM INTEGRATION**

- .1 Include a \$5,000 allowance for integration with the existing CHUBB fire alarm system main panel. Refer to Section 28 31 00 – Multiplex Fire Alarm System, 3.3 Field Quality Control for further information.

**1.7 SIGNAGE**

- .1 Include a \$7,500 allowance for wayfinding and room identification signage. The Owner will provide specifications for the signage after contract award.

**1.8 HAZARDOUS MATERIALS ABATEMENT**

- .1 Include a \$25,000 allowance for hazardous materials abatement.
- .2 The Owner has engaged a testing agency to evaluate the Aquarena for the presence of hazardous materials. Lead paint is suspected on the existing structural steel and the presence of asbestos is suspected in some masonry coatings, and other isolated areas.
- .3 A December 2021 asbestos and lead paint survey is included with the Contract Documents for reference.
- .4 Once testing is completed an updated report will be issued to the Contractor for this scope of work.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 21 00 – Allowances**

**Page 3 of 3**

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**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

Section 01 29 83 – Payment Procedures:  
Testing Laboratory Services

IFT May 16, 2023

Page 1 of 2

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 21 00 -- Allowances

**1.2            SECTION INCLUDES**

- .1      Inspecting and testing by inspecting firms or testing laboratories designated by Owner's Representative.

**1.3            RELATED REQUIREMENTS SPECIFIED ELSEWHERE**

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

**1.4            APPOINTMENT AND PAYMENT**

- .1      Owner's Representative will appoint services of a testing laboratory to be paid under the Testing Cash Allowance as specified in Section 01 21 00 – Allowances, except as follows:
  - .1      Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2      Inspection and testing performed exclusively for Contractor's convenience.
  - .3      Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  - .4      Mill tests and certificates of compliance.
  - .5      Tests specified to be carried out by Contractor under the supervision of Owner's Representative.
- .2      Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, the Contractor is to pay costs for additional tests or inspections as required by Owner's Representative to verify acceptability of corrected work.

**1.5            CONTRACTOR'S RESPONSIBILITIES**

- .1      Provide labour, equipment, and facilities to:
  - .1      Provide access to Work to be inspected and tested.
  - .2      Facilitate inspections and tests.
  - .3      Make good Work disturbed by inspection and test.
  - .4      If requested, provide secure storage on site for laboratory's exclusive use to store equipment and cure test samples. Provided heated area if requested by laboratory.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

Section 01 29 83 – Payment Procedures:  
Testing Laboratory Services

IFT May 16, 2023

Page 2 of 2

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- .2 Notify Owner's Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Owner's Representative.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 31 00 - Project Management and Coordination

Page 1 of 5

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**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1      Coordination work with other contractors and subcontractors under administration of Owner's Representative.
- .2      Scheduled project meetings.
- .3      Request for Information (RFI) procedure.

**1.2            RELATED SECTIONS**

- .1      Section 01 11 00 - Summary of Work.
- .2      Section 01 91 13 – Commissioning (Cx) Requirements.

**1.3            DESCRIPTION**

- .1      Coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of other contractors and subcontractors under instructions of Owner's Representative.

**1.4            PROJECT MEETINGS**

- .1      General project meetings are to be held once per every two weeks.
- .2      Attendance at project meetings:
  - .1      Contractor's project manager, site superintendent, representatives of major Subcontractors affecting building construction, and only such others as are especially invited to provide supplementary information for specific items.
  - .2      Contractor's and Sub-Contractor's representatives shall be qualified and authorized to act on behalf of the party each represents.
- .3      A separate project meeting between the Contractor's Project Manager and Memorial University's Project Manager will be held once per every two weeks, alternating with the general project meetings.
- .4      All meetings for the duration of the project shall be scheduled at the start of the project and the dates cannot be changed without one week's written notice to the Owner's Representative.
- .5      Once construction begins, all project meetings will be held on site.
- .6      The Contractor is required to record and distribute minutes.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 31 00 - Project Management and Coordination

Page 2 of 5

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**1.5 CONSTRUCTION ORGANIZATION AND START-UP**

- .1 Within the time period stipulated in the General Conditions, request a meeting of parties in contract to discuss and establish administrative procedures and responsibilities.
- .2 Agenda as per the General Conditions.
- .3 Comply with Owner's Representative's allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- .4 During construction coordinate use of site and facilities through Owner's Representative's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.
- .5 Comply with instructions of Owner's Representative for use of temporary utilities and construction facilities.

**1.6 ON-SITE DOCUMENTS**

- .1 Maintain at job site, one copy each of the following:
  - .1 Contract drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed shop drawings.
  - .5 List of outstanding shop drawings.
  - .6 Change orders.
  - .7 Other modifications to Contract.
  - .8 Field test reports.
  - .9 Copy of approved Work schedule.
  - .10 Health and Safety Plan and other Safety related documents.
  - .11 Manufacturers' installation and application instructions.
  - .12 Labour conditions and wage schedules.
  - .13 Other documents as specified.

**1.7 SCHEDULES**

- .1 Submit construction progress schedule in accordance with Section 01 32 00 - Construction Progress Documents to Owner's Representative.

**1.8 SUBMITTALS**

- .1 Make submittal to Owner's Representative for review.
- .2 Subcontract list:

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 31 00 - Project Management and Coordination

Page 3 of 5

---

- .1 Within 14 days of contract award, submit a written summary identifying individuals or firms proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design.
- .3 Key personnel:
  - .1 Within 14 days of contract award, submit a list of key personnel assignments, including superintendent and other personnel in attendance at the project site.
  - .2 Identify individuals and their duties and responsibilities.
- .4 Cashflow projection:
  - .1 Within 14 days of contract award, submit a projected schedule of monthly invoice amounts for the duration of the project.
  - .2 Update the schedule each month and submit with progress claim.
- .5 Submit shop drawings, product data and samples in accordance with Section 01 33 00 – Submittal Procedures for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Owner’s Representative.
- .6 Submit requests for payment to Owner’s Representative for review.
- .7 Submit requests for interpretation of Contract Documents and obtain instructions through Owner’s Representative.
- .8 Process change orders through Owner’s Representative.
- .9 Deliver closeout submittals for review by Owner’s Representative.

**1.9 REQUEST FOR INFORMATION (RFI)**

- .1 Submit all RFIs to the Owner’s Representative as an electronic (pdf) file via email or other electronic transfer process acceptable to the Owner’s Representative.
- .2 Include a schedule of RFIs with each project meeting agenda.
- .3 All RFIs are to follow a sequential numbering system.
- .4 Before submitting an RFI, thoroughly review the Contract Documents to ensure that the RFI is necessary and that the answer is not already incorporated in the Contract Documents.
- .5 Use clear and concise language to describe the essence of the issue or question.
- .6 Include detailed drawing and/or specification section references when seeking clarification on elements illustrated or explained in those documents.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 31 00 - Project Management and Coordination

Page 4 of 5

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- .7 If applicable, suggest viable solutions to resolve the issue in the RFI. Include sketches, photographs, or other supplementary information as required to allow the Owner's Representative to better understand the issue or question.
- .8 Poorly worded, confusing, or non-specific RFIs will be returned to the Contractor unanswered.
- .9 The Owner's Representative will reply to RFIs within 14 days from the day the RFI was received by the Owner's Representative. If an RFI response is urgent, the Contractor may mark it as such and the Owner's Representative will endeavour to respond sooner, but an early response cannot be guaranteed. The Contractor is to issue RFIs related to planned aspects of the work far enough in advance such that the 14-day processing time will not impact the project schedule.

**1.10 CLARIFICATION DRAWINGS**

- .1 If requested, provide information required by Owner's Representative for preparation of clarification drawings.
- .2 Owner's Representative may furnish additional drawings or specification items for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in contract documents.

**1.11 GENERAL CONTRACTOR'S COORDINATION RESPONSIBILITIES**

- .1 Ensure that contract work that may require the effort of multiple trades is fully and completely covered under the stipulated price bid. For example, ensure that miscellaneous excavation and backfill requirements that are required by mechanical and electrical sub-trades are included. Change orders for work missed in pricing due to a sub-trade not receiving or reviewing all contract documents will not be considered.
- .2 Ensure that contract work normally or typically the responsibility of the General Contractor to facilitate and/or assist the work of sub-trades is fully and completely covered under the stipulated price bid. For example, include cost of cutting and patching, and cleaning if not specifically included under the sub-trade's scope.
- .3 Take full responsibility to coordinate the portions of work included in the contract as cash allowance items. The general contractor is responsible for coordinating the work of all trades or subcontractors engaged under a cash allowance. Ensure that such work is properly scheduled and integrated into the overall project schedule.
- .4 Be aware of and take full responsibility to coordinate changes requested by sub-trades that are approved by the Architect, Engineer or Site Representative. Assume all additional design and engineering costs. For example, coordinate, pay for, and be responsible for
  - .1 All required structural steel fabrication, roofing, electrical, and controls changes that may accrue from an approved substitution of HVAC rooftop equipment.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 31 00 - Project Management and Coordination

Page 5 of 5

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- .2 Any approved changed to specified items that require modifications to illustrated details or other aspects of the contract documents.
- .5 Take full responsibility for the coordination and location of service penetrations.
- .6 Coordinate the size of mechanical housekeeping pads with the size of mechanical equipment procured under this contract. Assume responsibility for appropriate sizing.
- .7 Coordinate the design and fabrication of structural steel and miscellaneous steel connection details. Ensure tabs, plates, angles, pins, and any other components or aspects of the connection details are compatible with the architectural design and that they are concealed within wall or ceiling assemblies, do not conflict with other building elements, or protrude into the usable space of rooms or other occupied areas.
- .8 Take full responsibility to coordinate with public utilities as required to complete the project and maintain the schedule.
- .9 Take full responsibility to coordinate permits, inspections and approvals with Authorities Having Jurisdiction as required to construct the project and maintain the schedule.

**1.12 CLOSEOUT PROCEDURES**

- .1 Notify Owner's Representative when Work is considered ready for Substantial Performance.
- .2 Accompany Owner's Representative on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Owner's Representative's instructions for correction of items of Work listed as deficient at Substantial Performance and for access to Owner-occupied areas.
- .4 Notify Owner's Representative of instructions of items of Work determined in Owner's Representative's final inspection.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 32 00 - Construction Progress Documentation

Page 1 of 4

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 31 00 – Project Management and Coordination
- .2      Section 01 77 00 - Closeout Procedures.

**1.2            QUALIFICATIONS**

- .1      The Contractor is to employ or otherwise retain the services of a professional construction progress scheduler with experience scheduling complex renovation and expansion projects of similar scope to this project.
- .2      Submit references for the scheduler related to three similar projects located in Canada and completed within the past 10 years.
- .3      The professional scheduler will be responsible for creating, updating and maintaining the project schedule for the duration of the project.

**1.3            SCHEDULES REQUIRED**

- .1      Submit schedules as follows:
  - .1      Construction Progress Schedule.
  - .2      Submittal Schedule for Shop Drawings, Product Data and Samples.
  - .3      Shutdown or closure activity.

**1.4            FORMAT**

- .1      Prepare schedule in form of a Gantt type horizontal bar chart.
- .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 workday of each week.
- .5      Format for listings: chronological order of start of each item of work.
- .6      Identification of listings: By Systems description.

**1.5            SUBMISSION**

- .1      Submit initial schedule within the time frame listed in the General Conditions.
- .2      Submit schedules electronically in MS Project format (filename.mpp)
- .3      Owner's Representative will review schedule and return review copy within 14 days after receipt.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 32 00 - Construction Progress Documentation

Page 2 of 4

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- .4 Resubmit finalized schedule within 7 days after return of review copy.
- .5 Submit weekly updates, including a two-week look-ahead schedule.
- .6 Submit revised progress schedule with each application for payment.
- .7 Distribute copies of revised schedule to:
  - .1 Job site office.
  - .2 Subcontractors.
  - .3 Other concerned parties.
- .8 Instruct recipients to report to Contractor within 7 days if there are any problems anticipated by timetable shown in schedule.

**1.6 CRITICAL PATH SCHEDULING**

- .1 Include complete sequence of construction activities.
- .2 Include dates for commencement and completion of each major element of construction as follows. Owner's Representative may request additional breakdowns.
  - .1 Demolition, exterior and interior
  - .2 Excavation, USM removals, grading
  - .3 Site servicing
  - .4 Asphalt
  - .5 Exterior concrete
  - .6 Landscaping
  - .7 Concrete foundations
  - .8 Reinforcing of existing steel
  - .9 Structural steel
  - .10 Slab on Grade
  - .11 Floor and Roof Decks
  - .12 Exterior Wall Systems:
    - .1 Masonry back-up walls
    - .2 Steel stud and gypsum board back-up walls
    - .3 Masonry veneer
    - .4 Wood siding
  - .13 Interior Partitions:
    - .1 Masonry
    - .2 Steel stud and drywall
  - .14 Roofing
  - .15 Fenestration:
    - .1 Curtain wall
    - .2 Aluminum and HM doors
  - .16 Interior doors

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 32 00 - Construction Progress Documentation

Page 3 of 4

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- .17 Specialty equipment:
  - .1 Pool equipment
  - .2 Diving tower modifications, diving boards
  - .3 Pool bulkheads
- .18 Finishes:
  - .1 Painting
  - .2 Pool tank refinishing
  - .3 Flooring:
    - .1 Porcelain tile
    - .2 Resilient flooring
    - .3 Washroom accessories
- .19 Millwork
- .20 Plumbing rough-in
- .21 Plumbing fixture install
- .22 Pool pump
- .23 Sparger system
- .24 HVAC, provide breakdown of major equipment or areas of the building, including pool dehumidifier, general air handler, and VRF system.
- .25 Fire protection systems
- .26 NF Power poles, transformer and terminal pole
- .27 Electrical service and distribution.
- .28 Lighting
- .29 Fire Alarm
- .30 Miscellaneous electrical systems (telephone, data, television, security, etc.)
- .31 Commissioning
- .3 Show projected percentage of completion of each item as of first day of month.
- .4 Indicate progress of each activity to date of submission schedule.
- .5 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.
- .6 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.

**1.7 SUBMITTALS SCHEDULE**

- .1 Include schedule for submitting shop drawings, product data, and samples.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 32 00 - Construction Progress Documentation**

**Page 4 of 4**

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- .2 Indicate dates for submitting, review time, resubmission time, latest date for meeting fabrication schedule.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- .1      Shop drawings, product data, samples, certificates, and transcripts.

**1.2      RELATED SECTIONS**

- .1      Section 01 32 00 – Construction Progress Documentation.
- .2      Section 01 45 00 – Quality Control
- .3      Section 01 78 00 – Closeout Submittals

**1.3      ADMINISTRATIVE**

- .1      This section specifies general requirements and procedures for contractor's submissions of shop drawings, product data, samples and mock-ups to Owner's Representative 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 an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2      Do not proceed with work until relevant submissions are reviewed by Owner's Representative.
- .3      Present shop drawings, product data, samples and mock-ups in SI Metric units. Where items or information is not produced in SI Metric units converted values are acceptable.
- .4      Review submittals prior to submission to Owner's Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .5      Notify Owner's Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6      Verify that field measurements and affected adjacent Work are coordinated.
- .7      Contractor's responsibility for errors and omissions in submission is not relieved by Owner's Representative's review of submittals.
- .8      Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Owner's Representative review of submission, unless Owner's Representative gives written acceptance of specific deviations.
- .9      Make any changes in submissions which Owner's Representative may require consistent with Contract Documents and resubmit as directed by Owner's Representative. When

resubmitting, notify Owner's Representative in writing of revisions other than those requested.

- .10 Keep one reviewed copy of each submission on site.

#### 1.4 SUBMITTALS

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor 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 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.
- .4 Submit shop drawings as electronic files in PDF format for each requirement requested in specification Sections and as Owner's Representative may reasonably request.
  - .1 PDF file name must start with the relevant specification section number, followed by a description of the submittal. For example, a roofing materials submittal would be named: *075200 – base sheet and cap sheet.*
  - .2 Shop drawings are to be emailed or submitted via file sharing service.
  - .3 All shop drawings will be submitted to the same individual at the Prime Consultant's office who will then log and distribute the shop drawings to the relevant disciplines.
  - .4 Contact information for this individual will be supplied at the initial project meeting.
- .5 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 Specification section.
  - .6 Other pertinent data.
- .6 Submissions shall include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of subcontractor, supplier and manufacturer.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 33 00 – Submittal Procedures

Page 3 of 4

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- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.
- .7 Submit electronic copy in PDF format of product data sheets or brochures for requirements requested in Specification Sections and as requested by Owner's Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .8 Submit electronic copy of test reports for requirements required in the specification sections or as requested by the Owner's Representative.
  - .1 Report signed by authorized official of the testing laboratory that material, product, or system identical to material, product, or system to be provided has been tested in accordance with the specifications.
  - .2 Testing must be within one year of the date of project award for the contract.
- .9 Submit electronic copy of all certificates for requirements requested in specification sections and as requested by the Owner's Representative.
  - .1 Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets the required specifications.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .10 Submit electronic copies of manufacturer's field reports for requirements requested in specification sections or as required by the Owner's Representative.
  - .1 Documentation of the testing and verification actions taken by the manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .11 Supplement standard information to provide details applicable to project.
- .12 Cross-reference product data information to applicable portions of Contract Documents.

- .13 Delete information not applicable to project.
- .14 If upon review by Owner's Representative, 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.
- .15 Samples:
  - .1 Label samples with origin and intended use.
  - .2 Notify Owner's Representative 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 samples.
  - .4 Make changes in samples, which Owner's Representative may require, consistent with Contract Documents.
  - .5 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

#### **1.5 SHOP DRAWINGS REVIEW**

- .1 Allow 14 days from the day the submission was received by the Owner's Representative for review of each submission by the Owner's Representative.
- .2 Adjustments made on submittals by Owner's Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Owner's Representative prior to proceeding with Work.
- .3 The review of shop drawings by Owner's Representative is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Owner's Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same and such review shall not relieve the Contractor of their responsibility for errors or omissions in the shop drawings or their responsibility for meeting all requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to fabrication processes or to techniques of construction and installation; and for co-ordination of the work of all sub-trades.

#### **PART 2 PRODUCTS (NOT APPLICABLE)**

#### **PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

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

### **1.2 SUMMARY**

- .1 Types of items described in this Section:
  1. Health and safety requirements for projects located in Newfoundland and Labrador.

### **1.3 REFERENCES**

- .1 Code and standards referenced in this section refer to the latest edition thereof.
- .2 Canadian Standards Association (CSA)
  1. CSA S269.1 Falsework for Construction Purposes.
  2. CAN/CSA-Z259.1 Safety Belts and Lanyards.
  3. CAN/CSA-Z259.10 Full body Harnesses.
  4. CAN/CSA-Z259.11 Shock Absorbers for Personal Fall Arrest Systems.
  5. CAN/CSA-Z259.2, Fall Arresting Devices, Personnel Lowering Devices and Lifelines.
  6. FCC No. 301 Standard for Construction Operations.
  7. CSA Z275.2 Occupational Safety Code for Diving Operations.
  8. CSA Z275.4 Competency Standard for Divers Operations.
- .3 FCC No. 302 Standard for Welding and Cutting.
- .4 Transportation of Dangerous Goods Act Regulations.
- .5 Newfoundland Occupational Health and Safety Act, Amended
- .6 Consolidated Newfoundland and Regulations 1149 WMIS Regulations Under the Occupational Health and Safety Act
- .7 Consolidated Newfoundland and Regulations 1165 Occupational Health and Safety Regulations under the Occupational Health and Safety Act.
- .8 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .9 National Building Code of Canada.

#### **1.4 SUBMITTALS**

- .1 At least 10 (ten) working days prior to commencing any site work: submit to Owner's Representative copies of:
  1. A complete Site Specific Hazard Assessment and Safety Program Table of Contents.
  2. **Including requirements as outlined by the Contractor Safety Management Element, See attachment at the end of this section.**
- .2 Acceptance of the Project Health and Safety Hazard Assessment and Management Plan and other submitted documents by the Owner's Representative shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.
- .3 Owner's Representative makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Project Health and Safety Hazard Management Plan and other submitted documents by this acceptance.
- .4 Responsibility for errors and omissions in the Project Health and Safety Hazard Assessment and Management Plan and other submitted documents is not relieved by acceptance by Owner's Representative.

#### **1.5 OCCUPATIONAL HEALTH AND SAFETY (PROJECT HEALTH AND SAFETY HAZARD ASSESSMENT AND MANAGEMENT PLANS)**

- .1 Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OH&S) Act and Regulations.
- .2 Prepare a detailed Project Health and Safety Hazard Assessment and Management Plan for the Owner. Assessment shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.
- .3 Provide a copy of the Project Health and Safety Hazard Assessment and Management Plan upon request to Occupational Health and Safety Branch, Department of Labour, Province of Newfoundland and Labrador and the Owner.
- .4 The written Health and Safety Hazard Assessment and Management Plan shall incorporate the following:
  1. A site-specific health and safety plan, refer to clause 1.6 Site-Specific Health and Safety Hazard Assessment and Management Plan of this section for requirements.
  2. An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.
  3. A comprehensive work plan which shall:
    - a. define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives
    - b. establish personnel requirements for implementing the plan, and
    - c. establish site specific training and notification requirements and schedules.

4. A personal protected equipment (PPE) Program which shall detail PPE:
    - a. Selection criteria based on site hazards.
    - b. Use, maintenance, inspection and storage requirements and procedures.
    - c. Decontamination and disposal procedures.
    - d. Inspection procedures prior to during and after use, and other appropriate medical considerations.
    - e. Limitations during temperature extremes, heat stress and other appropriate medical consideration.
  5. An emergency response procedure, refer to Clause 1.7 Supervision and Emergency Response Procedure of this section for requirements.
  6. A hazard communication program for informing workers, visitors and individuals outside of the work area as required.
  7. A diving program which shall contain standard operating procedures to be followed in the diving operation.
  8. A health and safety training program.
  9. General safety rules.
- .5 Periodically review and modify as required each component of the Project Health and Safety Hazard Assessment and Management Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Project Health and Safety Hazard Assessment and Management Plan.
- .6 Implement all requirements of the Project Health and Safety Hazard Assessment and Management Plan.
1. Ensure that every person entering the project site is informed of requirements under the Project Health and Safety Hazard Assessment and Management Plan.
  2. Take all necessary measures to immediately implement any engineering controls, administrative controls, personal protective equipment required or termination of work procedures to ensure compliance with the Project Health and Safety Hazard Assessment and Management Plan.

## **1.6 SITE SPECIFIC HEALTH AND SAFETY PLAN**

- .1 Prepare a detailed site-specific Project Health and Safety Plan which shall:
  1. Contain certain hazard assessment results.
  2. Identify engineering and administrative demonstrative controls (work-practices and procedures) to be implemented for managing identified and potential hazards and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.
- .2 Review for completeness the hazard assessment results immediately prior to commencing work when a new hazard is identified during completion of work and when an error or omission is identified.
  1. Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards.
  2. Retain copies of all completed hazard assessments at the project site and make available to the Owner's Representative immediately upon request.

## **1.7 SUPERVISION AND EMERGENCY RESCUE PROCEDURE**

- .1 Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OH&S Act and Regulations
- .2 Assign a sufficient number of supervisory personnel to the work site.
- .3 Provide a suitable means of communications for workers required to work alone.
- .4 Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan.
- .5 The emergency response plan shall address, as a minimum:
  1. Pre-emergency planning.
  2. Personnel roles, lines of authority and communication.
  3. Emergency recognition and prevention.
  4. Safe distances and places of refuge.
  5. Site security and control
  6. Evacuation routes and procedures
  7. Decontamination procedures which are not covered by the site-specific safety and health plan.
  8. Emergency medical treatment and first aid.
  9. Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial, and federal government departments.
  10. PPE and emergency equipment.
  11. Procedures for handling emergency incidents.
  12. Site specific emergency response training requirements and schedules.
  13. For diving operation, include procedures for:
    - a. Managing deteriorating environmental conditions.
    - b. Managing unexpected weather or sea-state condition.
    - c. Evacuation of diver(s) under pressures greater than atmospheric pressure.
    - d. In-water emergency transfers.
    - e. Managing failing of equipment below the surface that impairs the ability of a diver to complete a dive.
    - f. Managing failure of any major component of diving plant or equipment.
    - g. Emergency signalling between divers involved in the diving program and between the diver(s) and the attendants using umbilical, tethers or other suitable methods.
    - h. Mobilizing stand-by divers.
    - i. Mobilizing crafts, stand-by boats and any other devices to be used for rescue.
    - j. Contacting evacuation, rescue, treatment facilities and medical services that will be used in the diving program.
    - k. Operation of emergency power and lighting facilities.
- .6 The emergency response procedures shall be rehearsed regularly as part of the overall training program.
- .7 Provide adequate first aid facilities for the jobsite and ensure that a minimum number of workers are trained in first aid in accordance with the First Aid Regulations.

## **1.8 CONTRACTORS SAFETY OFFICER**

- .1 The contractor's Safety Officer will be solely responsible for the implementation and monitoring of the Project Health and Safety Hazard Assessment and Management Plan and will have the authority to implement health and safety changes as directed by the Owner's Representative. The Safety Officer shall have as a minimum:
  1. Completed training in hazardous occurrence management and response/protocols.
  2. Completed training in the use, maintenance of fall protection systems.
  3. Completed training in the design and construction of scaffolding.
  4. Completed training in confined space entry protocols and techniques.
  5. Completed training in First Aid.
  6. Have working knowledge of occupational safety and health regulations.
  7. Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  8. Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  9. Be on site during execution of Work and report directly to and be under direction of site supervisor.

## **1.9 HEALTH AND SAFETY COMMITTEE**

- .1 Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations. Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

## **1.10 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

## **1.11 UNFORESEEN HAZARDS**

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Owner's Representative verbally and in writing.

## **1.12 INSTRUCTION AND TRAINING**

- .1 Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:
  1. Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring, and enforcing health and safety requirements.
  2. Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.
  3. Limitations, use, maintenance, and disinfection-decontamination of personal protective equipment associated with completing work.
  4. Limitations, use, maintenance and care of engineering controls and equipment.
  5. Limitations and use of emergency notifications and response equipment including emergency response protocol.
  6. Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.
- .2 Provide and maintain training of workers, as required, by Federal and Provincial legislation.
- .3 Provide copies of all safety training certificates, upon request, to Owner's Representative for review, and to be maintained on the worker when they enter the work site.
- .4 Authorized visitors shall not access the work site until they have been:
  1. Notified of the names of persons responsible for implementing, monitoring and enforcing the Health and Safety Hazard Assessment and Management Plan.
  2. Briefed on safety and health hazards present on the site.
  3. Instructed in the proper use and limitations of personal protective equipment.
  4. Briefed as the emergency response protocol including notification and evacuation process.
  5. Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.

## **1.13 CONSTRUCTION SAFETY MEASURES**

- .1 Observe construction safety measures of National Building Code, latest edition, Provincial Government, OH&S Act and Regulations, Workplace Health and Safety and Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.
- .2 Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the site Health and Safety Hazard Assessment and Management Plan.
- .3 Provide Owner's Representative with copies of all orders, directions and any other documentation, issued by the Provincial Department of Government Services, Occupational Health and Safety branch immediately after receipt.

#### **1.14 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province and authority having jurisdiction, and in consultation with Owner's Representative.

#### **1.15 HEALTH AND SAFETY MONITORING**

- .1 Periodic inspections of the contractor's work may be carried out by the Owner's Representative to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.
- .2 The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

#### **1.16 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Owner's Representative.
- .2 Provide Owner's Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Owner's Representative may stop work if non-compliance of health and safety regulations is not corrected.

#### **1.17 WHMIS**

- .1 Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.
- .2 Deliver copies of relevant (Material) Safety Data Sheets (SDS) to job site and the Owner's Representative. The SDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work.
- .3 Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.
- .4 Label controlled products at jobsite as per OH&S and Regulations.
- .5 Provide appropriate emergency facilities as specified in the SDS where workers might be exposed to contact with chemicals, e.g. eye-wash facilities, emergency shower.
  1. Workers to be trained in use of such emergency equipment.
- .6 Contractor shall provide appropriate personal protective equipment as specified in the SDS where workers are required to use controlled products.
  1. Properly fit workers for personal protective equipment

2. Train workers in care, use and maintenance of personal protective equipment.
- .7 No controlled products are to be brought on-site without prior approved SDS.
- .8 The SDS are to remain on site at all times.

#### **1.18 OVERLOADING**

- .1 Ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

#### **1.19 FALSEWORK**

- .1 Design and construct falsework in accordance with CSA S269.1.

#### **1.20 SCAFFOLDING**

- .1 Design, erect and maintain scaffolding in accordance with CSA S269.2 and Sections 91-97 of the OH&S Act and Regulations.
- .2 Ensure that fall-restraint or fall-arrest devices are used by all workers working at elevations greater than 3.05 metres above grade or floor level in accordance with CSA Z259.

#### **1.21 PERSONAL PROTECTIVE EQUIPMENT**

- .1 Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Hazard Assessment and Management Plan and those workers are trained in the proper care, use, and maintenance of such equipment.
- .2 PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site.
- .3 Provide workers and visitors to the site with proper respiratory protection equipment.
  1. No work shall be performed in an area where an airborne contaminant exceeds one half ( $\frac{1}{2}$ ) the IDLH concentration.
  2. Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety Branch, Department of Labour of the Province of Newfoundland and Labrador and these specifications.
  3. Establish, implement, and maintain a respirator inspection and maintenance program.
  4. Copies of all respirator owners' maintenance manuals shall be always kept at the contractor's site office.
- .4 Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 35 29.06 Health and Safety Requirements

Page 9 of 16

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1. Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.
  2. Dermal protection equipment shall not be used after exceeding 75% of the breakthrough time. The breakthrough time shall be based on the contaminant which requires the least amount of time to break through the protective equipment
  3. Copies of all dermal protection user specifications, owners and maintenance manuals shall be always kept at the contractor's site office.
  4. Establish, implement, and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.
- .5 Provide all workers and up to two (2) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight-hour shift without proper hearing protection.
- .6 Provide all workers and up to two (2) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials, and physical hazard.
- .7 Provide workers and up to two (2) visitors to the site with CSA approved hard hats.

## **1.22 EXCAVATION SAFETY**

- .1 Protect excavations more than 1.25 metres deep against cave-ins or wall collapse by side wall sloping to the appropriate angle of repose, an engineered shoring/sheathing system or an approved trench box.
  1. Provide a ladder which can extend from the bottom of the excavation to at least 0.91 metres above the top of the excavation.
- .2 Ensure that all excavations less than 1.25 metres deep are effectively protected when hazardous ground movement may be expected.
- .3 Design trench boxes, certified by a registered Professional Engineer, and fabricated by a reputable manufacturer. Provide the manufacturer's Depth Certificate Statement permanently affixed. Use trench boxes in strict accordance with manufacturer's instructions and depth certification data.
- .4 For excavations deeper than six (6) metres, provide a certificate from a registered Professional Engineer stating that the protection methods proposed have been properly designed in accordance with accepted engineering practice. The engineer's certificate shall verify that the trench boxes, if used, are properly designed and constructed to suit the depth and soil conditions.
  1. Ensure that the superintendent and every crew chief, foreperson and lead hand engaged in trenching operations or working in trenches have in his/her possession a copy of the Department of Labour's "Trench Excavation Safety Guide".

## **1.23 CONFINED SPACE WORK**

- .1 Comply with requirements of Canada Occupational Safety and Health Regulations, Part XI and Consolidated Regulations Newfoundland and Labrador (CRNL) OH&S 1165/96.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 35 29.06 Health and Safety Requirements

Page 10 of 16

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- .2 Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.
- .3 Develop a confined space entry program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program.
  1. Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.
- .4 Provide and maintain training of workers, as required by the Federal and Provincial Legislation.
- .5 Provide Owner's Representative with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance with Federal and Provincial Legislation.

#### **1.24 HAZARDOUS MATERIALS**

- .1 Should material resembling hazardous materials (asbestos/mould) be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.
- .2 Unless otherwise noted, for hazardous materials abatement and repair, employ the services of a recognized Environmental Consultant to provide all air monitoring and testing services for regulatory requirements.

#### **1.25 HEAVY EQUIPMENT**

- .1 Ensure mobile equipment used on jobsite is of the type specified in OH&S Act and Regulations fitted with a Roll-Over Protective (ROP) Structure.
- .2 Provide certificate of training in Power Line Hazards for operators of heavy equipment.
- .3 Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines.
- .4 Equip cranes with:
  1. A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.
  2. A legible load chart.
  3. A maintenance logbook.

#### **1.26 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations of Work.

#### **PART 2 - PRODUCTS (NOT APPLICABLE)**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 35 29.06 Health and Safety Requirements**

**Page 11 of 16**

---

**PART 3 - EXECUTION (NOT APPLICABLE)**

**APPENDIX "A" Contractor Safety Management Element**



## Table of Contents



## **1.0 Purpose**

## **2.0 Scope**

## **3.0 Definitions**

## **4.0 Roles and Responsibilities**

### **4.1 Project Management Team**

### **4.2 Contractors**

## **5.0 Procedure**

### **5.1 Considerations prior to signing of contract**

#### **5.1.1**

## **5.2 Requirements**

5.2.1

5.2.2

5.2.3

5.2.4

5.2.5

## **5.3 Schedule of Submissions**

5.3.1

## **6.0 Post-Contract Evaluation**

**END OF SECTION**

**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 01 52 00 - Construction Facilities.
- .2      Section 01 56 00 - Temporary Barriers and Enclosures.

**1.2      PROTECTION OF EXISTING BUILDING AND SERVICES**

- .1      When working within an existing occupied building the following requirements apply:
  - .1      The Contractor shall provide temporary enclosures for securing work area and the maintenance of any services necessary to the proper and efficient operation of the Project.
  - .2      The Contractor shall conduct construction operations with minimum interference to existing building operations, adjacent buildings, adjacent public or private roadways, parking lots, sidewalks and access facilities in general.
  - .3      The Contractor shall provide protection against smoke propagation emanating from welding operations by use of temporary smoke barriers and/or temporary local ventilation of areas involved and shall provide a fire extinguisher at all areas where welding is being carried out.
  - .4      Special provisions shall be made by the Contractor to protect existing building areas when exposed by removal of existing roofing and walls or other exterior surfaces. All necessary precautions and measures shall be taken by the Contractor to ensure the interior of existing building is always weather tight and fully secure.
  - .5      All Work in areas to receive renovations shall be completely sealed off by the Contractor from the remainder of the building. Temporary partitions shall be installed, covered, insulated and sealed from construction noise and dust. All debris shall be removed daily from these areas, as well as from all areas of the site, to maintain clean, safe and efficient site conditions. Control of dust is critical. Take all necessary precautions and schedule Work to ensure adjoining occupied areas are always completely dust free.
  - .6      The Contractor shall take all necessary precautions to fully protect the existing equipment and furnishings against damage from water, dust or the like, during installation of new work, including cutting of existing roof and walls. Dust screens and/or platforms shall be provided as specified above. Cover and protect existing furnishings, equipment, etc., by means acceptable to the Owner whenever Work is to be carried on above or beside such existing items.
  - .7      Where material or equipment is being transported within the existing building on carts or pallets, such carts or pallets shall have rubber tires.
  - .8      The Contractor shall provide temporary hoarding to maintain unobstructed access to exits and to prevent access to construction areas in accordance with all Safety Regulations and good practice.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 35 30 – Renovation Procedures

Page 2 of 2

---

- .9 The Contractor shall seal, supply and return ducts and chases or temporary filters installed to prevent migration of dust and noise through existing air systems.
- .10 Where work is confined inside a room, the door shall be temporarily weather stripped to prevent dust from leaving the room.
- .11 The Contractor shall make good, at no expense to the Owner, any damage or disruption caused to the existing building contents and to the adjoining property, utilities and services not called for as part of the Work of this contract. All repair work shall only be done after consultation with the Owner's Representative, appropriate parties and authorities and to standards and codes or the authorities having jurisdiction.
- .12 Making good shall mean restoration to at least the original condition in terms of strength, safety, workmanship and appearance.
- .13 The Contractor shall protect existing exterior finishes, windows, doors, etc., at all times from damage from hoists, chutes, materials handling equipment, or new construction.
- .14 The Contractor shall obtain the Owner's Representative's approval prior to cutting openings through structural members.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS AND DOCUMENTS**

- .1      Section 01 41 00 – Regulatory Requirements
- .2      Section 31 00 09 - Unwatering
- .3      The City of St. John’s Specification Book, Fourth Edition, Division 9 Environmental Requirements.
  - .1      The Contractor is to follow all municipal mandatory technical requirements related to environmental protection. If there is a conflict between Section 01 35 43 and the City of St. John’s Division 9 requirements, the Division 9 requirements shall govern.

**1.2            FIRES**

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

**1.3            DISPOSAL OF WASTES**

- .1      Do not bury rubbish and waste materials on site.
- .2      Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

**1.4            DRAINAGE**

- .1      Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2      Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3      Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.5            POLLUTION CONTROL**

- .1      Maintain temporary erosion and pollution control features installed under this contract.
- .2      Control emissions from equipment and plant to local authorities emission requirements.
- .3      Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4      Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 35 43 – Environmental Procedures**

**Page 2 of 2**

---

**1.6 NOTIFICATION**

- .1 Owner's Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of environmental protection. Contractor: after receipt of such notice, inform Owner's Representative of proposed corrective action and take such action as approved by Owner's Representative.
- .2 Owner's Representative may issue stop order of work until satisfactory corrective action has been taken.
- .3 No time extensions will be granted or equitable adjustments allowed to Contractor for such suspensions.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            REFERENCES AND CODES**

- .1      Perform Work in accordance with National Building Code of Canada (NBCC) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2      Meet or exceed requirements of:
  - .1      Contract documents.
  - .2      Specified standards, codes and referenced documents.

**1.2            CITY OF ST. JOHN’S CAPITAL WORKS**

- .1      For all municipal mandatory technical requirements, the City of St. John’s Specification Book, Fourth Edition shall be regarded as the minimum mandatory requirements.

**1.3            HAZARDOUS MATERIAL DISCOVERY**

- .1      Asbestos: stop work immediately should materials believed to contain asbestos be encountered in during the execution of the work and notify Owner’s Representative. Do not proceed until written instructions have been received from Owner’s Representative. Perform asbestos abatement and repair in accordance with Newfoundland and Labrador Asbestos Abatement Regulations, Latest Edition.
- .2      Mould: stop work immediately should material resembling mould be encountered during the execution of work and notify Owner’s Representative. Do not proceed until written instructions have been received from Owner’s Representative.
- .3      Hydrocarbons and petroleum products: stop work immediately should material appearing to be contaminated with hydrocarbons or petroleum products be encountered during the execution of work and notify Owner’s Representative. Do not proceed until written instructions have been received from Owner’s Representative.

**1.4            BUILDING SMOKING ENVIRONMENT**

- .1      Comply with smoking restrictions.

**1.5            RELICS AND ANTIQUITIES**

- .1      Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.
- .2      Give immediate notice to Owner’s Representative and await Owner’s Representative’s written instructions before proceeding with work in this area.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 41 00 – Regulatory Requirements**

**Page 2 of 2**

---

- .3 Relics, antiquities, and items of historical or scientific interest remain the Owner's property.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED DOCUMENTS**

- .1 Drawings and general provisions of this contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

**1.2**            **INDUSTRY STANDARDS**

- .1 Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made part of the Contract Documents by reference.
- .2 All construction industry standards referenced in this specification to meet the edition of the standard referenced by the National Building Code of Canada (NBCC). If the construction industry standard is not referenced in the National Building Code of Canada, the latest edition of the standard shall apply.
- .3 Each entity engaged in construction on this Project must be familiar with construction industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Construction Documents.
  - .1 Where copies of construction industry standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available upon request.

**1.3**            **ABBREVIATIONS AND ACRONYMS FOR INDUSTRY ORGANIZATIONS**

- .1 Where abbreviations and acronyms are used, they shall mean the recognized name of the entities in the following list. Names are believed to be accurate and up to date as of the date of the Contract Documents.
- .2 Industry Organizations:
  - .1 Air Conditioning and Mechanical Contractors Association (AMCA).
  - .2 Air Conditioning and Refrigeration Institute (ARI).
  - .3 Americans with Disability Act (ADA).
  - .4 Air Movement and Control Association (AMCA).
  - .5 The Aluminum Association, Inc. (AA).
  - .6 American Architectural Manufacturers Association (AAMA).
  - .7 American Association of State Highway and Transportation Officials (AASHTO).
  - .8 American Association of Textile Chemists and Colourists (AATCC).
  - .9 American Bearing Manufacturers Association (ABMA).
  - .10 American Boiler Manufacturer's Association (ABMA).

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 42 00 – References

Page 2 of 4

---

- .11 American Concrete Institute (ACI).
- .12 American Industrial Hygiene Association (AIHA).
- .13 American Institute of Steel Construction (AISC).
- .14 American Iron & Steel Institute (AISI).
- .15 American National Standards Institute (ANSI).
- .16 American Petroleum Institute (API).
- .17 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
- .18 American Society of Mechanical Engineers (ASME).
- .19 American Society of Sanitary Engineer's (ASSE).
- .20 American Society for Testing and Materials (ASTM).
- .21 American Water Works Association (AWWA).
- .22 American Welding Society (AWS).
- .23 American Wood-Preservers' Association (AWPA).
- .24 Architectural Woodwork Institute (AWI).
- .25 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .26 Asphalt Institute (AI).
- .27 Associated Air Balance Council (AABC).
- .28 Association of the Wall and Ceilings Industries International (AWEI).
- .29 Atomic Energy Control Board Regulations.
- .30 Brick Industry Association (BIA).
- .31 Building Industry Consulting Services International (BICSI).
- .32 Canada Green Building Council (CaGCB).
- .33 Canada Labour Code.
- .34 Canadian Council of Ministers of the Environment (CCME).
- .35 Canadian Code for Preferred Packaging.
- .36 Canadian Construction Materials Centre (CCMC).
- .37 Canadian Environmental Protection Act (CEPA).
- .38 Canadian Gas Association (CGA).
- .39 Canadian General Standards Board (CGSB).
- .40 Canadian Institute of Steel Construction (CISC).
- .41 Canadian Nursery Landscape Association (CNLA).
- .42 Canadian Paint Manufacturer's Association (CPMA).
- .43 Canadian Roofing Contractors' Association (CRCA).
- .44 Canadian Sheet Steel Building Institute (CSSBI).
- .45 Canadian Standards Association (CSA).
- .46 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).
- .47 Canadian Urethane Foam Contractors' Association Inc. (CUFCA).
- .48 Carpet and Rug Institute (CRI).

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 42 00 – References

Page 3 of 4

---

- .49 Ceramic Tile Institute (CTI).
- .50 Consumer Electronics Association (CEA).
- .51 Cooling Technology Institute (CTI).
- .52 Department of Justice Canada (Jus).
- .53 Electrical and Electronic Manufacturers' Association of Canada (EEMAC).
- .54 Electronic Industries Alliance (EIA).
- .55 Environment Canada (EC).
- .56 The Environmental Choice Program.
- .57 Environmental Protection Agency (EPA).
- .58 Environmental Protection Services (EPS).
- .59 ETL Listing Laboratories (ETL).
- .60 Factory Mutual (FM).
- .61 Federal Communications Commission (FCC).
- .62 Flat Glass Manufacturers Association (FGMA).
- .63 Green Seal Environmental Standards.
- .64 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
- .65 Hydraulics Institute (HI).
- .66 Hydronic Institute of Boiler and Radiator Manufacturers (IBR).
- .67 Industry Canada - Terminal Attachment Program.
- .68 Institute of Electrical and Electronics Engineers (IEEE).
- .69 Institute for Research in Construction (IRC).
- .70 Insulated Cable Engineers Association (ICEA).
- .71 International ElectroTechnical Commission (IEC).
- .72 International Masonry Industry All-Weather Council (IMIAC).
- .73 International Standards Organization (ISO).
- .74 Laminators Safety Glass Association (LSGA).
- .75 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
- .76 Master Painters Institute (MPI).
- .77 National Energy Code of Canada for Buildings (NECB).
- .78 National Association of Architectural Metal Manufactures (NAAMM).
- .79 National Association of Corrosion Engineers (NACE).
- .80 National Building Code of Canada (NBC).
- .81 National Bureau of Standards/Products Standard (NBS/PS).
- .82 National Electrical Manufacturers Association (NEMA).
- .83 National Environmental Balancing Bureau (NEBB).
- .84 National Fire Code of Canada (NFC).
- .85 National Fire Protection Association (NFPA).
- .86 National Floor Covering Association (NFCA).

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 42 00 – References

Page 4 of 4

---

- .87 National Hardwood Lumber Association (NHLA).
- .88 National Lumber Grades Authority (NLGA).
- .89 National Plumbing Code of Canada (NPC).
- .90 National Research Council Canada (NRC).
- .91 National Roofing Contractors Association (NRCA).
- .92 National Sanitation Foundation (NSF).
- .93 Newfoundland Occupational Health and Safety Act.
- .94 Plumbing and Drainage Institute (PDI).
- .95 Province of Newfoundland and Labrador Building Accessibility Regulations.
- .96 Provincial Boiler, Pressure Vessel and Compressed Gas Regulations.
- .97 Scientific Equipment and Furniture Association (SEFA).
- .98 Sealant and Waterproofer's Institute.
- .99 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- .100 Society of Automotive Engineers (SAE).
- .101 The Society for Protective Coatings (SSPC).
- .102 South Coast Air Quality Management District (SCAQMD).
- .103 Telecommunications Distribution Methods Manual (TDMM).
- .104 Telecommunications Industries Association (TIA).
- .105 Terrazzo Tile and Marble Association of Canada (TTMAC).
- .106 Thermal Insulation Association of Canada (TIAC).
- .107 Transport Canada (TC).
- .108 Transport Canada - Marine Safety (TCMS).
- .109 Treasury Board of Canada (TB).
- .110 Treasury Board Information Technology Standard (TBITS).
- .111 Truss Plate Institute of Canada (TPIC).
- .112 Underwriters' Laboratories Inc. (UL).
- .113 Underwriter's Laboratories of Canada (ULC).
- .114 United States Federal Trade Commission (US Federal Trade Commission).
- .115 U.S. Coast Guard Equipment List (USCG).
- .116 U.S. Department of Transportation (DOT).

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**      **REFERENCES**

- .1      ASTM E779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
- .2      ASTM E783, Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
- .3      ASTM E1186, Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

**1.2**      **SECTIONS INCLUDE**

- .1      Inspection and testing, administrative and enforcement requirements.
- .2      Tests and mix designs.
- .3      Mock-ups.
- .4      Mill tests.
- .5      Equipment and system adjust and balance.

**1.3**      **RELATED SECTIONS**

- .1      Section 01 21 00 – Allowances.
- .2      Section 01 33 00 – Submittal Procedures
- .3      Section 01 78 00 – Closeout Submittals

**1.4**      **INSPECTION**

- .1      Allow Owner's Representative unrestricted access to Work.

**1.5**      **INDEPENDENT INSPECTION AGENCIES**

- .1      Independent Inspection/Testing Agencies will be engaged by Owner's Representative for purpose of inspecting and/or testing portions of Work.
- .2      Allocated costs: to Section 01 21 00 – Allowances and Section 01 29 83 – Payment Procedures: Testing Laboratory Services.
- .3      Provide equipment required for executing inspection and testing by appointed agencies.

- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 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 Owner's Representative at no cost to Owner's Representative. Pay costs for retesting and reinspection.

#### **1.6 PROCEDURES**

- .1 Notify appropriate agency and Owner's Representative 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 an orderly sequence so as not to cause delay 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 DEFECTIVE WORK**

- .1 Remove and reinstate defective work as directed by Owner's Representative.

#### **1.8 REPORTS**

- .1 Submit electronic copies of inspection and test reports to Owner's Representative in pdf format.
- .2 Provide copy to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.
- .3 Include copy of all inspection and test reports in Commissioning Manuals.

#### **1.9 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as specified or requested by Owner's Representative.

#### **1.10 MILL TESTS**

- .1 Submit mill test certificates as requested by the Owner's Representative.

#### **1.11 MOCK-UPS**

- .1 Testing may be implemented for this project to confirm the quality of the installation with respect to air infiltration standards for buildings. The testing agency may be requested to perform site testing on a mock-up or on a randomly chosen window (and associated construction) installation based on quality criteria as listed under Section 1.1.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 45 00 – Quality Control**

**Page 3 of 3**

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- .2 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .3 Construct in all locations acceptable to Owner's Representative as specified in specific Section.
- .4 Prepare mock-ups for Owner's Representative review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .5 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .6 Remove mock-up at conclusion of Work or when acceptable to Owner's Representative
- .7 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.
- .8 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.
- .9 Mock-ups may remain as part of Work.

**1.12 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical, and building equipment systems.
- .2 Mechanical – coordinate with mechanical division.
- .3 Electrical – Coordinate with electrical division.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 52 00 - Construction Facilities.
- .2      Section 01 56 00 - Temporary Barriers and Enclosures.
- .3      Section 31 00 09 – Unwatering.

**1.2**            **DEWATERING – UNWATERING**

- .1      Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- .2      Refer to Section 31 00 09 – Unwatering.

**1.3**            **WATER SUPPLY**

- .1      The Contractor may connect to a potable water source on site. Coordinate connection location with Owner’s Representative and pay all costs associated with temporary measured required to facilitate connection and distribution of water for construction purposes.

**1.4**            **TEMPORARY POWER AND LIGHT**

- .1      Provide temporary power during constructing for temporary lighting, heating, site construction trailers and operating of any electrical construction equipment and power tools in accordance with governing regulations and the Canadian Electrical Code.
- .2      Payment:
  - .1      At the start of the project and for the entire time that the building is closed to the public and the Contractor is granted full and unrestricted access, the Contractor is to pay all costs associated with the provision of electricity for construction purposes and to maintain a minimal level of heat and ventilation throughout the building. Payment to Newfoundland Power must be arranged with the Owner and it may be required that the Owner pay Newfoundland Power and seek reimbursement from the Contractor.
  - .2      After partial Substantial Performance has been issued to the Contractor and the building has been returned to the Owner for use of the swimming pool area and associated change rooms, the Owner will furnish free of charge to the Contractor all necessary electricity for construction purposes. The Owner reserves the right to restrict the use of its utilities if, in the opinion of the Owner, the Contractor fails to adequately conserve utilities or to use utilities appropriately. If Owner restricts use of facilities, the Contractor shall obtain required services from public utilities at no additional cost to the Owner.

- .3 Power consumption shall not disrupt owners need for continuous service.
- .4 The Contractor shall provide, at their own expense, temporary service wiring, transformers, receptacles, fixtures, connections, etc. conforming to Canadian Electrical Code and shall make such available to all trades throughout the project.
- .5 The Contractor, at their own expense, shall be responsible to connect to existing power source at approved location, and to provide temporary power outlets and/or panels for small tools only as necessary for construction operations, and wiring from temporary power source to these outlets and/or panels. Contractor to pay all costs for installation, maintenance and removal of cables, distribution and branch panel boards, poles, lighting, heating and general power receptacles as required.
- .6 The Contractor shall disconnect and remove temporary services when no longer required.
- .7 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx. Temporary lighting to consist of wiring, pig tail sockets and 75 watt shatterproof incandescent lamps to provide a minimum light level of 162 lux.
- .8 Electrical power and lighting systems installed under this contract may be used for construction requirements only with prior approval of Owner's Representative provided that guarantees and warranties are not affected. Make good damage to electrical system caused by use under this contract. Replace lamps which have been used for more than 3 months.

**1.5 TEMPORARY HEATING AND VENTILATION**

- .1 Provide temporary heating required during construction period, including attendance, maintenance, and fuel.
- .2 Pay for all costs related to temporary heat and ventilation used during construction, including costs of installation, fuel operation, maintenance and removal of equipment; but excluding the cost of electricity when provided by Owner as noted in 1.4.2 in this Section.
- .3 Use of direct, fired heaters discharging waste products into work areas will not be permitted. Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel Salamanders are not permitted.
- .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 and relative humidity less than 60% in areas where construction is in progress.
  - .1 Maintain minimum temperature of 10°C or higher where specified as soon as finished work is commenced. Maintain until acceptance of structure by Owner's Representative.
  - .2 Maintain ambient temperature and humidity levels as required for comfort of personnel.
- .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 Maintain strict supervision of operation of temporary heating and ventilating equipment to ensure conformance with all applicable codes and standards. Enforce safe practices and prevent the abuse of services and any damage to building finishes.
- .8 Be responsible for damage to Work due to failure in providing adequate heat, humidity and protection during construction.
- .9 Use of new or existing systems for temporary heating, ventilating or air conditioning will only be permitted if approved by Owner's Representative and provided that guarantees and warranties are not affected.

## **1.6 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations, and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

## **1.7 TEMPORARY COMMUNICATION FACILITIES**

- .1 Provide and pay for temporary internet connection, including all necessary lines, components and equipment, to facilitate communication with the Contractor's site offices.

**1.8            REMOVAL OF TEMPORARY FACILITIES**

- .1        Remove temporary facilities from site when directed by Owner's Representative.
- .2        If project site is closed down at end of construction season keep temporary facilities operational until close down or removal is approved by Owner's Representative.

**PART 2            PRODUCTS (NOT APPLICABLE)**

**PART 3            EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1**

**GENERAL**

**1.1 SECTION INCLUDES**

- .1 Security requirements.
- .2 Construction aids.
- .3 Office and sheds.
- .4 Parking.
- .5 Project identification.

**1.2 RELATED SECTIONS**

- .1 Section 01 35 29.06 – Health and Safety Requirements
- .2 Section 01 51 00 - Temporary Utilities.
- .3 Section 01 56 00 - Temporary Barriers and Enclosures.

**1.3 INSTALLATION AND REMOVAL**

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

**1.4 SCAFFOLDING**

- .1 Provide and maintain scaffolding in rigid, secure and safe manner.
- .2 Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Section 01 35 29.06 – Health and Safety Requirements.

**1.5 HOISTING**

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

**1.6 SITE STORAGE/LOADING**

- .1 Confine work and operations of employees by Contract Documents. 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 SECURITY**

- .1 The provision of security personnel to guard site and contents of site after working hours and during holidays is at the discretion of the Contractor. The Owner does not provide security services for construction projects.
- .2 Provided security at all times if/while construction is shut down because of a strike or lockout.
- .3 Contractor to ensure that all openings to buildings are properly closed with secure barricades and all temporary doors are equipped with locking hardware. Keys to all access doors and gates shall be left with the Owner's Representative in case emergency access is required.
- .4 The Contractor shall provide the Owner's Representative with names and phone numbers to contact at night, in case of an emergency.

## **1.8 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site provided it does not disrupt performance of work.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated or directed by Owner's Representative and provide snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

## **1.9 CONTRACTOR'S SITE OFFICES**

- .1 Provide an enclosed office heated to 20 °C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings for up to 10 people and furnished with meeting table and chairs and high-speed internet access.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Provide suitable secure facilities for project documentation including as-built drawings. Ensure that as-built drawings are not removed from Site Office.
- .4 Maintain site office in a neat and tidy manner, suitable for project meetings.
- .5 Subcontractors may provide their own offices as necessary.

**1.10 EQUIPMENT, TOOL AND MATERIALS 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.

**1.11 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Provide exclusive facilities for male and female personnel and/or visitors.
- .3 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .4 When permanent water and drain connections are completed, Contractor may provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used only upon approval of Owner's Representative.

**1.12 SITE SIGN**

- .1 Locate job sign as directed by Owner's Representative to ensure good visibility by passing traffic.
- .2 Construct timber job sign frame using two (2) 140 x 140 mm timber posts set vertically in concrete to a ground depth of 1000mm or below the frost line, whichever is greater. Install three (3) 38 x 89 mm horizontal timber braces.
- .3 Backfill compact and level ground around job sign frame to the satisfaction of the Owner's Representative.
- .4 Attach 1,200 mm x 2,400 mm plywood sign to timber frame using galvanized nails.
- .5 CAD graphics file for site sign to be provided by Owner's Representative. Contractor to print and install sign on board.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 56 00 Temporary Barriers and Enclosures

Page 1 of 3

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**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 30 – Renovation Procedures.
- .2      Section 01 51 00 – Temporary Utilities.
- .3      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            HOARDING**

- .1      The Contractor must maintain a secure and safe site for the duration of the project and ensure that the public is fully aware of the extents of the site area and any construction hazards that may exist. This will require some areas of fencing or hoarding.
- .2      Full site hoarding is not required, but the area of the extension on the east side of the building as well as all laydown and storage areas in use for the purpose of this Contract must be closed to unauthorized access with hoarding as described below.
- .3      Provide temporary wire or chain-link fencing with a gate at the vehicle entrance to the laydown area and at the access to the extension construction area.
- .4      Within the hoarded areas, erect temporary enclosures around and well-back from open excavations using 1,200 mm high polypropylene snow fencing wired to rolled steel "T" bar fence posts spaced at 1800 mm on centre. Maintain fence in good repair until excavation is complete/backfilled.

**1.5            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.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 56 00 Temporary Barriers and Enclosures

Page 2 of 3

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- .2 Provide as required by governing authorities.

**1.6 WEATHER ENCLOSURES**

- .1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Erect enclosures to allow access for installation of materials and working inside enclosure.
- .4 Design enclosures to withstand wind pressure and snow loading.

**1.7 DUST TIGHT SCREENS**

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

**1.8 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossing at Westerland Road, ramps and construction runways as may be required for access to Work.
- .2 Build and maintain temporary roads where indicated or directed and provide snow removal during period on work.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

**1.9 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.

**1.10 FIRE ROUTES**

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

**1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

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

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 56 00 Temporary Barriers and Enclosures**

**Page 3 of 3**

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**1.12            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 Owner's Representative 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 (NOT APPLICABLE)**

**PART 3            EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 61 00 – Common Product Requirements

Page 1 of 6

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**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.

**1.2            RELATED SECTIONS**

- .1      Section 01 45 00 – Quality Control.
- .2      Section 01 73 00 – Execution.

**1.3            REFERENCES**

- .1      Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2      Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.
- .3      If there is question as to whether any product or system is in conformance with applicable standards, the Owner's Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4      Cost for such testing will be borne by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

**1.4            QUALITY**

- .1      Products, materials, equipment and articles (referred to as products throughout specifications) 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 Owner's Representative based upon requirements of Contract Documents.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 61 00 – Common Product Requirements

Page 2 of 6

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- .4 Within 7 days of written request by Owner's Representative, submit following information for material and equipment proposed for supply:
  - .1 Name and address of manufacturer.
  - .2 trade name, model and catalogue number,
  - .3 performance, descriptive and test data,
  - .4 manufacturer's installation or application instructions,
  - .5 evidence of arrangements to procure.
- .5 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.
- .6 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.

**1.5 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Owner's Representative 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 Owner's Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Owner's Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

**1.6 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 / panel materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 61 00 – Common Product Requirements

Page 3 of 6

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- .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 Owner's Representative.
- .9 Touch-up damaged factory finished surfaces to Owner's Representative satisfaction. Use touch-up materials to match original. Do not paint over name plates.

**1.7 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.

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

**1.9 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. Immediately notify Owner's Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Owner's Representative reserves the right to require dismissal from site any workers which they deem incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Owner's Representative, whose decision is final.

**1.10 CO-ORDINATION**

- .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.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 61 00 – Common Product Requirements

Page 4 of 6

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**1.11 CONCEALMENT**

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

**1.12 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.

**1.13 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate unless they are specifically dimensioned or located.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Owner's Representative of conflicting installation. Install as directed.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Owner's Representative.

**1.14 FASTENINGS GENERAL**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work, unless stainless steel or other material is specifically requested in affected specification section.
- .2 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood plugs are not acceptable.
- .3 Conceal fasteners unless otherwise indicated. Space evenly and lay out neatly.
- .4 Fastenings which cause spalling or cracking are not acceptable.
- .5 Obtain Owner's Representative's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166.

**1.15 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 a minimum grade of 304 stainless steel for exterior areas, use higher grade if indicated elsewhere.
- .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.

**1.16 PROTECTION OF WORK IN PROGRESS**

- .1 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 Owner's Representative.

**1.17 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.
- .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.
- .3 Submit schedule to and obtain approval from Owner's Representative for any shut-down or closure of active services or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Owner's Representative and confirm findings in writing.
- .5 Remove abandoned services lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.

**1.18 SELECTION OF MATERIAL AND EQUIPMENT**

- .1 Material and equipment will be specified in the tender documents, and selected by Contractor, by one or more of the following methods:
  - .1 Specification by reference to a relevant Standard, such as CSA, ASTM, ULC, etc., select any material or equipment that meets or exceeds the specified.
  - .2 Specification by reference to an accepted product evaluation publication, such as the CGSB "Qualified Products List", or CCMC Registry of Product Evaluations", - select any manufacturer's product so listed.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 61 00 – Common Product Requirements

Page 6 of 6

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- .3 Specification by Prescriptive or Performance specification – select any material or equipment meeting or exceeding specification.
- .4 Specification by identification of one or more Manufacturer’s specific product(s) as an “Acceptable Product”, along with a listing of other manufacturers who may offer equivalent products – select any product so named, or select from equivalent product(s) of other listed manufacturers.
- .2 “Acceptable Product” is deemed to be a complete and working commodity as described by a manufacturer’s name, catalogue number, trade name, or any combination thereof, and will constitute the minimum standard of acceptance.
- .3 Owner’s Representative will determine acceptability of Contractor’s selection of material and equipment at time of Shop Drawing review.
- .4 When material or equipment is specified by a Standard, Prescriptive or Performance specification, upon request of the Owner’s Representative, obtain from manufacturer an independent laboratory reporting, showing that material or equipment meets or exceeds the specified requirements.

**1.19 SUBSTITUTION OF MATERIAL AND EQUIPMENT**

- .1 Refer to General Condition 37 for requirements.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**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 elevations and inverts for Work.
- .3      Recording of subsurface conditions found.

**1.2            QUALIFICATIONS OF SURVEYOR**

- .1      Qualified registered land surveyor, licensed to practise in the Province of Newfoundland and Labrador.

**1.3            SURVEY REFERENCE POINTS**

- .1      Existing base horizontal and vertical 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 Owner's Representative.
- .4      Report to Owner's Representative 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 permanent benchmarks on site, referenced to established benchmarks 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      Stake for grading, fill placement.
- .4      Establish pipe invert elevations.
- .5      Stake batter boards for foundations.
- .6      Establish foundation column locations and floor elevations.
- .7      Establish lines and levels for mechanical and electrical work.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 71 00 – Examination and Preparation

Page 2 of 3

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**1.5 EXISTING SERVICES**

- .1 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 pedestrian and vehicular traffic.
- .2 Before commencing work, establish location and extent of service lines in area of Work and notify Owner's Representative of findings.
- .3 Remove abandoned service lines within 2 m of structures or as directed on drawings. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.

**1.6 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate unless specifically dimensioned or located on drawings.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Owner's Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Owner's Representative.

**1.7 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.

**1.8 SUBMITTALS**

- .1 Submit name and address of Surveyor to Owner's Representative.
- .2 On request of Owner's Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit an as-built survey and certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.
  - .1 As-built survey to locate all site infrastructure and provide sufficient elevation information for below ground and above ground equipment, piping, services, and utilities.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 71 00 – Examination and Preparation**

**Page 3 of 3**

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**1.9            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 Owner’s Representative determine that conditions do differ materially, instructions will be issued for changes in Work.

**PART 2            PRODUCTS (NOT APPLICABLE)**

**PART 3            EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

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

**1.2            RELATED SECTIONS**

- .1      Section 01 11 00 - Summary of Work.
- .2      Section 01 33 00 - Submittal Procedures.
- .3      Individual product Sections: cutting and patching incidental to work of section. Advance notification to other sections required.

**1.3            SUBMITTALS**

- .1      Submit written request 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.
  - .5      Work of Owner or separate contractor.
- .2      Include in request:
  - .1      Identification of Project.
  - .2      Location and description of affected Work.
  - .3      Statement on necessity for cutting or alteration.
  - .4      Description of proposed Work, and products to be used.
  - .5      Alternatives to cutting and patching.
  - .6      Effect on Work of Owner or separate contractor.
  - .7      Written permission of affected separate contractor.
  - .8      Date and time work will be executed.

**1.4            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.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 73 00 – Execution

Page 2 of 3

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- .5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.
- .6 Obtain Owner's Representative's approval before cutting, boring or sleeving load-bearing members.

**1.5 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 openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .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 not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work 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 firestopping material in accordance with Section 07 84 00 - Firestopping, full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.
- .14 Make cuts with clean, true, smooth edges.
- .15 Where new work connects with existing, and where existing work is altered, cut, patch and make good to match existing work.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 73 00 – Execution**

**Page 3 of 3**

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**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 74 11 – Cleaning

Page 1 of 3

---

**PART 1      GENERAL**

**1.1            GENERAL**

- .1      Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2      Store volatile waste in covered metal containers and remove from premises at end of each working day.
- .3      Provide adequate ventilation during use of volatile or noxious substances. Use for building ventilation systems is not permitted for this purpose.

**1.2            RELATED SECTION**

- .1      Section 01 77 00 - Closeout Procedures.
- .2      General Conditions – GC40.

**1.3            PROJECT CLEANLINESS**

- .1      Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2      Remove waste materials and debris from site at the end of each working day. Do not burn waste materials on site.
- .3      Clear snow and ice from access to building.
- .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      Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.
- .7      Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8      Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9      Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10     Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 74 11 – Cleaning

Page 2 of 3

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**1.4 FINAL CLEANING**

- .1 Refer to General Conditions GC40.
- .2 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 When the Work is Totally Performed, remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.
- .5 Remove waste materials from the site at regularly scheduled times or dispose of as directed by the Owner's Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Leave the work broom clean before the inspection process commences.
- .8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .15 Remove dirt and other disfiguration from exterior surfaces.
- .16 Clean and sweep roofs.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 74 11 – Cleaning**

**Page 3 of 3**

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- .19 Remove snow and ice from access to building.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- .1      Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, including:
  - .1      Diversion of Materials.
  - .2      Materials Source Separation Program (MSSP).

**1.2      DEFINITIONS**

- .1      Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .2      Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .3      Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .4      Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .5      Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1      Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2      Returning reusable items including pallets or unused products to vendors.
- .6      Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .7      Separate Condition: Refers to waste sorted into individual types.
- .8      Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

**1.3      MATERIALS SOURCE SEPARATION PROGRAM (MSSP)**

- .1      Prepare MSSP and have ready for use prior to project start-up.
- .2      Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by authorities having jurisdiction.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 01 74 21 – Construction/Demolition Waste Management and Disposal

**Page 2 of 3**

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- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
  - .1 Transport to recycling facility or,
  - .2 Transport to waste disposal facility.

**1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Unless specified otherwise, materials for removal become Contractor's property.
- .2 Protect, stockpile, store and catalogue salvaged items.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to approved local facility.
- .4 Protect structural components not removed for demolition from movement or damage.
- .5 Support affected structures. If safety of building is endangered, cease operations and immediately notify Department having jurisdiction.
- .6 Protect surface drainage, mechanical and electrical from damage and blockage.
- .7 Separate and store materials produced during dismantling of structures in designated areas.
- .8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On-site source separation is recommended.

**1.5 DISPOSAL OF WASTES**

- .1 Remove all waste and surplus materials from work area daily.
- .2 Do not bury rubbish or waste materials.
- .3 Do not dispose of any waste into waterways, storm, or sanitary sewers.

**1.6 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 74 21 – Construction/Demolition Waste Management and Disposal

Page 3 of 3

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- .2 Provide security measures approved by Owner's Representative.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION**

**3.1            APPLICATION**

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**3.2            CLEANING**

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

**3.3            DIVERSION OF MATERIALS**

- .1 On-site sale or distribution of salvaged materials to third parties is not permitted.
- .2 From following list, separate materials from general waste stream and stockpile in separate piles or containers for removal, as reviewed by Owner's Representative and consistent with applicable fire regulations.
  - .1 Mark containers or stockpile areas.
  - .2 Provide instruction on disposal practices.
- .3 Construction waste requiring separate recycling or disposal:
  - .1 Cardboard and paper
  - .2 Metals
  - .3 Paint and other liquid materials
  - .4 All other general construction waste.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 74 11 - Cleaning.
- .2      Section 01 78 00 - Closeout Submittals.
- .3      Section 01 91 13 – General Commissioning (Cx) Requirements.

**1.2**            **FINAL INSPECTION AND DECLARATION PROCEDURES**

- .1      Contractor's Inspection: The Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects; repair as required. Notify the Owner's Representative in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made. Request an Owner's Representative's Consultant's Inspection.
- .2      Owner's Representative's Inspection: Owner's Representative and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.
- .3      Completion: submit written certificate that the 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 Fire Commissioner, Utility companies have been submitted.
  - .5      Operation of systems have been demonstrated to Owner's personnel.
  - .6      Work is complete and ready for Final Inspection.
- .4      Final Inspection: When items noted above are completed, request final inspection of Work by the Owner's Representative and the Contractor. If Work is deemed incomplete by the Owner's Representative, complete outstanding items and request a reinspection.
- .5      Declaration of Substantial Performance: When the Owner's Representative considers 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 General Conditions for specifics to application.
- .6      Commencement of Lien and Warranty Periods: The date of acceptance of the submitted declaration of Substantial Performance shall be the date for commencement for the warranty period and commencement of the lien period.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 77 00 – Closeout Procedures

Page 2 of 2

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- .7 Declaration of Total Performance: When the Owner's Representative considers final deficiencies and defects have been corrected and it appears requirements of the Contract have been totally performed, make application for certificate of Total Performance. Refer to General Conditions for specifics to application. If Work is deemed incomplete by the Consultant, complete the outstanding items and request a reinspection.

**1.3 REINSPECTION**

- .1 Should status of work require reinspection by Owner's Representative due to failure of work to comply with Contractor's claims for inspection, Owner will deduct amount of compensation for reinspection services from payment to Contractor.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **SECTION INCLUDES**

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

**1.2**            **RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 01 45 00- Quality Control.
- .3      Section 01 71 00 – Examination and Preparation.
- .4      Section 01 77 00 - Closeout Procedures.
- .5      Section 01 91 13 – General Commissioning (Cx) Requirements.

**1.3**            **SUBMISSION**

- .1      Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2      Submit one copy of completed volumes in final form 15 days prior to final inspection.
- .3      Copy will be returned after final inspection, with Owner's Representative's comments.
- .4      Revise content of documents as required prior to final submittal.
- .5      Two weeks prior to Substantial Performance of the Work, submit to the Owner's Representative, two final copies of operating and maintenance manuals.
- .6      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.
- .7      If requested, furnish evidence as to type, source and quality of products provided.

- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

**1.4 FORMAT**

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm (8.5" x 11") 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 under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide electronic version of complete submission in PDF format, except provide dwg-format CAD files. Provide all electronic files on a CD or flash drive.

**1.5 CONTENTS - EACH VOLUME**

- .1 Table of Contents: provide title of project; names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; 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 clearly 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.

- .6 Training: Refer to Section 01 91 13 – General Commissioning (Cx) Requirements.

## **1.6 AS-BUILTS AND SAMPLES**

- .1 In addition to requirements in General Conditions, maintain at the site for Owner's Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to the 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 Owner's Representative.

## **1.7 RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on a hard copy set of drawings.
- .2 Provide felt tip marking pens, maintaining red color pens for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured horizontal and vertical locations of internal utilities and other fitting or fixtures that are concealed from view post-construction. Measurements to be referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.

- .5 Changes made by change orders.
- .6 Details not on original Contract Drawings.
- .7 References to related shop drawings and modifications.
- .5 Specifications: 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: submit manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 At completion of project provide all recorded information on print drawings or scan to PDF or transfer to CAD files in dwg format. Submit as part of the Closeout Submittals.

**1.8 FINAL SURVEY**

- .1 Submit a final site survey certificate illustrating all as-built site infrastructure (above and below grade) and topographical conditions. Survey to certify that elevations and locations of completed Work are in conformance with the Contract Documents. Any discrepancies are to be noted and brought to the attention of the Owner's Representative.

**1.9 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 coordination 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
- .15 Additional requirements: As specified in individual specification sections.

**1.10 MATERIALS AND FINISHES**

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- .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.

**1.11 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 Deliver to site location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

**1.12 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 Deliver to site location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

**1.13 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 Deliver to project site place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.

**1.14 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 Owner's Representative.

**1.15 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan to Owner's Representative's approval.
- .3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 78 00 – Closeout Submittals

Page 7 of 8

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- .1 Separate each warranty or bond 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 bonds, 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 bonds until time specified for submittal.
- .6 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems.
  - .3 Provide list for each warranted equipment, item and feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .4 Procedure and status of tagging of equipment covered by extended warranties.

- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .7 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .8 Written verification will follow oral instructions. Failure to respond will be cause for the Owner's Representative to proceed with action against Contractor.

**1.16 PRE-WARRANTY CONFERENCE**

- .1 Meet with Owner's Representative to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Owner's Representative.
- .2 Owner's Representative will establish communication procedures for:
  - .1 Notification of construction warranty defects.
  - .2 Determine priorities for type of defect.
  - .3 Determine reasonable time for response.

**1.17 WARRANTY TAGS**

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Owner's Representative.
- .2 Leave date of acceptance until project is accepted for occupancy.
- .3 Indicate following information on tag:
  - .1 Type of product/material; model number; serial number; contract number; warranty period; inspector's signature; construction contractor.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1      SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.
  - .2 Related Requirements
    - .1 Section 01 77 00 - Closeout Procedures
    - .2 Section 01 78 00 - Closeout Submittals
    - .3 Section 01 91 13.13 – Commissioning Plan
    - .4 Section 01 91 33 – Commissioning Forms
    - .5 Section 01 91 41 – Commissioning Training
  - .3 Acronyms:
    - .1 Cx - Commissioning.
    - .2 EMCS - Energy Monitoring and Control Systems.
    - .3 O&M - Operation and Maintenance.
    - .4 PV - Performance Verification.
    - .5 TAB - Testing, Adjusting and Balancing.

**1.2      GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
  - .2 Ensure appropriate documentation is compiled into the Operations and Maintenance Manual included as part of the close-out submittals.
  - .3 Contractors verification that quality of all work is of the highest possible quality and in accordance with all applicable codes, standards, manufacturer requirements and industry practice.
  - .4 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to function interactively with each other as intended in accordance with Contract Documents and design criteria.
  - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

### **1.3 COMMISSIONING OVERVIEW**

- .1 Section 01 91 13.13 - Commissioning Plan.
- .2 For Cx responsibilities refer to Section 01 91 13.13 - Commissioning Plan.
- .3 Cx to be a line item of Contractor's cost breakdown and include Cx costs in all major subcontractor breakdowns where they have commissioning scope.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections and Cx forms provided by the Owners Representative.
- .5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .6 Owner's Representative will issue Substantial Completion Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Owner's Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

### **1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Owner's Representative, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

### **1.5 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review Contract Documents, confirm by writing to Owner's Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx PV review and verification:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation shelf-ready.
  - .5 Understand completely design criteria and intent and special features.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 91 13 – General Commissioning Requirements**

**Page 3 of 9**

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- .6 Have completed all checks outlined in PV forms with form completed to confirm systems are ready for on-site checks by Owners Representatives.
  - .7 Submitted the preliminary completed PV forms for review and approval.
  - .8 Submit complete start-up documentation to Owner's Representative.
  - .9 Have Cx schedules up-to-date.
  - .10 Ensure systems have been cleaned thoroughly.
  - .11 Complete TAB procedures on systems, submit final complete TAB reports to Owner's Representative for review and approval allowing 2 weeks for review of final TAB report.
  - .12 Ensure "As-Built" system schematics are available.
- .4 Inform Owner's Representative in writing detailed list of discrepancies and deficiencies on finished works.

**1.6 CONFLICTS**

- .1 Report conflicts between requirements of this section and other sections to Owner's Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

**1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 6 weeks after award of Contract:
    - .1 Name of Contractor's Cx agent who will oversee the commissioning process for all systems and equipment.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.
- .2 Request in writing to Owner's Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
- .3 Submit proposed Cx procedures to Owner's Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
- .4 Provide additional documentation relating to Cx process required by Owner's Representative.

**1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Owner's Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Owner's Representative.

**1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 00 - Construction Progress Documentation.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13 – General Commissioning Requirements

Page 4 of 9

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- .2 Verification of reported results.
- .3 Repairs, retesting, re-commissioning, re-verification.
- .4 Training.

**1.10 COMMISSIONING MEETINGS**

- .1 At 60% construction completion stage, call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
  - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .2 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
  - .1 Convene Cx meetings following project meetings.
  - .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
  - .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
  - .4 Meeting will be chaired by Contractor, who will record and distribute minutes.
  - .5 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

**1.11 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

**1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days notice prior to commencement.
- .2 Owner's Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

**1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Owner's Representative.
- .2 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
- .3 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .4 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other

- divisions or required to maintain integrity of warranty.
- .2 Verify with manufacturer that testing as specified will not void warranties.

- .5 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### **1.14 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of product information report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures.
  - .3 Operational testing: document equipment performance.
  - .4 System PV: include repetition of tests after correcting deficiencies.
  - .5 Systems PV verification by Owners Representatives.
  - .6 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Owner's Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Owner's Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Owner's Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Owner's Representative.
  - .3 If evaluation report concludes that major damage has occurred, Owner's Representative shall reject equipment.
    - .1 Rejected equipment to be remove from site and replace with new.
    - .2 Subject new equipment/systems to specified start-up procedures.

#### **1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Owner's Representative for approval before commencement of commissioning.
- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,

- .5 Step-by-step description of complete start-up procedures, to permit Owner's Representative to repeat start-up at any time.

**1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Owner's Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

**1.17 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

**1.18 START OF COMMISSIONING**

- .1 Notify Owner's Representative at least 21 days prior to start of Cx PV review and verification with Owners Representative.
- .2 Any rescheduling of commissioning due to failure of systems and/or equipment to be ready will result in 21 days' notice being provided for the new Cx PV review date.
- .3 Start Cx review with owner's representative after elements of building affecting start-up and performance verification of systems have been completed and documented.

**1.19 INSTRUMENTS / EQUIPMENT**

- .1 Submit to Owner's Representative for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

**1.20 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Cx procedures to be repeatable and reported results are to be verifiable.
- .2 Carry out Cx:
  - .1 Under actual operating conditions, over entire operating range, in all modes.
  - .2 On independent systems and interacting systems.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

- .5 EMCS graphics to be fully completed and operational.

**1.21 WITNESSING COMMISSIONING**

- .1 Owner’s Representative to witness activities and verify results during PV verification review.

**1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Owner’s Representative within 5 days of test and with Cx report.

**1.23 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Owner’s Representative in accordance with equipment manufacturer’s instructions, using manufacturer’s data, with manufacturer’s assistance and using approved formulae.

**1.24 EXTENT OF VERIFICATION**

- .1 Provide manpower and instrumentation to verify up to 50 % of reported results, unless specified otherwise in other sections.
- .2 Number and location to be at discretion of Owner’s Representative.
- .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .4 Review and repeat commissioning of systems if inconsistencies found in any of the reported results.
- .5 Perform additional commissioning until results are acceptable to Owner’s Representative.

**1.25 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Owner’s Representative for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Owner’s Representative’s approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Owner’s Representative deems Contractor’s request for second verification was premature.

**1.26 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

**1.27 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Owner's Representative.
- .2 Report problems, faults or defects affecting Cx to Owner's Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Owner's Representative.

**1.28 COMPLETION OF COMMISSIONING**

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Owner's Representative.

**1.29 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

**1.30 TRAINING**

- .1 In accordance with Section 01 91 41 – Commissioning (Cx) Training.

**1.31 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with Owner's Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.32 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 91 13 – General Commissioning Requirements**

**Page 9 of 9**

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**1.33 OWNER'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Owner's Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

**PART 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**PART 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 1 of 18

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**PART 1      GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Description of overall structure of Plan and roles and responsibilities of commissioning team.
- .2 Related Requirements
  - .1 Section 01 77 00 - Closeout Procedures.
  - .2 Section 01 78 00 - Closeout Submittals.
  - .3 Section 01 91 13 – General Commissioning Requirements
  - .4 Section 01 91 33 – Commissioning Forms
  - .5 Section 01 91 41 – Commissioning Training

**1.3 GENERAL**

- .1 Provide a fully functional facility:
  - .1 Systems, equipment and components meet user's functional requirements before date of Substantial Completion and operate consistently at peak efficiencies under normal loads.
  - .2 Owner and O&M personnel have been fully trained in aspects of installed systems.
  - .3 Equipment operation has been optimized to improve life cycle costs.
  - .4 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
  - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
  - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
  - .3 Sets out deliverables relating to O&M, process and administration of Cx.
  - .4 Describes process of verification of how built works meet Owner requirements.
  - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
  - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
    - .1 Overview of Cx.
    - .2 General description of elements that make up Cx Plan.
    - .3 Process and methodology for successful Cx.
- .4 Acronyms:
  - .1 Cx - Commissioning.
  - .2 EMCS - Energy Monitoring and Control Systems.
  - .3 WHMIS Safety Data Sheets (SDS).
  - .4 PV - Performance Verification.
  - .5 TAB - Testing, Adjusting and Balancing.
  - .6 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
  - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
  - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of

occupancy, weather conditions, need for heating/cooling loads.

#### **1.4 DEVELOPMENT OF 100% CX PLAN**

- .6 Cx Plan to be 100% completed by the contractor within 3 months of award of contract to consider:
  - .1 Approved shop drawings and product data.
  - .2 Approved changes to contract.
  - .3 Contractor's project schedule.
  - .4 Cx schedule broken down into tasks, systems and equipment.
  - .5 Contractor's, subcontractor's, suppliers' requirements.
  - .6 Project construction team's and Cx team's requirements.
- .7 Submit completed Cx Plan to Owner's Representative and obtain written approval.

#### **1.5 REFINEMENT OF CX PLAN**

- .1 During construction phase, revise, refine and update Cx Plan to include:
  - .1 Changes resulting from Client program modifications.
  - .2 Approved design and construction changes.
- .2 Revise, refine and update every 3 months during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Owner's Representative for review and obtain written approval.

#### **1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM**

- .1 The contractor shall be responsible to undertake detailed Cx to bring the facility to a fully operational state and free of deficiencies in the most effective and timely manner available.
  - .1 Cx incorporates inspection and quality assurance activities as construction progresses, including start up and demonstration, performance verification, fine tuning, and operator training.
  - .2 The contractor shall bear all costs associated with the required personnel and test equipment as outlined in specification sections and all costs with organizing and managing the activities of the applicable sub-trades as identified in this section.
  - .3 Fully document all tests and inspections performed during the construction, at start up, and during performance verification and fine tuning. Incorporate into final commissioning documentation.
  - .4 Provide direct training to designated staff responsible for the operation and maintenance of the building equipment and systems.
  - .5 Construction Team: contractor, subcontractors, suppliers and support disciplines, are responsible for construction/installation in accordance with Contract Documents, including:
    - .1 Testing.
    - .2 TAB.
    - .3 Developing O&M manual.
    - .4 Performance of Cx activities.
    - .5 Delivery of training and Cx documentation.
    - .6 Performing verification of performance of installed systems and equipment.
    - .7 Implementation of Training Plan.
    - .8 Assigning one person as point of contact with Owner's Representative for

- administrative and coordination purposes.
- .9 Contractor's Cx agent implements specified Cx activities including:
  - .1 Demonstrations.
  - .2 Training.
  - .3 Testing.
  - .4 Preparation, submission of test reports
- .2 Owner's Representative is responsible for:
  - .1 Providing PV Commissioning Forms.
  - .2 Monitoring operations Cx activities.
  - .3 Witnessing, of reported results.
  - .4 Witnessing TAB and other tests.

## **1.7 CX PARTICIPANTS**

- .1 Employ the following Cx participants to verify performance of equipment and systems including being present for PV verification by owners representative:
  - .1 Installation contractor/subcontractor:
    - .1 Equipment and systems except as noted.
  - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
    - .1 To include performance verification.
  - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
- .2 Ensure that Cx participants:
  - .1 Could complete work within scheduled time frame.
  - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
    - .1 Modify ventilation rates to meet changes in off-gassing.
    - .2 Changes to heating or cooling loads beyond scope of EMCS.
    - .3 Changes to EMCS control strategies beyond level of training provided to O&M personnel.
    - .4 Redistribution of electrical services.
    - .5 Modifications of fire alarm systems.
    - .6 Modifications to voice communications systems.
- .3 Provide names of participants to Owner's Representative and details of instruments and procedures to be followed for Cx three (3) months prior to starting date of Cx for review and approval.

## **1.12 DELIVERABLES RELATING TO THE CX PROCESS**

- .1 General:
  - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Deliverables: provide:
  - .1 Startup, pre-Cx activities and documentation for systems, and equipment.
  - .2 Completed installation verification forms.
  - .3 Completed product information report forms.

- .4 Completed performance verification (PV) report forms.
- .5 Results of Performance Verification Tests and Inspections.
- .6 Description of Cx activities and documentation.
- .7 Description of Cx of integrated systems and documentation.
- .8 Training Plans.
- .9 Cx Reports.
- .10 Prescribed activities during warranty period.

- .3 Owner's Representative to witness results.

### **1.16 CX OF INTEGRATED FIRE PROTECTION AND LIFE SAFETY SYSTEMS**

- .1 Cx of integrated systems as per National Building Code of Canada 2020, subsection 3.2.9, to be performed by Contractor, using procedures developed by Owner's Representative.
- .2 Tests to be witnessed by Owner's Representative and documented on approved report forms.
- .3 Integrated systems to include, but not necessarily limited to:
  - .1 HVAC and associated systems requiring automatic shutdown
  - .2 Fire and smoke dampers
  - .3 Fire alarm systems
  - .4 Sprinkler system
  - .5 Voice communications systems
  - .6 Elevator emergency operation
  - .7 Emergency power generator
  - .8 Transfer switch and controllers
  - .9 Emergency lighting systems
  - .10 Access controls and other related door hardware items.

### **1.21 CX SCHEDULES**

- .1 Prepare detailed Cx Schedule and submit to Owner's Representative for review and approval within 10 weeks of project award. Include:
  - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
    - .1 Design criteria, design intents.
    - .2 Pre-TAB review: 2 months before the start of Cx.
    - .3 Contractor Cx agents' credentials: 2 months before start of Cx.
    - .4 Cx procedures: 3 months after award of contract.
    - .5 Cx Report format: 3 months after contract award.
    - .6 Product Information Forms: 3 months before start-up
    - .7 Installation/Start-up Checklists: 3 months before start-up
    - .8 Discussion of heating/cooling loads for Cx: 3 months before start-up.
    - .9 Submission of list of instrumentation with relevant certificates: 1 month before start of Cx.
    - .10 Notification of intention to start TAB: 14 days before start of TAB.
    - .11 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation and building fully cleaned with no construction activities.
    - .12 Notification of intention to start contractor completion of PV activities: 14 days prior to start

- .13 Notification of intention to start Cx on site PV verification review by owner's representative: 21 days before start of Cx PV verification review by owner representative.
- .14 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed, 14 days before start of integrated system Cx.
- .15 Identification of deferred Cx.
- .16 Implementation of training plans.
- .17 Cx reports: immediately upon successful completion of Cx.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Owner.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.

## **1.22 CX REPORTS**

- .1 Submit reports of tests, witnessed and certified by Contractor to Owner's Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.

## **1.24 ACTIVITIES DURING WARRANTY PERIOD**

- .1 Cx activities must be completed and accepted by owner's representative before issuance of Substantial Completion, although it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
  - .1 Fine tuning of HVAC systems.
  - .2 Adjusting of pool mechanical systems, including dehumidifier once pool area is in full operation and opened to the public.
  - .3 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.

## **1.27 FINAL SETTINGS**

- .1 Upon completion of Cx to satisfaction of Owner's Representative, lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

## **PART 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **PART 3 EXECUTION**

### **3.01 COMMISSIONING TASKS**

- .1 The following section summarizes the general tasks to be conducted for the commissioning PV process for the building systems and on-site Cx review with further detailed checks being provided within applicable specification sections and installations checks, verification activities and performance verification (PV) checks detailed on the Cx forms provided by the Owner's

Representative.

- .2 The list included below is intended to provide a basic overview and the detailed requirements for all system checks and PV forms will exceed those general overview tasks listed below.
- .3 In addition to the tasks outlined, all manufacturer start-up and commissioning tasks to be completed and documented.

### **3.02 CIVIL DISCIPLINE: SYSTEMS TO BE COMMISSIONED**

- .1 Site Earth Works
  - .1 Confirm removal of all unsuitable materials.
  - .2 Confirm compliance with Geo-technical Report.
  - .3 Confirm construction of engineered rock fill.
  - .4 Ensure backfilling is compacted in lifts equally, inside and outside foundation walls.
  - .5 Ensure site grading is done in lifts and compacted to meet contract documents.
  - .6 Ensure materials quality compliance of sub-grade and bedding materials, supported by laboratory test reports.
  - .7 Ensure site sloped away from building
  - .8 Ensure site sloped to drainage system components.
  - .9 Provide reports on compaction testing results.
- .2 Site Storm Drainage
  - .1 Confirm pipe size and materials
  - .2 Confirm and record location and elevation of pipe/culvert inverts.
  - .3 Confirm proper pipe bedding installation and inspection prior to backfilling.
  - .4 Review system with facility operator.
- .3 Manholes and Catchbasins
  - .1 Confirm location and elevation of manholes and catchbasins, including invert elevations.
- .4 Hard Landscaping - Asphalt/Concrete
  - .1 Confirm subbase, base granulars, asphalt, and concrete meet specification requirements.
  - .2 Provide records of acceptable compaction results for subbase and base granulars.
  - .3 Provide record of concrete strength, mix design, and temperature at time of placement.
  - .4 Provide records of asphalt testing results.
  - .5 Verify placement of control joints in concrete walkways, curbs and other exterior on grade concrete slabs.
  - .6 Confirm placement of concrete reinforcements.
  - .7 Ensure no ponding on asphalt areas.
  - .8 Ensure proper slope to drainage.
  - .9 Ensure all permanent markings are installed for parking stalls, handicap accessibility and directional signage.
- .5 Soft Landscaping
  - .1 Mowable grassed areas
    - .1 Confirm topsoil meets contract requirements.
    - .2 Confirm sodding/hydroseeding meets contract requirements.
    - .3 Confirm fertilizer application.
    - .4 Verify maintenance of grass in accordance with contract requirements.
    - .5 Provide training on fertilizing and weed control.

### **3.03 STRUCTURAL DISCIPLINE: SYSTEMS TO BE COMMISSIONED**

- .1 Foundations
  - .1 Confirm footing and top of wall elevations meet contract requirements.
  - .2 Confirm footings, concrete piers and walls have required reinforcement installed.
  - .3 Confirm proper placement and construction of concrete/ piers and walls.
  - .4 Confirm concrete meets quality requirements and incorporate test results.
  
- .2 Structural Steel Frame
  - .1 Provide copy of erector’s certification before construction begins.
  - .2 Confirm base plates are shimmed, level, grouted, and anchor bolts are correctly aligned.
  - .3 Confirm steel is properly primed and painted
  - .4 Confirm structural steel is properly welded to meet contract requirements.
  - .5 Confirm structural bracing is in place in accordance with erection drawings.
  - .6 Confirm all welds are primed and painted.
  - .7 Confirm metal deck is correctly welded.
  - .8 Confirm structural third-party inspection has been completed satisfactorily.
  - .9 Record all on site test results and project record information prior to structural steel being covered by other trades.
  - .10 Provide certification of quality compliance from fabricator.
  
- .3 Concrete Suspended Slabs and Slabs on Grade
  - .1 Confirm concrete meets quality requirements and incorporate test results.
  - .2 Confirm location and installation of thickened slabs meet contract requirements.
  - .3 Confirm location and installation of control joints.
  - .4 Confirm concrete floor curing (and sealer) applied as per manufacturer’s instructions and compatible with finish flooring materials.
  - .5 Confirm reinforcement is correctly placed in slab.
  - .6 Provide records of curing conditions for the first 14 days of the initial placement.
  - .7 Provide survey of finished floor elevations to confirm compliance with required “Level” tolerance.

### **3.04 ARCHITECTURAL DISCIPLINE: SYSTEMS TO BE COMMISSIONED**

- .1 Thermal and Moisture Protection
  - .1 Provide records of compliance regarding moisture content of building materials.
  - .2 Confirm insulation types and values meet contract requirements.
  - .3 Confirm rigid insulation is adhered as per manufacturer’s instructions.
  - .4 Ensure mechanical protection is provided for exposed insulation.
  - .5 Certify continuity of air barriers and vapour retarders.
  - .6 Provide records of independent leakage testing for air barrier assembly (if required).
  - .7 Provide certificate of product quality compliance for insulation, air barriers, vapor retarders, etc.
  
- .2 Roof Assembly
  - .1 Confirm integrity of roof installation.
  - .2 Perform flood testing if required by the specifications.
  - .3 Verify slopes of roof provide positive water flow to roof drains. Ensure no ponding of water on roof.
  - .4 Confirm all flashing is in place and sealing is complete.
  - .5 Ensure the installation of all roofing accessories.

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 8 of 18

- .6 Include inspection reports from manufacturer representative as specified indicating all warranties are in place.
  
- .3 Doors and Windows
  - .1 Doors:
    - .1 Confirm operation of all mechanical door hardware.
    - .2 Confirm operation of all electrical/electronic door hardware including safety features.
    - .3 Ensure tightness and continuity of smoke/sound stripping and accessories.
    - .4 Ensure keying in place and properly recorded.
    - .5 Confirm sign over to Client for use.
    - .6 Provide training and warranties.
  - .2 Windows and Curtain Wall:
    - .1 Check all window glazing seals.
    - .2 Confirm all sealant in place around frames.
    - .3 Provide training and warranties.
  - .3 Door Operators
    - .1 Confirm correct door operators installed.
    - .2 Check for smooth operation, time for operator to act, hold open time and closure time.
    - .3 Check switch integrity. Observe how switch operates.
    - .4 Ensure proper operation of safety edges and of the safety features.
    - .5 Provide training and warranties.
  - .4 Entrances and Exits
    - .1 Confirm correct operation of all doors.
    - .2 Confirm lock assembly operates as required.
    - .3 Verify door closers operate correctly. Provide verification from manufacturer of proper operation of electronic closure.
    - .4 Confirm if doors are/can be affected by wind conditions.
    - .5 Confirm door entrance grilles free of debris and secure.
    - .6 Confirm all weatherstripping in place and properly secured.
    - .7 Confirm accessibility compliance for wheelchair users.
    - .8 Demonstrate maintenance required.
    - .9 Provide warranties.
  
- .4 Aquatics/Pool Deck Equipment
  - .1 Confirm all equipment is installed as per manufacturer's requirements, engineered shop drawings and all other contract documentation.
  - .2 Confirm that all equipment is acceptable to authorities having jurisdiction and ready to use.
  - .3 Demonstrate that all equipment is functioning correctly and within manufacturer's acceptable tolerances.
  - .4 Train staff in the operation and maintenance of equipment, including cleaning procedures for materials and surfaces.
  
- .5 Room Fit-up & Finishes
  - .1 Confirm all ceiling systems installed as per manufacturer's requirements.
  - .2 Confirm ceiling integrity.
  - .3 Verify spare products provided and signed off by operating staff.
  - .4 Confirm wall finishes. Include paint type, number and colour chip each location.  
Confirm MPI system for all substrates and confirm that products used are acceptable

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 9 of 18

- manufacturers for the various components of each MPI system specified. Confirm gloss levels.
- .5 Confirm flooring used. Provide information on type of flooring, location, colour.
  - .6 Provide and review all cleaning processes for ceiling, walls, flooring. Verify application processes of sealants, waxes, etc. as applicable.
  - .7 Demonstrate maintenance required.
  - .8 Provide Technical Support Inspector's inspection report verifying finishes have met contract requirements.
- .6 Occupant Safety and Accessibility
- .1 Fire Separations
    - .1 Verify fire stopping and smoke seals in place.
    - .2 Verify sleeves in hollow walls around piping.
    - .3 Verify installation of angle iron around duct work installed as specified.
    - .4 Verify fire dampers electrically wired into the F.A. P. installed as specified
    - .5 Verify continuity and ratings of fire separations.
    - .6 Confirm fire ratings for door assemblies comply with door schedule.
    - .7 Confirm door closures, smoke sweeps, hardware complies with hardware schedule.
  - .2 Escape Routes Within Facility
    - .1 Confirm walls as per fire ratings and plan location.
    - .2 Verify length of travel meets design requirements.
    - .3 Verify panic hardware installed as per section/specification.
    - .4 Confirm fire rated doors/closures meet design requirement.
    - .5 Confirm visual markers for visually impaired.
    - .6 Test emergency lighting.
  - .3 Doors in Fire Separations
    - .1 Verify smoke sweeps/seals installed properly.
    - .2 Verify door closures/hardware hinges installed properly and operating.
    - .3 Verify door closure installed properly and operating
    - .4 Verify hinges as per specification installed properly.
    - .5 Verify doors closures meet Code requirements.
    - .6 Verify ULC labels attached to door and frame.
  - .4 Barrier-free Path of Travel, Exterior and Interior
    - .1 Confirm exit doors meet contract requirements.
    - .2 Confirm occupancy approval received from Service NL or local authority.
    - .3 Verify fire extinguishers are installed in a manner which ensures barrier-free path of travel.
    - .4 Confirm barrier-free parking is provided.
    - .5 Verify dimensions of ramps, landings, and handrail heights meet contract requirements.
    - .6 Confirm handrails in stairs and ramps meet NBC.
    - .7 Confirm handrails have returns and finished to wall.
  - .5 Barrier-free Washroom and Shower
    - .1 Confirm toilets set at heights specified.
    - .2 Confirm barrier free washroom fixtures/vanities set at heights specified.
    - .3 Confirm door to washroom stalls are proper dimensions and equipped with specified hardware.
    - .4 Confirm shower stalls equipped with accessible shower attachments/folding stools.

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 10 of 18

- .5 Verify shower threshold 12 mm or less in height.
- .6 Verify shower base sloped to floor drain (approximately 1% grade).
- .7 Confirm shower curtains meet specification.
- .8 Ensure washroom accessories meet accessibility requirements (e.g. dimensions, size, placement, mounting heights of grab bars).

**.7 Millwork**

- .1 Ensure all dimensions and materials meet contract requirements.
- .2 Confirm installation and proper operation of all hardware.
- .3 Verify all systems installed level, plumb, and square.
- .4 Ensure proper fasteners are used to attach mill work to walls, floors, and ceilings.
- .5 Ensure all hinges have proper number of screws.
- .6 Ensure all bumpers are installed.
- .7 Ensure shelf supports and clips for shelves are installed.
- .8 Ensure all toe kicks are finished
- .9 Ensure counter tops meet contract requirements, back splash caulked, and matched end caps.
- .10 Provide instruction to operating staff as required.

**3.05 MECHANICAL DISCIPLINE: SYSTEMS TO BE COMMISSIONED**

**.1 Sprinkler System Devices**

- .1 Verify connection to fire alarm system.
- .2 Confirm signal to fire alarm system all devices.
- .3 Confirm location on as-built drawings.
- .4 Verify operation of all devices.
- .5 Verify drain test location and demonstrate. Observe how water flows from outlets.
- .6 Verify identification used for all devices.
- .7 Test BFP and provide report
- .8 Test and record system pressures
- .9 Verify full flow test of system
- .10 Verify remote inspector test connections
- .11 Demonstrate maintenance required and training.
- .12 Provide Certification Certificate for total system.

**.2 Plumbing Fixtures**

- .1 Confirm fixture installed matches contract documents.
- .2 Verify fixture trim operation.
- .3 Confirm operation of hands free powered trim Verify fixtures properly accessible and meet requirements for accessibility.
- .4 Demonstrate maintenance operations for all fixtures and trim types.
- .5 Verify cleaning methods for all fixtures. Demonstrate correct methods as required.
- .6 Confirm all trap seal primer operation
- .7 Confirm operation of drinking fountain and assoc. chillers
- .8 Provide Certificate of Compliance for Accessibility.

**.3 Domestic Water System**

- .1 Confirm interface of all devices with BAS.
- .2 Confirm operation of recirculation pump.
- .3 Verify hot water temperature at each plumbing fixture.
- .4 Verify and record setpoints of domestic hot water supply.

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 11 of 18

- .5 Confirm pressure reducing valve operation.
- .6 Confirm Water meter operation and adjustment
- .7 Confirm testing of all BFP's has passed
- .8 Confirm and record setpoints of tempered water devices. Measure and record outlet temperatures.
- .9 Test element amps at load and confirm with shop dwg
- .10 Provide copy of water test results
- .11 Confirm timed shower operation
- .12 Set shower high temperature limit stops
- .13 Set mixing valve temperatures at all mixing valves
- .14 Verify water balance report
- .15 Sterilize complete system prior to use.
- .16 Instruct owner on the operation of shut-off valves
- .17 Demonstrate maintenance required.
- .18 Confirm shower heat recovery system operation
- .19 Confirm operation of pre-heat tank. Record inlet/outlet temperatures
  
- .4 Hot Water Heating System
  - .1 Confirm interface of all devices with BAS.
  - .2 Confirm operation of all existing circulation pumps.
  - .3 Confirm interface of temperature, flow pressure and status points with BAS.
  - .4 Confirm operation of all existing heating valves
  - .5 Confirm operation of existing pre-heat system(domestic)
  - .6 Confirm operation of existing pool heating system
  
- .5 Swimming Pool Piping/Pumping System
  - .1 Confirm chlorine feed systems
  - .2 Confirm interface of all devices with BAS.
  - .3 Confirm main pool circulation pump operation. Verify rotation direction, inlet/outlet pressures, flow rates, motor electrical power.
  - .4 Confirm all balancing completed.
  - .5 Confirm operation of Pool Dehumidifier unit pool heat rejection pump/system to pool and to dry cooler
  - .6 Confirm heat rejection simultaneously to heat supply air
  - .7 Confirm all devices labeled.
  - .8 Confirm interface of devices with BAS.
  - .9 Measure and record all temperatures and pressures and groups provided. Confirm ranges are acceptable for ease of use.
  - .10 Provide maintenance training.
  - .11 Confirm operation and pressure setting of glycol feed systems
  - .12 Confirm Glycol loop operation to dry cooler
  - .13 Confirm air removal from system
  - .14 Confirm flushing and cleaning of all new pool system piping
  - .15 Confirm flushing and cleaning of all glycol piping
  - .16 Confirm water testing is complete and provide certificate
  - .17 Confirm % and strength of glycol
  - .18 Confirm air removal device and air vents
  
- .6 Air Handling Systems (Applicable for each system)
  - .1 Confirm interface of all devices with BAS.
  - .2 Verify factory start-up of unit

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 12 of 18

---

- .3 Verify balancing report
  - .4 Check filter status. Install clean filters.
  - .5 Confirm damper operation. Ensure dampers operate freely and sufficient damper motors are provided.
  - .6 Verify dampers seal tight when closed.
  - .7 Ensure units are clean and washed down prior to final acceptance.
  - .8 Verify fan systems capacity control. Measure static pressures at various flow settings of fan. Confirm system is stable when operating.
  - .9 Confirm heating and cooling operation. Measure inlet/outlet temperatures.
  - .10 Verify exhaust fan operation
  - .11 Verify F/A damper control
  - .12 Verify heat recovery wheel operation
  - .13 Verify heating coil operation
  - .14 Verify free-cooling control operation
  - .15 Verify all refrigerant pressures
  - .16 Confirm suitable drain traps provided. Verify trap height and system static pressures.
  - .17 Confirm fire alarm devices in place and fully functional.
  - .18 Confirm operation of all interior lights for the unit.
  - .19 Measure for belt tension and confirm it is within manufacturer's recommendation.
  - .20 Verify fan balance and confirm within tolerance.
  - .21 Verify bearing lubrication works correctly. Record bearing lubrication activities from start up to final turn over to Owner.
  - .22 Verify filters fit tight with minimal air leakage.
  - .23 Verify ease of accessibility for maintenance.
  - .24 Confirm capacity control for fan operation.
  - .25 Demonstrate maintenance required and training
- .7 Fans
- .1 Confirm correct installation as per manufacturer's instructions.
  - .2 Confirm correct rotation.
  - .3 Measure and record motor amperage.
  - .4 Verify (if applicable) belt tension.
  - .5 Verify bearings are lubricated. Record lubrication from start-up to final turn over to Owner.
  - .6 Verify no vibration exists.
  - .7 Confirm balancing completed. Verify results.
- .8 Reheat Coils
- .1 Confirm correct heating coil installed.
  - .2 Confirm full capacity operation and modulation
  - .3 Confirm and record inlet and discharge air temperature at full flow condition
  - .4 Confirm all disconnects
- .9 VRF and Mini Split System
- .1 Confirm condensate pumps and drains
  - .2 Confirm heating and cooling operation
  - .3 Confirm low ambient cooling for Electrical room units
  - .4 Confirm control of thermostats and stage two electric heat
  - .5 Confirm adequate access for servicing
  - .6 Confirm filters are installed and accessible
  - .7 Ensure spring isolators installed

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 13 of 18

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- .8 Ensure unit installed level
- .9 Confirm DDC space sensor
- .10 DDC Controls
  - .1 Confirm Honeywell EBI Graphics of new and existing equipment
  - .2 Confirm all DDC points are connected and operating.
  - .3 Confirm all equipment controlled by the DDC system is functioning properly.
  - .4 Confirm all sensors are calibrated and installed correctly.
  - .5 Verify all building automation sequences. (Provide all necessary additional programming required to achieve a fully functional system)
  - .6 Verify all DDC alarms.
  - .7 Verify all graphical representations.
  - .8 Confirm all DDC systems and components are fully BACNET compatible.
  - .9 Confirm software is installed and operational as directed as well as web access. Confirm validity of password information for access to system.
  - .10 Confirm wiring method conforms to wire size and type, and is installed in accordance with specification.
  - .11 Review maintenance procedures with manufacturer’s representative and provide training.

**3.06 ELECTRICAL DISCIPLINE: SYSTEMS TO BE COMMISSIONED**

- .1 Site Interior Feeders
  - .1 Confirm wire gauge, type & quantity of conductors.
  - .2 Install connectors.
  - .3 Confirm routing and support.
  - .4 Confirm bonding conductor.
  - .5 Megger all conductors prior to terminations.
  - .6 Confirm identification colors applied in accordance with specification.
- .2 Pad Mount Distribution Transformers.
  - .1 Megger all secondary conductors prior to terminations.
  - .2 Confirm cables undamaged.
  - .3 Measure and record amperage and voltage on secondary of transformer under normal load.
  - .4 Confirm conduits properly installed.
  - .5 Confirm concrete as per detail.
  - .6 Confirm rebar installed as pre detail.
  - .7 Confirm crushed stone installed.
  - .8 Confirm routing of primary and secondary conduits.
  - .9 Confirm proper grounding.
- .3 Dry Type Transformers Indoors.
  - .1 Megger all cables.
  - .2 Confirm cables not damaged.
  - .3 Measure and record amperage and voltage on primary and secondary of transformer under normal load.
  - .4 Confirm proper grounding.
  - .5 Confirm flexible connections to transformer.
  - .6 Confirm transformer housing not damaged.
  - .7 Confirm installation of sprinkler guards
  - .8 Confirm installation of identification.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 14 of 18

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- .9 Perform IR scan as per specifications.
- .4 Underground Services.
  - .1 Megger all conductors.
  - .2 Inspect trenches for foreign materials and sharp obstacles.
  - .3 Confirm proper conduit bedding and installation. (i.e. glue, support)
  - .4 Confirm conduit sizes, spare conduit and pull rope.
  - .5 Confirm trench/conduit depth.
  - .6 Confirm marking system installed.
  - .7 Confirm proper backfill procedure.
- .5 Service Entrance Equipment.
  - .1 Megger all cables.
  - .2 Measure and record voltage and amperage on all conductors under normal load.
  - .3 Confirm grounding and bonding.
  - .4 Confirm all connections properly torqued.
  - .5 Confirm identification installed.
  - .6 Confirm final cleaning.
  - .7 Confirm rating of OCP devices and adjustments as per specifications and in accordance with factory coordination study.
  - .8 Confirm connection to Building Automation System (BAS).
- .6 Distribution and Lighting Panelboards.
  - .1 Megger all feeder conductors.
  - .2 Measure and record voltage and amperage on all feeder conductors under normal load.
  - .3 Confirm grounding and bonding.
  - .4 Confirm all connections properly torqued.
  - .5 Confirm panel identification installed.
  - .6 Confirm final cleaning.
  - .7 Confirm panel directory correct.
  - .8 Confirm no splices within panel tub.
- .7 Disconnect/Safety Switches.
  - .1 Megger all conductors.
  - .2 Measure and record voltage and amperage on all conductors under normal load.
  - .3 Confirm grounding and bonding.
  - .4 Confirm all connections properly torqued.
  - .5 Confirm identification installed.
  - .6 Confirm final cleaning.
  - .7 Confirm proper rating of fuses installed.
  - .8 Confirm auxiliary contacts in elevator power disconnect switch installed and wired to elevator controller.
- .8 Equipment Enclosures, Splitters, Junction Boxes.
  - .1 Confirm all conduit and cable connections seated properly in enclosure.
  - .2 Confirm locknuts and bushings on all conduit connections. Double locknuts on RGS conduit.
  - .3 Confirm proper grounding and bonding.
  - .4 Confirm proper support.
  - .5 Confirm identification installed.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 15 of 18

---

- .9 Wiring Devices.
  - .1 Confirm devices installed in proper location.
  - .2 Confirm switches installed on latch side of doors.
  - .3 Confirm proper voltage/amperage rating.
  - .4 Confirm proper polarity.
  - .5 Confirm cover plate installed flush on wall.
  - .6 Confirm identification completed.
  - .7 Confirm flush plates not installed on surface boxes.
  
- .10 Circuit Breakers.
  - .1 Confirm breaker size as specified.
  - .2 Confirm breaker properly torqued to panel bus.
  - .3 Confirm load conductors properly torqued to breakers.
  - .4 Confirm GFCI breakers operate properly.
  - .5 Confirm voltage and amperage load on all circuit breakers. Record results.
  
- .11 Electric Heating.
  - .1 Confirm heater wattage and voltages are correct.
  - .2 Confirm heater connected to circuit indicated.
  - .3 Confirm heater controls operate properly.
  - .4 Confirm heaters fastened securely to building.
  - .5 Measure voltage and amperage at heaters. Record results.
  
- .12 Conduits.
  - .1 Confirm all conduits proper size and type.
  - .2 Confirm all conduits properly supported.
  - .3 Confirm conduit fill not exceeded.
  - .4 Confirm all in slab conduits noted on as-builts and installed in accordance with specification.
  - .5 Confirm pull ropes installed in all spare conduits.
  - .6 Confirm bonding conductor installed in all conduits.
  - .7 Confirm identification color coding applied in accordance with specification.
  
- .13 Grounding.
  - .1 Confirm grounding system installed and connections made are secure.
  - .2 Confirm connections to pool reinforcing steel.
  - .3 Verify connections and conductors protected from mechanical injury.
  - .4 Ensure compliance with the specification.
  - .5 Confirm bonding wire used in all conduit systems.
  - .6 Confirm all grounding buses installed correctly.
  - .7 Confirm connections to ground busses with approved connectors.
  - .8 Perform continuity and resistance tests.
  - .9 Demonstrate normal maintenance requirements for grounding system.
  - .10 Confirm building steel grounded.
  - .11 Check main systems ground.
  - .12 Check data system ground.
  - .13 Check telephone system ground.
  
- .14 Contactors.
  - .1 Verify installation of contactors and components.
  - .2 Verify installation of secondary control devices.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 16 of 18

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- .3 Confirm operation of all devices.
- .4 Demonstrate maintenance requirements.
  
- .15 Lighting.
  - .1 Confirm all lighting systems are properly supported.
  - .2 Confirm all fixture alignments.
  - .3 Confirm operation of all fixtures.
  - .4 Demonstrate maintenance procedures.
  - .5 Confirm spare parts are provided as specified.
  - .6 Verify outside lighting foundations are true and plumb.
  - .7 Verify operation of all exterior lighting.
  - .8 Provide copy of test results.
  - .9 Provide copy of warranties.
  - .10 Submit all spare lamps and ballasts.
  
- .16 Lighting Controls.
  - .1 Confirm operation of all line voltage occupancy sensors.
  - .2 Confirm operation of all low voltage occupancy sensors, day lighting sensors and load relays.
  - .3 Program low voltage controls in accordance with contract documents and owner's directions.
  - .4 Demonstrate maintenance procedures.
  - .5 Provide copy of warranties.
  
- .17 Fire Alarm.
  - .1 Verify that system components have been located and installed in accordance with the contract documents.
  - .2 Verify all wiring connections completed.
  - .3 Verify operation of all devices.
  - .4 Coordinate interconnection with Intrusion Alarm System.
  - .5 Test alarm operations for all areas and devices.
  - .6 Confirm graphic display mounted.
  - .7 Confirm location of Certificate of Compliance from manufacturer.
  - .8 Simulate grounds and breaks with the system.
  - .9 Check and verify communication panels operate correctly.
  - .10 Verify system maintenance procedures.
  - .11 Confirm all remote annunciators working.
  - .12 Confirm all interior and exterior audible devices working.
  - .13 Confirm all pull stations installed and operational.
  - .14 Confirm all visual signal devices operational.
  - .15 Check panel flush and level.
  - .16 Training provided.
  - .17 Warranties supplied.
  - .18 Maintenance materials supplied.
  - .19 Check tags for fire department, phone numbers at all pull stations.
  - .20 Confirm sprinkler system connections operational.
  - .21 Confirm interconnections to mechanical systems operable.
  - .22 Confirm interconnections to door hardware systems operable.
  - .23 Confirm interconnections to smoke venting systems operable.
  - .24 Confirm exterior horn and sprinkler bell installed and operable.
  - .25 Check all acoustic signal devices are audible from all locations.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 01 91 13.13 – Commissioning Plan

Page 17 of 18

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- .26 Commissioning to be conducted by factory trained technician.
- .27 Submit verification certificate.
  
- .18 Door Hardware/Card Access.
  - .1 Verify that 120Vac power and empty conduit for low voltage wiring has been located and installed in accordance with the contract documents.
  
- .19 Public Address Systems.
  - .1 Verify that system components for each system have been located and installed in accordance with the contract documents.
  - .2 Verify operation of assistive listening equipment.
  - .3 Train all designated staff in proper operation of systems.
  - .4 Commissioning to be conducted by factory trained technician.
  - .5 Demonstrate all maintenance procedures.
  - .6 Provide copy of warranty.
  
- .20 CCTV Surveillance Systems (Infrastructure & Cabling Only):
  - .1 Verify that system components have been located and installed in accordance with the contract documents and manufacturer recommendations.
  - .2 Confirm all testing as required completed and documented.
  - .3 Verify receipt of final certification documentation.
  - .4 Provide copies of data cable test results.
  - .5 Provide copy of warranty.
  
- .21 Data Systems.
  - .1 Verify that system components have been located and installed in accordance with the contract documents.
  - .2 Confirm all testing as required completed and documented.
  - .3 Verify receipt of final certification documentation.
  - .4 Commissioning to be conducted by factory trained technician.
  - .5 Provide copies of data cable test results.
  - .6 Provide copy of warranty.
  - .7 Confirm labeling of outlets to owner's requirements.
  
- .22 Exit Lighting Systems.
  - .1 Verify that system components have been located and installed in accordance with the contract documents.
  - .2 Verify all exit lights installed correctly and are operational.
  - .3 Confirm breaker for exit lights locked in ON position.
  - .4 Confirm operation of integral batteries, minimum 90 minute operation.
  - .5 Confirm integral emergency lighting heads are aimed properly.
  - .6 Demonstrate maintenance procedures.
  - .7 Confirm spare parts are provided as specified.
  
- .23 Emergency Lighting Systems.
  - .1 Verify that system components have been located and installed in accordance with the contract documents.
  - .2 Verify all emergency lighting units installed correctly and are operational.
  - .3 Confirm breaker for emergency lighting units locked in ON position.
  - .4 Confirm batteries are fully charged and operational for minimum 90 minutes.
  - .5 Confirm remote heads operational.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 91 13.13 – Commissioning Plan**

**Page 18 of 18**

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- .6 Confirm conductor size to remote heads.
- .7 Demonstrate maintenance procedures.
- .8 Confirm spare parts are provided as specified.

**END OF SECTION**

**PART 1      GENERAL**

**1.1      SUMMARY**

- .1      Section Includes:
  - .1      Information on commissioning forms to be completed for equipment, system and integrated system.
  
- .2      Related Requirements
  - .1      Section 01 91 13 – General Commissioning Requirements
  - .2      Section 01 91 13.13 – Commissioning Plan
  - .3      Section 01 91 41 – Commissioning Training

**1.2      INSTALLATION/START-UP CHECK LISTS**

- .1      Contractor to complete installation and start-up checklists for all equipment. Provide all blank forms for review and approval prior to using checklists.
  
- .2      Include the following data:
  - .1      Product manufacturer's installation instructions and recommended checks.
  - .2      Special procedures as specified in relevant technical sections.
  - .3      Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
  
- .3      Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Owner's Representative supplemental additional data lists will be required for specific project conditions.
  
- .4      Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
  
- .5      Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Owner's Representative. Check lists will be required during Commissioning and will be included in Operation and Maintenance Manual at completion of project.
  
- .6      Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.
  
- .7      All checklists to be compiled in single indexed document.

**1.3      PRODUCT INFORMATION (PI) REPORT FORMS**

- .1      Contractor to develop and submit completed product information forms for all equipment supplied in the project. Provide all forms for review and approval prior to entering data.
  
- .2      Product Information (PI) forms compile gathered project specific data on items of equipment produced by equipment manufacturer, includes nameplate information, technical data, capacity data, connection information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation

is included in the Operations and Maintenance manual at completion of work.

- .3 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Owner's Representative's approval
- .4 All PI forms to be compiled in single indexed document with final completed document included as part of O&M manual.

#### **1.4 COMMISSIONING FORMS – SAMPLES AND CHANGES**

- .1 Owner's Representative will develop and provide to Contractor required project-specific PV Commissioning forms in electronic format.
- .2 Changes and development of new commissioning forms:
  - .1 When additional forms are required but are not available from Owner's Representative develop appropriate verification forms and submit to Owner's Representative for approval prior to use.
  - .2 Additional commissioning forms to be in same format as provided by Owner's Representative

#### **1.5 PERFORMANCE VERIFICATION (PV) FORMS**

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2 Contractor to complete all tests and operational checks as outlined in the PV forms provided by owner's representative.
- .3 PV report forms include those developed by Contractor to record measured data and readings taken during functional testing and Performance Verification procedures.
- .4 Prior to PV of integrated system, complete PV forms of related systems and obtain Owner's Representative's approval.

#### **1.6 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
  - .1 Owner's Representative provides Contractor project-specific Commissioning forms with Specification data included.
  - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
  - .3 Confirm operation as per design criteria and intent.
  - .4 Identify variances between design and operation and reasons for variances.
  - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
  - .6 Record analytical and substantiating data.
  - .7 Verify reported results.
  - .8 Form to bear signatures of recording technician and reviewed and signed off by Owner's

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 01 91 33 – Commissioning Forms**

**Page 3 of 3**

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- Representative.
- .9 Submit immediately after tests are performed.
- .10 Reported results in true measured SI unit values.
- .11 Provide Owner's Representative with originals of completed forms.
- .12 Maintain copy on site during start-up, testing and commissioning period.
- .13 Forms to be both hard copy and electronic format with typed written results incorporated into Operations and Maintenance Manual.

**PART 2      PRODUCTS**

- 1.      NOT USED**
- .3 Not Used.

**PART 3      EXECUTION**

- 1.      NOT USED**
- .4 Not Used.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES:**

- .1            This Section specifies roles and responsibilities of Commissioning Training.

**1.2            RELATED SECTIONS:**

- .1            Section 01 78 00 – Closeout Submittals.
- .2            Section 01 91 13 – General Commissioning Requirements.
- .3            Section 01 91 13.13 – Commissioning Plan.
- .4            Section 01 91 33 – Commissioning Forms.

**1.3            GENERAL**

- .1            Training to be provided for all systems and equipment that may require owner input, monitoring, adjustment, maintenance, etc.

**1.4            TRAINEES**

- .1            Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2            Trainees may be available for training during any stages of construction for purposes of familiarization with systems.

**1.5            INSTRUCTORS**

- .1            Owner's Representative will arrange to provide:
  - .1            Descriptions of systems.
  - .2            Instruction on design philosophy, design criteria, and design intent.
- .2            Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
  - .1            Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out performance verification tests.
  - .2            Start-up, operation, shut-down of equipment, components and systems.
  - .3            Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
  - .4            Instructions on servicing, maintenance and adjustment of systems, equipment and components.

**1.6            TRAINING OBJECTIVES**

- .1            Training to be detailed and of an appropriate duration to ensure:

- .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
- .2 Effective on-going inspection, measurements of system performance.
- .3 Proper preventive maintenance, diagnosis and troubleshooting.
- .4 Ability to update documentation.
- .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

**1.7 TRAINING MATERIALS**

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
  - .1 As-Built Contract Documents.
  - .2 Operating Manual.
  - .3 Maintenance Manual.
  - .4 Testing, adjusting and balancing and performance verification Reports.
  - .5 Commissioning forms and other documentation forming part of the general commissioning process.
- .3 Owner's Representative will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to the same degree of detail.

**1.8 SCHEDULING**

- .1 Include in Project Schedule time for training in addition to time already allotted in other sections for commissioning on-site review activities.
- .2 Deliver training during regular working hours, training sessions to be determined in Commissioning meetings.
- .3 Training to be completed prior to acceptance of facility.

**1.9 RESPONSIBILITIES**

- .1 Be responsible for:
  - .1 Implementation of training activities,
  - .2 Coordination among instructors,
  - .3 Quality of training, training materials,
- .2 Owner's Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Owner's Representative.

**1.10 TRAINING CONTENT**

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.

- .2 Content includes:
  - .1 Review of facility and occupancy profile.
  - .2 Functional requirements.
  - .3 System philosophy, limitations of systems and emergency procedures.
  - .4 Review of system layout, equipment, components and controls.
  - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance, and shut-down procedures.
  - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
  - .7 Maintenance and servicing.
  - .8 Trouble-shooting diagnosis.
  - .9 Inter-Action among systems during integrated operation.
  - .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

**PART 2**      **PRODUCTS (NOT APPLICABLE)**

**PART 3**      **EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 03 10 00 – Concrete Forming and Accessories

Page 1 of 3

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**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2      Section 03 20 00 – Concrete Reinforcing.
- .3      Section 03 30 00 – Cast-in-place Concrete.
- .4      Section 07900 – Joint Sealants

**1.2      REFERENCES**

- .1      Codes and Standards referenced in this section refers to the latest edition thereof.
- .2      Canadian Standards Association (CSA)
  - .1      CAN/CSA-A23.1-19/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-19, Engineering Design in Wood.
  - .3      CSA O121, Douglas Fir Plywood.
  - .4      CSA O151, Canadian Softwood Plywood.
  - .5      CSA S269.1-16, Falsework and Formwork.
  - .6      CAN/CSA-S269.2-16, Access Scaffolding for Construction Purposes.
  - .7      ACI 347R-14(21), Guide to Formwork for Concrete.

**1.3      SUBMITTALS**

- .1      Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework and formwork drawings.
- .2      Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- .3      Indicate sequence of erection and removal of formwork/falsework as directed by Engineer/Architect.
- .4      For walls 2,400 mm high or greater, submit formwork shop drawings.
  - .1      Each shop drawing submission to bear stamp and signature of qualified professional structural engineer registered and licensed in Province of Newfoundland and Labrador, Canada.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 03 10 00 – Concrete Forming and Accessories

Page 2 of 3

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**PART 2      PRODUCTS**

**2.1          MATERIALS**

- .1      Formwork materials:
  - .1          For concrete without special architectural features, use wood and wood product formwork materials to CSA-0121 CAN/CSA-086.19.
  - .2          For concrete with special architectural features, use formwork materials to CSA-A23.1-19/A23.2-19.
- .2      Form ties:
  - .1          Removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
- .3      Form liner:
  - .1          Plywood, medium density overlay Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, T and G thickness as indicated.
- .4      Form release agent:
  - .1          Chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, non-toxic, biodegradable.
  - .2          Architectural concrete, including exterior round columns: release agent to be non-staining.
- .5      Falsework materials: to CSA-S269.1.
- .6      Sealant: to Section 07 92 10 - Joint Sealing.

**PART 3      EXECUTION**

**3.1          FABRICATION AND ERECTION**

- .1      Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2      Provide camber in floor slabs to accommodate flatness after stripping. Discuss camber requirements with Owner's Representative and indicate such requirements on submittals.
- .3      Fabricate and erect formwork in accordance with CAN/CSA-S269.1, to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1-19/A23.2-19.
- .4      Do not place shores and mud sills on frozen ground.
- .5      Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6      Align form joints and make watertight. Keep form joints to minimum.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 03 10 00 – Concrete Forming and Accessories

Page 3 of 3

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- .7 Locate horizontal form joints for exposed columns a minimum of 2400 mm above finished floor elevation. Discuss placement with Owner's Representative prior to locating joints in exposed or architectural concrete work.
- .8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise on drawings.
- .9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .10 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .11 Clean formwork in accordance with CSA-A23.1-19/A23.2-19, before placing concrete.

**3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 3 days for walls and sides of beams.
  - .2 5 days for columns.
  - .3 1 day for footings and abutments.
- .2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .3 Space reshoring in each principal direction at not more than 3000 mm apart.
- .4 Re-use formwork and falsework subject to requirements of CSA-A23.1-14/A23.2-14.
- .5 Remove formwork when concrete has reached 70% of its design strength or minimum period noted, whichever comes later, and replace immediately with adequate shoring.

**END OF SECTION**

**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2      Section 03 10 00 – Concrete Forming and Accessories.
- .3      Section 03 30 00 - Cast-in-Place Concrete.

**1.2      REFERENCES**

- .1      Codes and Standards referenced in this section refer to the latest edition thereof.
- .2      American Concrete Institute (ACI)
  - .1      ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.
  - .2      ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .3      American Society for Testing and Materials International (ASTM)
  - .1      ASTM A1064/A1064M-13, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .2      ASTM A496-07/A496M-07, Standard Specification for Steel Wire, Deformed, for Concrete.
  - .3      ASTM A497-07/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
  - .4      ASTM A775/A775M-16, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4      Canadian Standards Association (CSA)
  - .1      CSA-A23.1-19/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of test and Standard Practices for Concrete.
  - .2      CSA-A23.3-19, Design of Concrete Structures.
  - .3      CAN/CSA-G30.18:21, Carbon Steel Bars for Concrete Reinforcement.
  - .4      CSA-G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel /Structural Quality Steel.
  - .5      CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6      CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
  - .7      CSA-630.14, Deformed Steel Wire for Concrete Reinforcement.
  - .8      CSA-630.15, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- .5      Reinforcing Steel Institute of Canada (RSIC)
  - .1      RSIC, Reinforcing Steel Manual of Standard Practice.

**1.3 SUBMITTALS**

- .1 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Owner's Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada. SP-66, ACI Detailing Manual, 2004, American Concrete Institute.
- .2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Owner's Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A497/A497M-07.
- .4 Welded steel wire fabric: to ASTM A1064/A1064M-18a. Provide in flat sheets only.
- .5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1-19/A23.2-19.
- .6 Mechanical splices: subject to approval of Owner's Representative.
- .7 Plain round bars: to CSA-G40.20-13/G40.21-13 (R2018).

**2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1-19/A23.2-19, ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Owner's Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Owner's Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

**2.3 SOURCE QUALITY CONTROL**

- .1 Upon request, provide Owner's Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.
- .2 Upon request inform Owner's Representative of proposed source of material to be supplied.

**PART 3 EXECUTION**

**3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Owner's Representative.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

**3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1-19/A23.2-19.
- .2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Owner's Representative approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Prior to placing concrete, the contractor shall provide a written notification to the Owner's Representative that all reinforcing material placement is now in accordance with the drawings and specifications and ask for a review by the Engineer of Record. Concrete shall not be poured until the review is completed by the Engineer of Record.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2      Section 03 10 00 - Concrete Forming and Accessories.
- .3      Section 03 20 00 - Concrete Reinforcing.
- .4      Section 07 92 00 – Joint Sealants.

**1.2            MEASUREMENT PROCEDURES**

- .1      Cast-in-place concrete will not be measured but will be paid for as a fixed price item to be included in the base bid.

**1.3            REFERENCES**

- .1      Codes and Standards referenced in this section refers to the latest edition thereof.
- .2      American Society for Testing and Materials (ASTM)
  - .1      ASTM C260/C260M-10 (2006), Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2      ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3      ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
  - .4      ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - .5      ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
  - .6      ASTM D994/D994M-11 Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
  - .7      ASTM D1751-04 (2013), Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .3      Canadian Standards Association (CSA)
  - .1      CSA-A23.1-19/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CAN3-A266.4, Guidelines for the Use of Admixtures in concrete.
  - .3      CAN/CSA-A3000-13, Cementitious Materials Compendium.
  - .4      CSA A283-06(R2016), Qualification Code for Concrete Testing Laboratories.

**1.4 ACRONYMS AND TYPES**

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
  - .1 Type GU or GUb - General use cement.

**1.5 SUBMITTALS**

- .1 At least 4 weeks prior to commencing work, inform Owner's Representative of proposed source of aggregates and provide access for sampling.
- .2 Submit testing results and reports for review by Owner's Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Certificates:
  - .1 Minimum 4 weeks prior to starting concrete work submit to Owner's Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
    - .1 Portland cement.
    - .2 Blended hydraulic cement.
    - .3 Supplementary cementing materials.
    - .4 Grout.
    - .5 Admixtures.
    - .6 Aggregates.
    - .7 Water.
    - .8 Waterstops.
    - .9 Waterstop joints.
    - .10 Joint filler.
  - .2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1-19/A23.2-19.
  - .3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1-19/A23.2-19.

**1.6 SOURCE QUALITY CONTROL**

- .1 Have all concrete produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current "Certificate of Ready Mixed Concrete Production Facilities" issued by the Association. Submit a copy of this certificate to the Owner's Representative for approval.

**1.7 QUALITY ASSURANCE**

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Owner's Representative approval for following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.

**1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
  - .1 Modifications to maximum time limit must be agreed to Owner's Representative and concrete producer as described in CSA A23.1-19/A23.2-19.
  - .2 Deviations to be submitted for review by Owner's Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1-19/A23.2-19.
- .3 Waste Management and Disposal:
  - .1 Divert unused concrete materials from landfill to local facility approved by Owner's Representative.
  - .2 Provide an appropriate area on the job site where concrete trucks can be safely washed.
  - .3 Divert unused admixtures and additive materials (pigments, fibers) from landfill to official hazardous material collections site as approved by the Owner's Representative.
  - .4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

**1.9 SITE CONDITIONS**

- .1 Placing concrete during rain or weather events that could damage concrete is prohibited.

- .2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.
- .3 Cold weather protection:
  - .1 Maintain protection equipment, in readiness on Site.
  - .2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.
  - .3 Placing concrete upon or against surface at temperature below 5°C is prohibited.
- .4 Hot weather protection:
  - .1 Protect concrete from direct sunlight when ambient temperature above 27°C.
  - .2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.
  - .3 Protect from drying.

## **PART 2      PRODUCTS**

### **2.1          MATERIALS**

- .1 Portland cement: to CAN/CSA-A3000, Type GU.
- .2 Water: to CAN/CSA-A23.1-19.
- .3 Aggregates: to CSA-A23.1-19.
- .4 Coarse aggregates to be normal density to CSA-A23.1-19/A23.2-19.
- .5 Admixtures:
  - .1 Air entraining admixture: to CAN3-A266.1.
  - .2 Chemical admixtures: to CAN3-A266.2, Owner's Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .6 Non premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days. Net shrinkage @ 28 days: maximum 0%.
- .7 Ribbed waterstops: extruded PVC of sizes indicated shop welded corner and intersecting pieces.
  - .1 Tensile strength: to ASTM D412, method A, Die "C".
  - .2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.
  - .3 Tear resistance: to ASTM D624, method A, Die "B".
- .8 Premoulded joint fillers:

- .1 Bituminous impregnated fiber board: to ASTM D1751.
- .9 Self-levelling control joint or movement joint fillers:
  - .1 Refer to Section 07 92 00 – Joint Sealants for interior and exterior fillers.
- .10 Polyethylene film: minimum .15 mm thickness to ASTM C171.
- .11 Bonding adhesive: as approved by Owner's Representative.
- .12 Donetail anchor slots: minimum .6mm thick galvanized steel with insulation filled slots.

## **2.2 MIXES**

- .1 Proportion normal density concrete in accordance with CSA-A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 Provide concrete mix to meet following hard state requirements:
    - .1 Cement:
      - .1 Type GU Portland cement.
      - .2 Minimum compressive strength at 28 days as per contract drawings.
      - .3 Minimum cement content: 300 kg/m<sup>3</sup> of concrete.
      - .4 Class of exposure as per contract drawings.
      - .5 Nominal size of coarse aggregate: 20 mm maximum.
      - .6 Slump at time and point of discharge: 75 to 100 mm.
      - .7 Air content: 5 to 8 %.
      - .8 Chemical admixtures: admixtures in accordance with ASTM C494.
    - .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
    - .4 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Obtain Owner's Representative's approval before placing concrete. Provide 48 h notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:

- .1 Development of cold joints not allowed except at locations pre-approved by Owner's Representative.
- .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Owner's Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, and air temperature and test samples taken.
- .10 Do not place load upon new concrete until authorized by Owner's Representative.

### 3.2 CONSTRUCTION

- .1 Execute all cast-in-place concrete work in accordance with CSA-A23.19/A23.2-19
- .2 Sleeves and inserts.
  - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Owner's Representative.
  - .2 Where approved by Owner's Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated must be approved by Owner's Representative.
  - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Owner's Representative before placing of concrete.
  - .4 Check locations and sizes of sleeves and openings shown on drawings.
  - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor rods.
  - .1 Set anchor rods to templates under supervision of appropriate trade prior to placing concrete.
  - .2 Locate anchor rods used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
  - .3 Locate rebar in concrete to avoid clash with anchor bolts. Coordinate prior to final placement of rebar.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 03 30 00 – Cast in Place Concrete

Page 7 of 9

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- .4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
  
- .5 Finishing.
  - .1 Finish concrete to CSA A23.1/A23.2.
  - .2 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
  - .3 Use procedures as reviewed by Owner's Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
  - .4 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
  - .5 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges 150 mm and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.
  - .6 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
  - .7 Finish concrete floor to CSA A23.1/A23.2. Class A.
  - .8 Concrete floor to have finish hardness equal or greater than Mohs hardness in accordance with CSA-A23.1/A23.2.
  - .7 Provide steel trowelled finish for all interior floor slabs.
  - .9 Provide brushed (broom) finish for exterior walks, ramps and pads.
  
- .6 Joint fillers.
  - .1 Locate and form, isolation, construction and expansion joints as indicated. Install joint filler in all control and expansion joints.
  - .2 Pre-moulded fillers:
    - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Owner's Representative.
    - .2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
    - .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
  - .3 Self-levelling fillers:
    - .1 Install exterior joint filler in all control and movement joints at the main entrance area.
    - .2 Install interior joint filler in all control and movement joints where interior concrete slabs will remain exposed to view, without additional finished flooring.
  - .4 Interior slabs with finish flooring:

- .1 Treat control and movement joints in accordance with the flooring manufacturer's instructions for surface preparation related to the specific flooring to be installed.
- .2 Refer to Division 09 for flooring specifications.
- .7 Dampproof membrane.
  - .1 Install dampproof membrane under concrete slabs-on-grade inside building.
  - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
  - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

### 3.3 SURFACE TOLERANCE

- .1 Concrete tolerance in accordance with CSA-A23.1/A23.2, F-number method:
  - .1  $F_F = 25$
  - .2  $F_L = 20$ .
- .2 Exposed interior concrete slabs with a steel trowelled finish to have a tight, consistent appearance without surface burnishing.

### 3.4 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner's Representative in accordance with CSA-A23.1/A23.2, and Section 01 45 00 - Quality Control.
- .2 Confirm requirements with Owner's Representative. Typical requirements may include compressive strength testing of concrete with a minimum of four (4) cylinders and three (3) field cured cylinders taken for:
  - .1 Each day's pour.
  - .2 Each type of grade of concrete.
  - .3 Each change of supplier.
  - .4 Each 50 cubic meters or fraction thereof for footings and foundation walls, requirements of CAN/CSA A 23.1.
  - .5 Conduct at least one (1) slump and one (1) air entrainment test with each compressive strength test.
- .3 Pay for costs of tests as specified from Cash Allowance. Costs of retesting due to deficient work will be the responsibility of the contractor.
- .4 Take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.

- .6 Provide Certificate of Field Quality Inspection and Testing to Owner's Representative for inclusion in Commissioning Manual.
- .7 Inspection or testing by Owner's Representative will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

**3.5 DEFECTIVE WORK**

- .1 Repairs and classification of unacceptable concrete to be in accordance with CAN/CSA-A23.1.
- .2 Remove defective concrete and embedded debris and repair as directed by Owner's Representative.
- .3 Remove to bare concrete curing compounds detrimental to application of specified finishes.
- .4 Concrete to be supplied at the minimum strength requirement at 28 days. Tests indicating strengths lower than specified will necessitate further testing as required by the Owner's Representative. Cost for such testing to be at the Contractor's expense. Should further tests confirm low values, the Owner's Representative has the right to require strengthening of the affected area or removal and replacing of the weak concrete all to the Contractor's expense.
- .5 Repair all shrinkage cracks in the completed slab-on-grade to remain exposed employing a suitable epoxy injection technique acceptable to Owner's Representative to completely seal all such cracks, all to the Contractor's expense.

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 04 05 00 – Common Work Results for Masonry**

**Page 1 of 7**

---

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
- .2      Section 01 33 00 - Submittal Procedures.
- .3      Section 01 45 00 - Quality Control.
- .4      Section 01 61 00 - Common Product Requirements.
- .5      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .6      Section 04 05 12 - Masonry Mortar and Grout.
- .7      Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .8      Section 04 05 23 - Masonry Accessories.
- .9      Section 04 21 13 - Brick Masonry.
- .10     Section 04 22 00 - Concrete Unit Masonry.
- .11     Section 05 50 00 - Metal Fabrications.
- .12     Section 07 21 13 - Board Insulation.
- .13     Section 07 27 00 – Air Barriers.
- .14     Section 07 92 00 - Joint Sealants.

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA International).
  - .1      CSA-A165 Series, Standards on Concrete Masonry Units.
  - .2      CSA A179, Mortar and Grout for Unit Masonry.
  - .3      CSA-A371, Masonry Construction for Buildings.
- .2      International Masonry Industry All-Weather Council (IMIAC).
  - .1      Recommended Practices and Guide Specification for Hot and Cold Weather Masonry Construction.

**1.3 SUBMITTALS**

- .1 Product Data.
  - .1 Submit manufacturer's printed product literature, specifications and data, including product characteristics, performance criteria, limitations and colors.
  - .2 Submit Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS).
- .2 Shop drawings.
  - .1 Provide drawings stamped and signed by professional engineer licensed in Province of Newfoundland and Labrador, Canada.
  - .2 Shop drawings to include full wall elevations detailing vertical reinforcing, lap-splice locations, bond beams, openings and control joints, and any and all information pertinent to the design and layout of the masonry walls.
  - .3 Provide confirmation to Owner's Representative that any temporary bracing and support has been designed by professional engineer.
- .3 Manufacturer's Instructions: Submit manufacturer's installation instructions.

**1.4 QUALITY ASSURANCE**

- .1 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.
- .2 Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Qualifications:
  - .1 Manufacturer: minimum five (5) years experience in manufacturing components similar to or exceeding requirements of project.
  - .2 Masons: company or person specializing in masonry installations with minimum five (5) years documented experience with masonry work similar to this project.
    - .1 Masons employed on this project must demonstrate ability to reproduce mock-up standards.

**1.5 JOB MOCK-UPS.**

- .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up after acceptance of system, reinforcing and accessories via the submittals process.
- .3 Construct mock-up panel of an exterior masonry back-up wall with brick veneer at least 2400 mm wide x 1800 mm tall showing use of reinforcement, ties, air barrier, insulation, through-wall flashing, mortar droppings collection system, weep holes, jointing, coursing, mortar, masonry colours and textures, and general workmanship.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 04 05 00 – Common Work Results for Masonry

Page 3 of 7

---

- .4 Construct at least one mock-up panel of an interior masonry wall at least 2400 mm wide x 1800 mm tall showing use of reinforcement, jointing, coursing, mortar and workmanship. Mock-up to include an inside and an outside corner (may require more than one mock-up).
- .5 Mock-ups will be used to judge workmanship, substrate preparation, operation of equipment and material application.
- .6 Provide written notice of mock-up completion. Mock-up will be reviewed by Owner's Representative at the next scheduled project meeting or bi-monthly site review, whichever is sooner. Commence work only upon receipt of approval of mock-up by Owner's Representative.
- .7 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to job site in dry condition. Keep materials dry until use.
- .3 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

**1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and dispose of waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

**1.8 SITE CONDITIONS**

- .1 Cold weather requirements.
  - .1 In accordance with CSA-A371 and as outlined below.
    - .1 Maintain temperature of mortar between 5°C and 50°C until batch is used or becomes stable.
    - .2 Maintain ambient temperature of masonry work and its constituent materials between 5°C and 50°C and protect site from exposure to wind.
- .2 Hot weather requirements.
  - .1 In accordance with CSA-A371 and as outlined below.
    - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
    - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven

rain, until masonry work is completed and protected by flashings or other permanent construction.

- .3 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .4 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

## **PART 2      PRODUCTS**

### **2.1      MATERIALS**

- .1 Masonry materials are specified in related Sections indicated in 1.1.

## **PART 3      EXECUTION**

### **3.1      MANUFACTURER'S INSTRUCTIONS**

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

### **3.2      PREPARATION**

- .1 Provide temporary bracing and support of masonry work during and after erection until permanent lateral support is in place.
- .2 Bracing to be approved by Owner's Representative.
- .3 Protect adjacent materials from damage and disfiguration.

### **3.3      INSTALLATION**

- .1 Do masonry work in accordance with CSA-A371, except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment. Tolerances as per Annex C of CSA-A371, latest revision.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

### **3.4      CONSTRUCTION**

- .1 Exposed masonry:
  - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CSA A-165, Clause 82.1, in exposed masonry and replace with undamaged units.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 04 05 00 – Common Work Results for Masonry**

**Page 5 of 7**

---

- .2 Jointing:
  - .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where masonry is exposed to view.
  - .2 Strike flush joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .3 Cutting:
  - .1 Cut out for all recessed electrical, door hardware and mechanical controls device boxes and all other recessed or built-in objects.
  - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In:
  - .1 Build in items required to be built into masonry, including mechanical and electrical rough-in devices and all other materials.
  - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Wetting of bricks:
  - .1 Except in cold weather, wet bricks having an initial rate of absorption exceeding 1 g/minute/1000 mm<sup>2</sup>: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
  - .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.
- .6 Support of loads:
  - .1 Use 30 MPa concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
  - .2 Use grout to CSA A179, where grout is used in lieu of solid units.
  - .3 Install building paper below voids to be filled with grout; keep paper 25 mm back from faces of units.
- .7 Provision for movement:
  - .1 Leave 3 mm space below shelf angles.
  - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
  - .3 Build masonry to tie in with stabilizers with provision for vertical movement.
  - .4 Refer to drawings for other criteria at movement joints.
- .8 Loose steel lintels: Where indicated, install loose steel lintels. Centre over opening width.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 04 05 00 – Common Work Results for Masonry

Page 6 of 7

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- .9 Control joints: Construct continuous control joints where indicated or detailed.
- .10 Expansion joints: Build-in continuous expansion joints where indicated or detailed.

**3.5 SITE TOLERANCES**

- .1 Tolerances as per Annex C of CSA-A371, latest revision.

**3.6 FIELD QUALITY CONTROL**

- .1 Inspection and testing will be carried out by Testing Laboratory designated by Owner's Representative.
- .2 Cost of testing will be paid from cash allowance specified in Section 01 21 00 - Allowances. Re-testing as a result of deficient work will be paid for by Contractor.
- .3 Provide Certificate of Field Quality Inspection and testing to Owner's Representative for inclusion in Commissioning Manual.

**3.7 CLEANING**

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**3.8 PROTECTION**

- .1 Temporary Bracing and Supports:
  - .1 Provide temporary bracing and supports of masonry work during and after erection until permanent lateral support is in place.
  - .2 Provide confirmation to Owner's Representative that temporary bracing and support has been designed by professional engineer.
  - .3 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.
- .2 Moisture Protection:
  - .1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.
  - .2 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.
  - .3 Air Temperature Protection: protect completed masonry as per Part 1 article Site Conditions.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 04 05 00 – Common Work Results for Masonry**

**Page 7 of 7**

---

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 04 05 12 – Masonry Mortar and Grout

Page 1 of 5

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 04 05 00 - Common Work Results for Masonry.
- .4      Section 04 05 19 – Masonry Anchorage and Reinforcing.
- .7      Section 04 05 23 – Masonry Accessories.
- .8      Section 04 21 12 – Brick Masonry.
- .8      Section 04 22 00 – Concrete Unit Masonry.

**1.2            REFERENCES**

- .1      ASTM International:
  - .1      ASTM C270-12a Standard Specification for Mortar for Unit Masonry
- .2      Canadian Standards Association (CSA)
  - .1      CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CSA A179, Mortar and Grout for Unit Masonry.
  - .3      CAN/CSA A371, Masonry Construction for Buildings.
  - .4      CAN/CSA-A3000, Cementitious Materials Compendium; CAN/CSA-A3002, Masonry and Mortar Cement.

**1.3            SUBMITTALS**

- .1      Product Data:
  - .1      Submit manufacturer's printed product literature, specifications and data sheet including product characteristics, performance criteria, and limitations.
  - .2      Submit copy of WHMIS Material Safety Data Sheets.
- .2      Samples:
  - .1      Submit two samples of mortar showing actual product colour when set.
- .3      Manufacturer's Instructions:
  - .1      Submit manufacturer's installation instructions.

**1.4 QUALITY ASSURANCE**

- .1 Submit test reports showing compliance with specified performance characteristics and physical properties.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handles masonry mortar and grout materials in accordance with Section 01 61 00 - Common Product Requirements, supplemented as follows:
  - .1 Deliver prepackaged, dry-blended mortar mix to project site in labelled plastic-lined bags each bearing name and address of manufacturer, production codes or batch numbers, and color or formula numbers.
  - .2 Maintain mortar, grout and packaged materials clean, dry, and protected against dampness, freezing, traffic and contamination by foreign materials.

**1.6 SITE CONDITIONS**

- .1 Ambient Conditions: maintain materials and surrounding air temperature to:
  - .1 Minimum 5 degrees C prior to, during, and 5 days after completion of masonry work.
  - .2 Maximum 32 degrees C prior to, during, and 5 days after completion of masonry work.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Cement:
  - .1 Portland Cement: to CAN/CSA-A3000.
  - .2 Masonry Cement: to CAN/CSA-A3002 and CAN/CSA A179.
  - .3 Mortar Cement: to CAN/CSA-A3002 and CAN/CSA A179.
  - .4 Packaged Dry Combined Materials for mortar: to CAN/CSA A179, using gray color cement.
- .3 Aggregate: supplied by one supplier.
  - .1 Fine Aggregate: to CAN/CSA A179, natural sand.
  - .2 Course Aggregate: to CAN/CSA A179.
- .4 Water: clean and potable.

**2.2 COLOR ADDITIVES**

- .1 Use coloring admixture not exceeding 10% of cement content by mass, or integrally colored masonry cement, to produce colored mortar to match approved sample.

Admixtures to be approved prior to use. Use in accordance with the specific manufacturer's recommendations.

- .1 Mortar color: as selected from manufacturer's standard color range.
- .2 White mortar: use white masonry cement to produce mortar type specified.

**2.3 MORTAR MIXES**

- .1 All mixes as per CSA A179 Mortar and Grout for Unit Masonry, latest edition.
  - .1 Colour for exterior mortar to be selected from manufacturer's standard range.
- .2 Mortar for exterior masonry: Type S.
- .3 Mortar for interior masonry: Type S.
- .4 Parging mortar: Type N.
- .5 Pointing mortar: Type N.

**2.4 MORTAR MIXING**

- .1 Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration. Colour to be selected from manufacturer's standard range of colours to compliment brick.
- .2 Use a batch type mixer in accordance with CAN/CSA A179.
- .3 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour no more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.
- .4 Re-temper mortar only within two hours of mixing, when water is lost by evaporation.
- .5 Use mortar within 2 hours after mixing at temperatures of 32 degrees C, or 2-1/2 hours at temperatures at or near 5 degrees C.

**2.5 GROUT MIXES**

- .1 For bond beams, U-block lintels or reinforced cores:
  - .1 Minimum compressive strength of 15 MPa at 28 days or as otherwise indicated on drawings.
  - .2 Maximum aggregate size and grout slump: CAN/CSA A179.

**2.6 GROUT MIXING**

- .1 Mix grout ingredients in quantities needed for immediate use in accordance with CAN/CSA A179.

- .2 Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- .3 Do not use calcium chloride or chloride-based admixtures.

**PART 3      EXECUTION**

**3.1      MANUFACTURER'S INSTRUCTIONS**

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

**3.2      CONSTRUCTION**

- .1 Do masonry mortar and grout work in accordance with CSA A179, except where specified otherwise.
- .2 Apply parging in uniform coating of thickness indicated.

**3.3      MIXING**

- .1 All pointing mortar can be mixed using a regular paddle mixer. Electric mixers are preferred. Mixers run on hydrocarbons are not permitted to be used in enclosed areas, due to fumes. Mixing by hand must be pre-approved by the Owner's Representative.
- .2 Clean all mixing boards and mechanical mixing machine between batches.
- .3 Mortar must be weaker than the units it is binding.
- .4 Contractor to appoint one individual to mix mortar, for duration of project. In the event that this individual must be changed, mortar mixing must cease until the new individual is trained, and mortar mix is tested.

**3.4      MORTAR PLACEMENT**

- .1 Install mortar to manufacturer's instructions.
- .2 Install mortar to requirements of CAN/CSA A179.
- .3 Remove excess mortar from grout spaces.

**3.5      GROUT PLACEMENT**

- .1 Install grout in accordance with manufacturer's instructions.
- .2 Install grout in accordance with CAN/CSA A179.
- .3 Work grout into masonry cores and cavities to eliminate voids.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 04 05 12 – Masonry Mortar and Grout

Page 5 of 5

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- .4 Vibrate grout during placement to ensure consolidation. Rodding method is acceptable.
- .5 The maximum lift for fresh grout is 1,500 mm. End pour halfway up a concrete block, not at the joint.
- .6 Do not displace reinforcement while placing grout.

**3.6 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Clean masonry with low pressure clean water and soft natural bristle brush.

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 04 05 19 – Masonry Anchorage and Reinforcing

Page 1 of 8

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .4      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .5      Section 04 05 00 - Common Work Results for Masonry.
- .6      Section 04 05 12 – Masonry Mortar and Grout.
- .7      Section 04 05 23 – Masonry Accessories.
- .8      Section 04 21 12 – Brick Masonry.
- .8      Section 04 22 00 – Concrete Unit Masonry.

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA International).
  - .1      CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CSA-A370, Connectors for Masonry.
  - .3      CSA-A371, Masonry Construction for Buildings.
  - .4      CAN/CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.
  - .5      CSA-S304.1, Masonry Design for Buildings.
  - .6      CSA A179, Mortar and Grout For Unit Masonry.
  - .7      CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
  - .8      Other CSA standards as referenced in A371, A370 and within this specification section.

**1.3            SUBMITTALS**

- .1      Product Data:
  - .1      Submit manufacturer's printed product literature, specifications and data sheets for all products used in this project.
  - .2      Submit WHMIS MSDS - Material Safety Data Sheets.
- .2      Shop Drawings:
  - .1      Provide shop drawings illustrating bar bending details, anchorage details, lists and placing drawings.
  - .2      On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .3      Manufacturer's Instructions: Submit manufacturer's installation instructions.

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 04 05 19 – Masonry Anchorage and Reinforcing

Page 2 of 8

**1.4 SOURCE QUALITY CONTROL**

- .1 Upon request, provide Owner's Representative with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.
- .2 Upon request inform Owner's Representative of proposed source of material to be supplied.

**PART 2 PRODUCTS**

**2.1 BAR REINFORCEMENT**

- .1 Bar reinforcement: to CSA-A371 and CSA G30.18, Grade 400.
  - .1 Support and position reinforcing bars in accordance with CSA A371.
  - .2 All bars to be dowelled into foundation, thickened slab or slab-on-deck. Refer to drawings for requirements.
  - .3 All bars to be installed in fully grouted cores.
- .2 Sizes and Locations:
  - .1 Exterior walls:
    - .1 190 mm walls up to 4100 mm in height: 15M bars at 800 mm OC
    - .2 190 mm walls over 4100 mm in height: 20M bars at 800 mm OC
    - .3 Refer to drawings for special requirements in addition to the minimum requirements noted in this specification.
  - .2 Interior walls:
    - .1 190 mm walls: 15M bars at 1,200 mm OC
    - .2 140 mm walls: 10M bars at 1,200 mm OC
- .3 Wall terminations, corners and openings:
  - .1 Install vertical bars in grouted cores at all wall terminations (wing-walls/free ends), all outside corners, around all sides of openings and in U-block lintels.
  - .2 Install 2 horizontal bars with 10 M hooked ties at 200 mm OC in U blocks at the head of openings or where otherwise indicated. Fill with grout.
    - .1 Minimum depth of U block lintels:
      - .1 For 190 mm walls, all openings: 400 mm (two courses).
      - .2 For 140 mm walls with openings 1,000 mm or less: 200 mm (single course).
      - .3 For 140 mm with openings greater than 1,000 mm: 400 mm (two courses).
    - .2 Horizontal bars to extend 600 mm past opening on either side.
  - .3 Bar sizes to be the same as specified above for the wall type and/or location, except:

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 04 05 19 – Masonry Anchorage and Reinforcing

Page 3 of 8

- .1 Horizontal bar size for all U-block lintels to be a minimum of 15M.
- .2 Where larger bar sizes are indicated on drawing details, install the larger size.
- .4 Additional bar reinforcement: install any additional reinforcing in locations as indicated on drawings.

**2.2 WIRE AND SHEET METAL REINFORCEMENT AND ANCHORAGE**

- .1 Materials:
  - .1 All components of wire reinforcement products and installation to comply with CSA-A371 and CSA-A370.
    - .1 Cold-drawn steel wire as per CSA G30.3.
    - .2 Welded steel wire fabric as per CSA G30.5.
    - .3 Deformed steel wire as per CSA G30.14.
    - .4 Welded deformed steel wire fabric as per CSA G30.15.
  - .2 Sheet metal for masonry to concrete anchors: carbon steel as per ASTM A882.
  - .3 Corrosion protection for all wire and sheet metal reinforcement:
    - .1 As indicated with specified product, generally:
      - .1 Galvanized as per ASTM A153, Class B2, 458 g/m<sup>2</sup>, or,
      - .2 ASTM A 580 – AISI Type 304 stainless steel.
- .2 Horizontal reinforcing for all exterior and interior concrete block walls:
  - .1 Ladder-type:
    - .1 Exterior walls without masonry veneer and interior walls: two 4.76 mm parallel side rods with 3.66 mm cross rods welded at 400 mm OC.
      - .1 Double wythe walls: same as above, except four parallel side rods.
      - .2 Standard of acceptance:
        - .1 Typical Blok-Lok BL10 hot-dip galvanized.
        - .2 Double wythe: Blok-Lok BL12 hot-dip galvanized.
  - .2 Truss-type:
    - .1 Exterior masonry cavity walls: truss-type with 4.76 mm parallel side rods with 3.66 mm diagonal and cross rods welded at 400 mm OC with box ties at each intersection extending into cavity. Type 304 stainless steel as per ASTM A 580.
      - .1 Standard of acceptance: Blok-Lok BL-37.
- .3 Include all pre-manufactured Tees and corners to ensure horizontal reinforcing is continuous through wall intersections and changes in direction.
- .4 Installation:
  - .1 Place ladder-type horizontal reinforcing at the following maximum vertical spacing:

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 04 05 19 – Masonry Anchorage and Reinforcing

Page 4 of 8

- .1 Exterior and interior 190 mm or larger concrete block: 400 mm (every second course).
      - .2 Interior 140 mm concrete block or smaller: 600 mm (every third course)
    - .2 Lap longitudinal joints a minimum of 300 mm. Stagger joints a minimum of 750 mm between adjacent courses.
- .3 Masonry veneer ties:
  - .1 At new masonry back-up walls:
    - .1 Stainless steel slotted tie designed for use with horizontal truss-type reinforcement as specified above. Made from 4.76 mm OD diameter wire, flattened where embedded in brick veneer mortar.
      - .1 Include manufacturer's recommended plastic cavity wall insulation retainer.
      - .2 Standard of acceptance: 2X-HOOK by Blok-Lok.
    - .2 At existing masonry back-up walls (repairs):
      - .1 Stainless steel wire tie and surface-mounted plate combination system with anchor plate vertically-oriented and sized to accommodate insulation thickness; triangular-shaped wire that cannot disengage from the plate once installed.
        - .1 Anchor plate: 25 mm x 50 mm x 1.5 mm thick (16 ga.) stainless steel as per ASTM 167. Length to suit insulation thickness.
        - .2 Wire tie: 4.76 mm OD veneer wire tie x length to suit air space and veneer masonry thickness. Stainless steel as per ASTM A580/580M.
        - .3 Standard of acceptance: Blok-Lok BL-407.
      - .2 Include plastic insulation-holding wedges manufactured for use with veneer tie system.
      - .3 Anchor to existing concrete block wall with stainless steel all-weather screw anchors with integral washer and EPDM rubber seal:
        - .1 Anchor diameter: 6.4 mm x 38 mm embedment.
        - .2 Standard of acceptance: Tapcon SCOTS Screw Anchor by ITW Red Head.
    - .3 Installation:
      - .1 Install masonry veneer ties at the following on-centres:
        - .1 400 mm horizontal.
        - .2 400 mm vertical.
- .4 Concrete sill anchors:
  - .1 L-shaped plate with vertical dowel to anchor precast concrete sills to building structure. Dimensions as required for application x 4.7 mm thick stainless steel plate.

- .2 Refer to drawings for details and dimensions. Space anchors at 800 mm OC, a minimum of two anchors per sill piece.
- .3 Standard of acceptance: BL-431 stone anchor by Blok-Lok. Anchors may be shop-made to suite.

### **2.3 VERTICAL LATERAL SUPPORT ANCHORS**

- .1 Masonry to steel columns or concrete piers/walls or adjacent masonry for all interior and exterior concrete block walls.
- .2 Masonry to steel: refer to typical details on structural drawings.
- .3 Masonry to concrete: Galvanized flat-bar screw-on anchor for adjustable ties.
  - .1 Dimensions:
    - .1 Anchor: 3.42 mm thick x 19 mm wide x 180 mm long.
    - .2 Tie: 4.76 mm diameter x length as necessary to reach two-thirds of the way into the wall. Use trapezoid-shaped ties when block intersects concrete on end / perpendicular.
  - .2 Standard of acceptance: Blok-Lok Flex-O-Lok Type C with BLT-9/9A ties.
- .4 Masonry to masonry: corrugated wall tie.
  - .1 Use for connecting block furring around columns to the main/adjacent block wall or for connecting perpendicular block walls at joins.
  - .2 Dimensions:
    - .1 22 mm wide x 178 mm long x 1.2 mm thick (18 ga.)
  - .3 Standard of acceptance: Hohmann & Barnard CWT, standard size.
- .5 Installation, all vertical lateral support anchors:
  - .1 Refer to typical details on structural drawings.
  - .2 Depending on type: Weld, clip, fasten or embed anchors to steel columns, concrete structure or adjacent masonry walls at the following maximum vertical centres and at the top of walls:
    - .1 190 mm concrete block or larger: 800 mm OC.
    - .2 140 mm concrete block or smaller: 600 mm OC.

### **2.4 HORIZONTAL LATERAL SUPPORT**

- .1 Full height walls terminating at the underside of beams or metal deck:
  - .1 Most conditions requiring horizontal lateral support at the top of masonry walls are detailed on the structural or architectural drawings. These support conditions include continuous angles, clip angles or dowels welded to beams and inserted into the concrete block walls.
  - .2 Where there is no specific detail for horizontal lateral supports at the top of walls not exposed to public view, provide the following:
    - .1 One L102x76x6.4 x 200 mm long angle at each side of the partition.

**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 04 05 19 – Masonry Anchorage and Reinforcing

Page 6 of 8

- .1 Weld to steel beams above, or
- .2 Fasten to deck with concrete topping above with four 6 mm OD expansion anchors or approved anchoring system for metal deck with or without concrete topping, depending on location.
- .2 Locate angles at the following horizontal centres:
  - .1 190 mm concrete block or larger: 2,000 mm OC.
  - .2 140 mm concrete block: 1,400 mm OC.
- .2 Partial height walls terminating below the underside of the deck:
  - .1 Provide angle clips with diagonal bracing fastened to metal deck above as illustrated on drawings.
  - .2 Install clips and diagonal bracing where specifically indicated on drawings.
  - .3 Where not specifically indicated, locate bracing at the following horizontal centres:
    - .1 190 mm concrete block or larger: 3,500 mm OC.
    - .2 140 mm concrete block: 2,750 mm OC.
    - .3 90 mm concrete block: 1,900 mm OC.

**2.5 ANGLE LINTELS**

- .1 Loose-laid lintels: L 102x102x9.5 galvanized in lengths as required for openings. Provide 150 mm minimum bearing at ends.
- .2 Angle lintels or shelf angles anchored to steel structure: galvanized, refer to structural drawings for sizes.
- .3 Finish exposed sections of angles to Section 09 91 13 – Exterior Painting.
  - .1 Paint to match flashing colour.

**PART 3 EXECUTION**

**3.1 GENERAL**

- .1 Supply and install masonry connectors and reinforcement in accordance with the latest editions of CSA-A370, CSA-A371, CSA-A23.1/A23.2, and CSA-S304.1, unless indicated otherwise.
  - .1 Supply and install additional reinforcement to masonry as indicated in specifications or on drawings.
- .2 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets.
- .3 Prior to installing masonry walls obtain Owner's Representative's approval of locations of reinforcement and connectors.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 04 05 19 – Masonry Anchorage and Reinforcing

Page 7 of 8

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- .4 Advise Owner's Representative if field conditions require variation from these specifications regarding the location of anchors or reinforcing.

**3.2 FABRICATION**

- .1 Fabricate reinforcing in accordance with CSA-A23.1/A23.2.
- .2 Fabricate connectors in accordance with CSA-A370.
- .3 Obtain Owner's Representative's approval for locations of reinforcement splices other than shown on placing drawings.
- .4 Upon approval of Owner's Representative, weld reinforcement in accordance with CSA W186.

**3.3 REINFORCED LINTELS AND BOND BEAMS**

- .1 Reinforce masonry lintels and bond beams.
- .2 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371 and CSA-A179.

**3.4 GROUTING**

- .1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179, and as indicated.

**3.5 MOVEMENT JOINTS**

- .1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

**3.6 FIELD BENDING**

- .1 Do not field bend reinforcement and connectors except where indicated or authorized by Owner's Representative.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars and connectors which develop cracks or splits.

**3.7 FIELD TOUCH-UP**

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 04 05 19 – Masonry Anchorage and Reinforcing

Page 8 of 8

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**3.8 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 04 05 00- Common Work Results for Masonry.
- .4      Section 04 05 12 – Masonry Mortar and Grout.
- .5      Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .6      Section 04 21 13 – Brick Masonry.
- .7      Section 04 22 00 – Concrete Unit Masonry.
- .8      Section 07 92 00 – Joint Sealants.
- .9      Section 07 62 00 – Sheet Metal Flashing and Trim.

**1.2**            **REFERENCES**

- .1      American Society for Testing and Materials, (ASTM).
  - .1      ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness.
- .2      Canadian Standards Association (CSA)
  - .1      CSA-A371, Masonry Construction for Buildings.

**1.3**            **SUBMITTALS**

- .1      Product Data:
  - .1      Submit manufacturer's printed product literature, specifications and data including product characteristics, performance criteria, and limitations.
  - .2      Submit two copies of WHMIS MSDS - Material Safety Data.
- .2      Manufacturer's Instructions:
  - .1      Submit manufacturer's installation instructions.

**1.4**            **DELIVERY, STORAGE AND HANDLING**

- .1      Deliver, store and handle masonry accessories in accordance with, Section 01 61 00 - Common Product Requirements supplemented as follows:
  - .1      Keep fillers and adhesives dry, protected against dampness, and freezing.

- .2 Store packaged materials off ground and in accordance with manufacturer's written instructions.

## **PART 2**      **PRODUCTS**

### **2.1**      **MATERIALS**

- .1 Control joint filler: non-absorbent compressible back-up material installed behind sealant in control joints as indicated on drawings.
  - .1 Extruded round, closed-cell low-density polyethylene foam with a skin-like outer layer.
    - .1 Typical density: 1.5 lbs/cu.ft. as per ASTM D1622.
    - .2 Compression deflection: 4 psi @ 25% as per ASTM D1621.
    - .3 Water absorption: 0.02% by volume as per ASTM D1621.
    - .4 Standard of acceptance: Backer Rod – Standard by Hohmann & Barnard.
  - .2 Sealant: refer to Section 07 92 00 – Joint Sealants.
    - .1 Exterior masonry sealant to match colour of mortar.
- .2 Cell vents: polypropylene in conformance with ASTM D2240, D790B, D638 and D1238B.
  - .1 Honeycomb design allowing passage of moisture from cavity to the building exterior while restricting ingress of insects and other debris.
  - .2 Size: 9 mm wide x 64 mm high x 85 mm deep.
    - .1 Locate at 600 mm OC max., as indicated in Part 3 below.
  - .3 Colour: to be selected from manufacturer's standard range.
  - .4 Standard of acceptance:
    - .1 DA1006 by Dur-O-Wal.
    - .2 #QV Quattro Vent by Hohmann & Barnard Inc.
- .3 Cavity Wall Flashing:
  - .1 Membrane:
    - .1 Self adhering SBS rubberized asphalt compound integrally laminated to cross-laminated polyethylene film, minimum thickness 1.0 mm.
    - .2 Primer: use primer in all instances, product to be as per manufacturer's recommendation.
    - .3 Standard of acceptance:
      - .1 Blueskin TWF by Bakor
      - .2 Sopraseal membrane flashing by Soprema.
      - .3 Air-Shield TWF by W.R. Meadows.
  - .2 Sheet metal: refer to Section 07 62 00 – Sheet Metal Flashing and Trim.
- .4 Mortar Droppings Collection System:

- .1 High density, recycled polyester or high-density polypropylene geometric matrix designed to eliminate weep hole blockage from mortar droppings. 90% open mesh weave.
- .2 Standard of Acceptance:
  - .1 Mortar Net by Hohmann & Barnard, Inc.
  - .2 DA1008 Mortar Net by Dur-O-Wall.

### **PART 3**      **EXECUTION**

#### **3.1**      **MANUFACTURER'S INSTRUCTIONS**

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

#### **3.2**      **INSTALLATION**

- .1 Install continuous control joint fillers in control joints at locations indicated on drawings.
- .2 Reglets: install reglets at locations indicated on drawings.
- .3 Install cell vents in vertical joints immediately over flashings, in exterior wythes of masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.
- .4 Install mortar droppings collection system continuous at the base of the masonry wall cavity in accordance with manufacturer's instructions.

#### **3.3**      **CONSTRUCTION**

- .1 Build in flashings in masonry in accordance with CSA-A371 as follows:
  - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
  - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 300 mm, and as follows:
    - .1 For masonry backing embed flashing 25 mm in joint.
    - .2 For concrete backing, insert flashing into reglets.
    - .3 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.
  - .3 Lap joints 150 mm and seal with adhesive.
- .2 Form flashing (end dams) at lintels, sills and wall ends to prevent water from travelling horizontally past flashing ends.

**3.4 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 04 05 00 - Common Work Results for Masonry.
- .4      Section 04 05 12 – Masonry Mortar and Grout.
- .5      Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .6      Section 04 05 23 - Masonry Accessories.
- .7      Section 07 92 00 – Joint Sealants.

**1.2**            **REFERENCES**

- .1      American Society for Testing and Materials (ASTM).
  - .1      ASTM C216 - 10, Standard Specification for Facing Brick.
- .2      Brick Industry Association (BIA).
  - .1      Technical Note No. 20, Cleaning Brick Masonry.
- .3      Canadian Standards Association (CSA)
  - .1      CAN/CSA A82-14, Fired Masonry Brick Made From Clay or Shale.
  - .2      CAN3-A165 Series, CSA Standards on Concrete Masonry Units.
  - .3      CAN/CSA A371, Masonry Construction for Buildings.

**1.3**            **SUBMITTALS**

- .1      Product Data
  - .1      Submit manufacturer's printed product literature, specifications and data sheet.
  - .2      Submit data sheet for all cleaning products.
- .2      Samples
  - .1      Two of each type of masonry unit specified.

**1.4**            **QUALITY ASSURANCE**

- .1      Mock-up
  - .1      Construct mock-up in accordance with Section 01 45 00 – Quality Control.

- .2 Construct mock-up 10 m<sup>2</sup> minimum of brick unit masonry in area designated by Owner's Representative before proceeding with brick unit masonry work.
- .2 Test reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Pre-installation meeting: conduct pre-installation meeting to verify project requirements manufacturer's instructions and manufacturer's warranty requirements.

## **1.5 QUALIFICATIONS**

- .1 Manufacturer: company specializing in manufacturing products of this section with minimum 10 years experience.
- .2 Installer: company specializing in performing work of this section approved by manufacturer. Minimum 5 years experience.
- .3 Design structural installations under direct supervision of Professional Engineer experienced in structural design of brick masonry installation and registered in the Province of Newfoundland and Labrador.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURED UNITS**

- .1 Face brick.
  - .1 Fired clay brick: as per CSA A82-14 and/or ASTM C216-10.
    - .1 Type: FBS
      - .1 Size: Modular (57 mm high x 190 mm long x 90 mm deep).
      - .2 Void area 25% max. (cored as per CSA/solid as per ASTM).
    - .2 Grade: Exterior Grade (EG) / Severe Weather (SW).
      - .1 Minimum compressive strength: > 20 MPa / > 3000 psi.
      - .2 Maximum 5 hour boil water absorption:
        - .1 Average of 5 brick: 17%
        - .2 Individual brick: 20 %
      - .3 Maximum Saturation Coefficient:
        - .1 Average of 5 brick: 0.78
        - .2 Individual brick: 0.80
    - .3 Colour and texture: to match Tapestry Mingled Range, by Shaw Brick.
  - .2 Precast sills:
    - .1 Precast concrete sills to dimensions and design as indicated on drawings.

- .2 Minimum 15 MPa concrete.
- .3 Include 2-10M reinforcing bars per section.
- .4 Cast sills in longest practical length.
- .5 Concrete to be coloured to match brick. Exact colour to be selected by Owner's Representative from manufacturer's standard available pigments.

## **2.2 ACCESSORIES**

- .1 Brick Ties: to Section 04 05 19 – Masonry Anchorage and Reinforcing.
- .2 Reinforcement: to Section 04 05 19 – Masonry Anchorage and Reinforcing.
- .3 Connectors: to Section 04 05 19 – Masonry Anchorage and Reinforcing.
- .4 Flashing: to Section 04 05 23 - Masonry Accessories.
- .5 Mortar and Mortar Mixes: to Section 04 05 12 - Masonry Mortar and Grout.
- .6 Grout and grout mixes: to Section 04 05 12 - Masonry Mortar and Grout.

## **2.3 CLEANING COMPOUNDS**

- .1 Compatible with substrate and acceptable to masonry manufacturer for use on products.
- .2 Cleaning compounds compatible with brick masonry units and in accordance with manufacturer's written recommendations and instructions.

## **PART 3 EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 PREPARATION**

- .1 Protect adjacent finished materials from damage due to masonry work.

### **3.3 INSTALLATION**

- .1 Do masonry work in accordance with CSA-A371 and CSA-A179, and as defined and specified in Section 04 05 00 – Common Work Results for Masonry.
- .2 Bond pattern: running bond.
- .3 Do not mitre outside corners. Maintain running bond pattern and brick overlap. Cut brick on angle when corner is not 90 degrees.

**3.4 CLEANING**

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Clean unglazed clay masonry: clean 10 m<sup>2</sup> area of wall designated by Owner's Representative mock up panel specified in Section 04 05 00 - Common Work Results for Masonry as directed below and leave for one week. If no harmful effects appear and after mortar has set and cured, protect windows, sills, doors, trim and other work, and clean all brick masonry as follows.
  - .1 Remove large particles with wood paddles without damaging surface. Saturate masonry with clean water and flush off loose mortar and dirt.
  - .2 Scrub with solution of 25 ml trisodium phosphate and 25 ml household detergent dissolved in 1 L of clean water using stiff fibre brushes, then clean off immediately with clean water using hose. Alternatively, use proprietary compound recommended by brick masonry manufacturer in accordance with manufacturer's directions.
  - .3 Repeat cleaning process as often as necessary to remove mortar and other stains.
  - .4 Use acid solution treatment for difficult to clean masonry only after approval by Owner's Representative.
- .3 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 04 05 00 - Common Work Results for Masonry.
- .3      Section 04 05 12 – Masonry Mortar and Grout.
- .4      Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .7      Section 04 05 23 – Masonry Accessories.

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA)
  - .1      CAN/CSA A165 SERIES, CSA Standards on Concrete Masonry Units, covers: A165.1, A165.2, A165.3.
  - .2      CAN/CSA A371, Masonry Construction for Buildings.
  - .3      CSA S304.1, Design of Masonry Structures.
- .2      Underwriters' Laboratories of Canada (ULC).
  - .1      CAN/ULC-S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

**1.3            SUBMITTALS**

- .1      Product Data: submit manufacturer's printed product literature, specifications and data sheet illustrating products to be incorporated into project for specified products.
- .2      Test reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3      Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.4            QUALITY ASSURANCE**

- .1      Mock-up
  - .1      Construct mock-up in accordance with Section 01 45 00 – Quality Control.
  - .2      Construct mock-up of 10 m<sup>2</sup> minimum of concrete unit masonry in area designated by Owner's Representative before proceeding with additional masonry work.
  - .3      Allow 24 hours for inspection of mock-up by Owner's Representative before proceeding with Concrete Unit Masonry Work.

- .2 Pre-installation meeting: conduct pre-installation meeting to verify project requirements manufacturer's instructions and manufacturer's warranty requirements.

**1.5 QUALIFICATIONS**

- .1 Manufacturer: company specializing in manufacturing products of this section with minimum 10 years experience.
- .2 Installer: company specializing in performing work of this section approved by manufacturer. Minimum 5 years experience.
- .3 Design structural installations under direct supervision of Professional Engineer experienced in structural design of concrete masonry installation and registered in the Province of Newfoundland and Labrador.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Standard concrete block units: to CAN3-A165 Series - 14.
  - .1 Classification: H/15/A/M
  - .2 Sizes as indicated on drawings:
    - .1 Manufactured widths: 90 mm, 140 mm, 190 mm.
    - .2 Manufactured length: 390 mm.
    - .3 Modular height x length: 200 mm x 400 mm.
  - .3 Special shapes:
    - .1 Provide bullnose units for exposed edges and corners, including at lintels.
    - .2 Provide purpose-made shapes (U-Block) for lintels and bond beams. U-block or knock-out bond beam that is exposed to view must be full 400 mm blocks.
    - .3 Provide additional special shapes as indicated on drawings or as required by special construction conditions.

**2.2 ACCESSORIES**

- .1 Reinforcement: to Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .2 Connectors: to Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .3 Flashing: to Section 04 05 23 - Masonry Accessories.
- .4 Mortar and grout mixes: to Section 04 05 12 - Masonry Mortar and Grout.

**2.3 CLEANING COMPOUNDS**

- .1 Compatible with substrate and acceptable to masonry manufacturer for use on products.
- .2 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

**2.4 TOLERANCES**

- .1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA A165.1, supplemented as follows:
  - .1 Maximum variation between concrete block units within specific job lot not to exceed 2.0 mm.
  - .2 No parallel edge length, width or height dimension for individual concrete block unit to differ by more than 2.0 mm.
  - .3 Out of square tolerance of concrete block units not to exceed 2.0 mm.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Concrete block units.
  - .1 Bond pattern: running bond.
  - .2 Coursing height: 200 mm for one block and one joint
  - .3 Jointing:
    - .1 Concave where exposed to view and where paint or other finish coating is specified.
    - .2 Flush for concealed joints.
- .2 Special Shapes:
  - .1 Install special units to form corners, returns, offsets, reveals and indents without cut ends being exposed and without losing bond or module.
  - .2 Install bullnose units at all vertical or horizontal exposed outside corners, wall free-ends (wing-walls) and openings.
  - .3 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
  - .4 End bearing: not less than 200 mm.

**3.2 CONSTRUCTION**

- .1 Cull out masonry units, in accordance with CAN/CSA A165 and approved range of color samples, with chips, cracks, broken corners, excessive color and texture variation.
- .2 Build in miscellaneous items including, but not limited to, bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.

- .3 Fit masonry closely against electrical or controls device boxes; and plumbing fixtures, penetrations; or other mechanical devices or equipment so that collars, plates and covers will overlap and conceal cuts.
- .4 Install movement joints and keep free of mortar where indicated.
- .5 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.
- .6 Solid Units: apply mortar over entire vertical and horizontal surfaces.
- .7 Ensure compacted head joints. Use full or face-shell joint as indicated.
- .8 Tamp units firmly into place.
- .9 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.
- .10 Tool exposed joints concave; strike concealed joints flush.
- .11 After mortar has achieved initial set up, tool joints.
- .12 Do not interrupt bond below or above openings.

**3.3 CLEANING**

- .1 Standard block: Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.
- .2 Upon completion of installation remove surplus materials, rubbish, tools and equipment barriers.

**3.4 PROTECTION**

- .1 Brace and protect concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.

**END OF SECTION**

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 05 12 23 – Structural Steel for Buildings

Page 1 of 6

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3      Section 05 21 00 - Steel Joist Framing.
- .4      Section 05 31 00 - Steel Decking.
- .5      Section 05 50 00 - Metal Fabrications.
- .6      Section 09 91 23 - Interior Painting.

**1.2            REFERENCES**

- .1      All codes and standards reference in this section refers to the latest edition thereof.
- .2      Canadian Standards Association (CSA)
  - .1      CAN/CSA G40.20-13(R2018)/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2      CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3      CAN/CSA-S16-14, Limit States Design of Steel Structures.
  - .4      CAN/CSA-S136-16, North American Specification for the Design Cold Formed Steel Members.
  - .5      S136.1-16, Commentary on North American Specification for the Design of Cold Formed Steel Structural Members.
  - .6      CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
  - .7      CSA W48, Filler Metals and Allied Materials for Metal Arc Welding of Structural Steel.
  - .8      CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .9      CSA W59-18, Welded Steel Construction (Metal Arc Welding) Metric.
- .3      American Society for Testing and Materials International (ASTM)
  - .1      ASTM A36/A36M, Specification for Structural Steel.
  - .2      ASTM A992/A992-20, Standard Specification for Structural Steel Shapes
  - .3      ASTM F3125/F3125M-19e2, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated.
  - .4      ASTM F436-19, Specification for Hardened Steel Washers.
  - .5      ASTM A307-21, Specification for Carbon Steel Bolts, Studs and Threaded rod, 60,000PSI Tensile Strength.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 05 12 23 – Structural Steel for Buildings

Page 2 of 6

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- .6 ASTM C1107/C1107M-20 Specification for Hydraulic Cement Grout (Non-Shrinkable) Packaged/Dry.
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).
  - .1 CISC/CPMA 2-75: Quick-Drying Primer for use on Structural Steel.
  - .2 CISC/CPMA 1-73a: Quick-Drying One-coat Paint for use on Structural Steel.
- .5 The Society for Protective Coatings (SSPC) and the National Association of Corrosion Engineers International (NACE).
  - .1 SSPC SP-7/NACE No. 4, Brush-Off Blast Cleaning.
  - .2 SSPC SP-6/NACE No. 3 Commercial Blast Cleaning.
  - .3 SSPC SP-10/NACE No. 2, Near-White Blast Cleaning.

### **1.3 SHOP DRAWINGS**

- .1 Submit shop drawings including fabrication and erection documents and materials list.
- .2 On erection drawings: indicate details and information necessary for assembly and erection purposes such as, description of methods, sequence of erection, type of equipment used in erection and temporary bracings.
  - .1 Show detail of all non-standard connections such as bracing connections, truss connections, moment connections and hanger assemblies and other non-standard connections as requested by the Owner's Representative.
- .3 Erection drawings to be stamped by a qualified professional Engineer licensed to practice in the Province of Newfoundland and Labrador. The erection drawings are to contain a clause stating that the professional Engineer who stamped the erection drawings is responsible for all fabricator designed assemblies, components and connections required for this project.
- .4 Drawings for all fabricator designed assemblies, components and connections are to be stamped and signed by the professional Engineer who stamped the erection drawings.

### **1.4 SAMPLES**

- .1 Prepare sample of typical exposed structural connections in accordance with approval of Owner's Representative. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance and material acceptable for entire project.

### **1.5 DESIGN REQUIREMENTS**

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16-14 and CAN/CSA-S136-16 with S136.1-16 to resist forces, moments, shears and allow for movements indicated.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 05 12 23 – Structural Steel for Buildings

Page 3 of 6

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- .2 Unless noted otherwise on the drawings or in the specification, connection design is the responsibility of the structural steel fabricator. Fully detailed connections shown on the contract drawings including bolt and welded sizes are deemed to have been designed by the Engineer.
- .3 Coordinate the design and fabrication of structural steel and miscellaneous steel connection details. Ensure tabs, plates, angles, pins, and any other components or aspects of the connection details are compatible with the architectural design and that they are concealed within wall or ceiling assemblies, do not conflict with other building elements, or protrude into the usable space of rooms or other occupied areas.
- .4 If connection for shear only (standard connection is required):
  - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction".
  - .2 If shears are not indicated, select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by a fully laterally supported beam section in bending, provided no point loads act on beam.
- .5 For non-standard connections, submit sketches and design calculations stamped and signed by qualified professional Engineer licensed in the Province of Newfoundland and Labrador. Connections to be submitted for review prior to erection drawing submittal.
- .6 If not shown on the drawings, vertical bracing and horizontal plan bracing connections shall be designed for minimum of 70% capacity of gross section in tension or 100% of the compression capacity of the member based on its unsupported length whichever governs the member selection.
- .7 For beams with intersection bracing members design connections for beam reactions plus reaction from bracing member.
- .8 Design splices for the full strength of the member in torsion, bending, shear, and axial load unless noted otherwise.
- .9 Provide pair of bearing stiffeners on beam and girders at point of concentrated loads, such as at columns, monorail beams, and equipment supports.

## **1.6 SOURCE QUALITY CONTROL**

- .1 If requested submit on certified copy of mill reports covering chemical and physical properties of steel used in this work.

## **1.7 QUALITY ASSURANCE**

- .1 At least 2 weeks prior to fabrication of structural steel submit to Owner's Representative a letter from the fabricators Welding engineer stating the Welding engineer is responsible for welding procedures and practices for this project as outlined in CSA S47.1

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 05 12 23 – Structural Steel for Buildings

Page 4 of 6

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- .2 Provide certificate of Quality Compliance from steel fabricator upon completion of structural steel fabrication stating that the work has been designed and fabricated in accordance with the requirements of the contract documents.
- .3 If requested, submit to the Owner's Representative one copy of all approved welding procedures for this project.

**PART 2      PRODUCTS**

**2.1            MATERIALS**

- .1 Structural steel: to CAN/CSA-G40.20-13(R2018)/G40.21-13(R2018) Grade 350W unless noted.
- .2 Cold formed structural members: to CAN/CSA S-136-16.
- .3 Anchor rods: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .4 Bolts, nuts and washers: to ASTM F3125/F3125M-19e2 and F436-19.
- .5 Welding materials: to CSA W59-18 and certified by Canadian Welding Bureau.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.

**2.2            FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA-S16-14 and in accordance with approved reviewed shop drawings.
- .2 Install shear studs in accordance with CSA W59-18.
- .3 Seal members by continuous welds where indicated.

**2.3            SURFACE PREPARATION AND SHOP PAINTING**

- .1 Clean and prepare structural steel in accordance with SSPC and NACE surface preparation standards.
- .2 Apply paint under cover; on dry surfaces when both surface and air temperatures are above 5° C. Maintain protection and minimum temperature until paint is thoroughly dry.
- .3 Apply one coat of primer or paint (as specified below) in shop to steel surfaces except:
  - .1 Surfaces intended to receive spray-applied fireproofing.
  - .2 Surfaces to be encased in concrete.
  - .3 Surfaces to receive field installed stud shear connections.
  - .4 Surfaces and edges to be field welded.

- .4 Surface preparation and prime painting schedule:
  - .1 Columns, floor and roof beams, purlins, braces, reinforcing plates, rods or angles, and associated steel members located in or exposed to the Aquatics area. Refer to architectural ceiling plans for areas of exposed structural steel.
    - .1 SSPC SP-10/NACE No. 2 Near-White Blast Cleaning.
    - .2 One-component, multi-purpose alkyd primer compatible with specified polyurethane coating.
      - .1 Standard of acceptance: Devguard 4160 by PPG.
      - .2 Light grey or off-white tint, different colour from other primers used in project for identification purposes.
  - .2 All other steel members:
    - .1 SSPC SP-6/NACE No. 3 Commercial Blast Cleaning.
    - .2 CISC/CPMA 2-75: Quick-Drying Primer for use on Structural Steel (suitable for finish coating as per Section 09 91 23 - Interior Painting).

### **PART 3**      **EXECUTION**

#### **3.1**      **GENERAL**

- .1 Structural steel work: in accordance with CAN/CSA-S16.14.
- .2 Welding: in accordance with CSA W59-18.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

#### **3.2**      **CONNECTION TO EXISTING WORK**

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Owner's Representative for direction before commencing fabrication.

#### **3.3**      **MARKING**

- .1 Mark materials in accordance with CAN/CSA G40.20-13(R2018)/G40.21-13(R2018). Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

**Section 05 12 23 – Structural Steel for Buildings**

**Page 6 of 6**

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**3.4 ERECTION**

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16-12 and in accordance with approved reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Owner's Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

**3.5 FIELD PAINTING**

- .1 Paint in accordance with Section 09 91 23 – Interior Painting.

**3.6 FIELD QUALITY CONTROL**

- .1 Inspection and testing of materials and workmanship will be carried out by an Inspection and Testing company designated by Owner's Representative. Owner will pay costs of initial inspection and testing. Costs for any reinspection and/or re-testing as a result of deficient work will be paid for by the contractor, by credit change order.
- .2 The Inspection and Testing Company will carry out vertical and horizontal alignment checks, torque testing and inspection of representative connection welds, including shear studs.
- .3 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Owner's Representative.
- .4 Prior to inspection & testing by the Inspection and Testing company the structural steel erection contractor will carry out an inspection of the work and make the inspection results available to the Owner's Representative and the Inspection and Testing company. The inspection report will identify the areas of work inspected, deficiencies identified, and measures taken to correct the deficiencies.
- .5 Copies of test reports and inspections to be included in Operations and Maintenance Manual.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
- .2      Section 01 33 00 - Submittal Procedures.
- .3      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .4      Section 05 12 23 – Structural Steel for Buildings
- .5      Section 05 31 00 - Steel Decking.
- .6      Section 05 50 00 – Metal Fabrications.
- .7      Section 09 91 23 - Interior Painting.

**1.2**            **REFERENCES**

- .1      All codes and standards referenced in this section refer to the latest edition thereof.
- .2      Canadian Standards Association (CSA International)
  - .1      CSA-G40.20-13/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2      CAN/CSA-S16.14, Limit States Design of Steel Structures.
  - .3      CAN/CSA-S136-16, North American Specification for the Design Cold Formed Steel Members.
  - .4      CSA-W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
  - .5      CSA-W55.3, Certification of Companies for Resistance Welding of Steel and Aluminum.
  - .6      CSA-W59-18, Welded Steel Construction (Metal Arc Welding).
- .3      Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
  - .1      CISC/CPMA 2 75: Quick-Drying, Primer for Use on Structural Steel.
  - .2      CISC/CPMA 1 73a: Quick-Drying, One-Coat Paint for Use on Structural Steel.
- .4      The Society for Protective Coatings (SSPC) and the National Association of Corrosion Engineers International (NACE).
  - .1      SSPC SP-7/NACE No. 4, Brush-Off Blast Cleaning.
  - .2      SSPC SP-1, Solvent Cleaning.

**1.3 SHOP DRAWINGS**

- .1 Submit shop details and erection drawings.
- .2 Submit drawings stamped and signed by qualified professional Engineer registered or licensed in province of Newfoundland and Labrador, Canada.
- .3 On erection drawings include relevant details such as joist mark, depth, spacing, bridging lines, bearing, anchorage and details.
- .4 In shop details, provide particulars, relative to joist geometry, framed openings, splicing details, bearing and anchorage. Include member size, properties, specified and factored member loads, and stresses under various loadings, deflection and camber.
- .5 If requested submit to Owner's Representative one copy of all approved welding procedures for this project.

**1.4 DESIGN OF STEEL JOISTS AND BRIDGING**

- .1 Design steel joists and bridging to carry loads indicated in joist schedule shown on drawings in accordance with CAN/CSA-S16.14.
- .2 Design joists and anchorages for uplift forces as indicated.
- .3 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.
- .4 Unless indicated otherwise on the drawings limit roof joist deflection due to specified live load to  $L/300$  of span and deflection due to specified total load to  $L/240$  of span.
- .5 Unless indicated otherwise on the drawings limit floor joist deflection due to specified live load to  $L/360$  of span and deflection due to specified total load to  $L/240$  of span.
- .6 Submit calculations and joist design drawings for all joists for Owner's Representative review at least 2 weeks prior to fabrication. Calculations and joist design drawings to be stamped and signed by a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador.

**1.5 QUALITY ASSURANCE**

- .1 At least two weeks prior to start of fabrication submit to the Owner's Representative a letter from the fabricators welding engineer stating that the welding engineer is responsible for welding procedures and practices for this project as outlined in CSA W 47.1.
- .2 Provide Certificate of Quality Compliance from open web steel joists fabricator upon completion of fabrication stating that the work has been designed and fabricated in accordance with the requirements of the contract documents.

**PART 2**      **PRODUCTS**

**2.1**      **MATERIALS**

- .1      Structural steel: to CSA-G40.20-13(R2018)/G40.21-13(R2018) and CAN/CSA-S136-16.
- .2      Welding materials: to CSA-W59-19.
- .3      Shop paint primer: to CISC/CPMA-2.

**2.2**      **FABRICATION**

- .1      Fabricate steel joists and accessories as indicated in accordance with CAN/CSA-S16.14, CAN/CSA-S136-16 and in accordance with approved reviewed shop drawings.
- .2      Weld in accordance with CSA-W59-19.
- .3      Provide top bottom chord extensions where indicated.
- .4      Provide diagonal and horizontal bridgings and anchorages as indicated.

**2.3**      **SURFACE PREPARATION AND SHOP PAINTING**

- .1      Clean and prepare steel joists to CAN/CSA-S16.14 and in accordance with SSPC and NACE surface preparation standards.
- .2      Clean all members of loose mill scale, rust, oil, dirt and other foreign matter. Prepare surfaces in accordance with SSPC SP1 and SP7.
- .3      Apply paint under cover; on dry surfaces when both surface and air temperatures are above 5° C. Maintain protection and minimum temperature until paint is thoroughly dry.
- .4      Apply one coat of primer or paint (as specified below) in shop to steel surfaces except:
  - .1      Surfaces and edges to be field welded.
- .5      Surface preparation and prime painting schedule:
  - .1      SSPC-SP7/NACE No. 4 Brush-Off Blast Cleaning.
  - .2      CISC/CPMA: 2-75: Quick-Drying Primer for use on Structural Steel (suitable for finish coating as per Section 09 91 23 - Interior Painting).

**PART 3**      **EXECUTION**

**3.1**      **GENERAL**

- .1      Structural steel work: in accordance with CAN/CSA-S16.14 and CAN/CSA-S136-16.
- .2      Welding: in accordance with CSA-W59-18

- .3 Companies to be certified under Division 1 or 2.1 of CSA-W47.1 for fusion welding and/or CSA-W55.3 for resistance welding.
- .4 Provide certification that welded joints are qualified by Canadian Welding Bureau.

**3.2 CONNECTION TO EXISTING WORK**

- .1 Verify dimensions and condition of existing work; report discrepancies and potential problem areas to Owner's Representative for direction before commencing fabrication.

**3.3 ERECTION**

- .1 Erect steel joists and bridging as indicated in accordance with CAN/CSA-S16.14 and in accordance with reviewed erection drawings.
- .2 Complete installation of all bridging and anchorages before placing construction loads on joists.
- .3 Do not alter or field cut joints or bridging without approval of Owner's Representative.
- .4 Clean with mechanical brush and touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

**3.4 FIELD PAINTING**

- .1 Paint: in accordance with Section 09 91 23 - Interior Painting.

**3.5 FIELD QUALITY CONTROL**

- .1 Inspection and testing of materials and workmanship will be carried out by an Inspection and Testing designated by Owner's Representative. Owner will pay costs of initial inspection and tests. Costs for any re-inspections and or retesting as a result of deficient work will be paid for by contractor by credit change order.
- .2 Testing company will carry out vertical and horizontal alignment checks, inspect representative joists for integrity, accuracy of fabrication and soundness of welds. Testing company may also monitor test loading of joists used by manufacturer to verify design and check representative field connections. Owner's Representative will determine extent of and identify all inspections.
- .3 Prior to inspection and testing by the Inspection and testing company the structural steel erection contractor will carry out an inspection of the work and make the inspection results available to the Owner's Representative and the inspection and testing company. The inspection report will identify the areas of work inspected, deficiencies identified and measures taken to correct the deficiencies.
- .4 Submit test report to Owner's Representative within 7 days after completion of inspection.

- .5 Copies of inspections and test reports to be included in the Operations and Maintenance Manual.

**3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by steel joists framing installation.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 05 12 23 - Structural Steel for Buildings.
- .4      Section 05 21 00 - Steel Joist Framing.
- .5      Section 05 50 00 – Metal Fabrications.
- .6      Section 07 92 00 – Joint Sealants.
- .7      Section 09 91 23 – Interior Painting.

**1.2**            **REFERENCES**

- .1      All codes and standards referenced in this section refer to the latest edition thereof.
- .2      Canadian Standards Association (CSA)
  - .1      CSA C22.2 No.79, Cellular Metal and Cellular Concrete Floor Raceways and Fittings.
  - .2      CAN/CSA-S16.1-14, Limit States Design of Steel Structures.
  - .3      CAN/CSA-S136-16, North American Specification for the Design Cold Formed Steel Members.
  - .4      CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
  - .5      CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .6      CSA W59-18, Welded Steel Construction, (Metal Arc Welding) Metric.
- .3      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.
- .4      American Society for Testing and Materials, (ASTM)
  - .1      ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5      Canadian Sheet Steel Building Institute (CSSBI)
  - .1      CSSBI 10M-18, Standard for Steel Roof Deck.
  - .2      CSSBI 12M-15, Standard for Composite Steel Deck.

**1.3 DESIGN REQUIREMENTS**

- .1 Design steel deck using limit states design in accordance with CAN/CSA S136-16 and CSSBI 10M-18 and CSSBI 12M-15.
- .2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.
- .3 Deflection under specified live load not to exceed 1/300 of span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.
- .4 Where vibration effects are to be controlled as indicated, dynamic characteristics of decking system to be designed to be in accordance with CAN/CSA-S16.14.

**1.4 SHOP DRAWINGS**

- .1 Submit drawings stamped and signed by qualified professional engineer registered and licensed in the Province of Newfoundland and Labrador, Canada.
- .2 Submit design calculations if requested by Owner's Representative.
- .3 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Galvanized steel sheet: to ASTM A653/A653M structural quality Grade 230, 255, with protective coating as specified below, minimum base steel thickness as indicated on the drawings.
- .2 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm. Metallic coating same as deck material.
- .3 Painting: to Section 09 91 23 – Interior Painting.
- .4 Caulking: to Section 07 92 00 – Joint Sealants.

## **2.2 TYPES OF DECKING**

- .1 Consult structural drawings for deck types, locations and other requirements.
- .2 Thicknesses noted below is a minimum. If greater thickness is required for snow drift shown on drawings, then deck supplier is to increase core thickness accordingly at no expense to the owner.
- .3 38 mm deep Canam P-3606, 20 gauge (0.91mm) or approved equal.
  - .1 Protective coating: G90 Galvanized, minimum coating weight.
  - .2 Paint deck in exposed areas as per Section 09 91 23 – Interior Painting.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- .1 Structural steel work: in accordance with CAN/CSA S136-16 and CSSBI 10M-18 and CSSBI 12M-15.
- .2 Welding: in accordance with CSA W59-18, except where specified otherwise.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.

### **3.2 ERECTION**

- .1 Erect steel deck as indicated and in accordance with CAN/CSA S136-16, CSSBI 10M-18 and CSSBI 12M-15 and in accordance with approved reviewed erection drawings.
- .2 For cellular deck butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.
- .3 For non-cellular deck lap ends to 50 mm minimum.
- .4 Weld and test stud shear connectors through steel deck to steel joists/beams below in accordance with CSA W59-13.
- .5 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.
- .6 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mill scale and other foreign matter.
- .7 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

- .8 Place and support reinforcing steel as indicated.

### **3.3 OPENINGS AND AREAS OF CONCENTRATED LOADS**

- .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.
- .2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.
- .3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

### **3.4 CONNECTIONS**

- .1 Install connections in accordance with CSSBI recommendations as indicated on the drawings whichever is the most stringent.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by steel decking installation.

### **3.6 FIELD TOUCH-UP PAINTING**

- .1 Upon erection completion, mechanically brush clean bolts, rivets, welds, and burned or scratched surfaces.
- .2 For galvanized steel surface with damage and without shop coat, repair with field touch up primer.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 07 27 00 – Air Barriers.
- .4      Section 09 21 16 - Gypsum Board Assemblies.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials (ASTM)
  - .1      ASTM A653/A653 M- Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2      ASTM A792/A792M- Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .2      Canadian Standards Association (CSA)
  - .1      CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .2      CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .3      CSA W59, Welded Steel Construction (Metal Arc Welding) (Metric Version).
  - .4      CAN/CSA S136, North American Specification for the Design of Cold-Formed Steel Structural Members.
- .3      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-1.181-Ready-Mixed Organic Zinc-Rich Coating.
- .4      Canadian Sheet Steel Building Institute (CSSBI)
  - .1      CSSBI 52M- Lightweight Steel Framing Binder.
  - .2      CSSBI 55-04, Guide Specification for Wind Bearing Steel Studs.

**1.3            SYSTEM DESIGN**

- .1      The Contractor is responsible for the structural design of the wind load bearing metal stud wall system and the high interior wall near grid 3.2, separating the fitness area ceiling space from the pool area.
- .2      Metal stud quantities and individual stud locations as indicated on the detailed drawings are for guidance and to show design intent only – the correct quantity and/or locations of individual framing members may not be illustrated in all cases.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

IFT May 16, 2023

Section 05 41 00 – Structural Metal Stud Framing

Page 2 of 4

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**1.4 SUBMITTALS**

- .1 All shop drawings submitted shall bear the stamp of a qualified Professional Engineer registered to practice in the province of Newfoundland and Labrador.
- .2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Indicate design loads, member sizes and quantities, materials, design thickness exclusive of coatings, coating specifications, connection and bracing details, screw sizes and spacing, and anchors.
  - .2 Indicate locations, dimensions, openings and requirements of related work.
  - .3 Indicate welds by welding symbols as defined in CSA W59.
- .3 Submit samples of framing components and fasteners to Owner's Representative, if requested.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Protect steel studs during transportation, site storage and installation in accordance with CSSBI Sheet Steel Facts #3.
- .2 Handle and protect galvanized materials from damage to zinc coating.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Steel: to CSA S136, fabricated from ASTM A653/A653M, Grade 230 steel.
- .2 Zinc coated steel sheet: quality to A653M, with Z275 designation zinc coating.
- .3 Aluminum-zinc alloy coated steel sheet: to ASTM A792M, commercial quality, grade 37 with AZ180 coating, regular spangle surface, chemically treated for unpainted finish.
- .4 Welding materials: to CSAW59 and certified by Canadian Welding Bureau.
- .5 Screws: pan head, self-drilling, self-tapping sheet metal screws, corrosion protected to minimum requirements of CSSBI, (minimum coating thickness of 0.008 mm of zinc), length to suit application, but not less than 5.0 mm longer than twice the thickness of steel.
- .6 Anchors: concrete expansion anchors or other suitable drilled type fasteners.
- .7 Bolts, nuts, washers: hot dipped galvanized to CAN/CSA-G164, 600 g/m<sup>2</sup> zinc coating.
- .8 Touch up primer to repair damaged or cut metallic coatings: zinc rich, to CAN/CGSB 1-GP-181.

**2.2 STEEL STUD DESIGNATIONS**

- .1 Colour code steel studs in accordance with CSSBI Technical Bulletin Vol. 7, No.2.

**2.3 METAL FRAMING**

- .1 Steel studs: to CSA S136, fabricated from zinc coated steel, depth as indicated on drawings. Minimum steel thickness of 1.52 mm (16 ga.)
- .2 Stud tracks: fabricated from same material and finish as steel studs, depth to suit.
  - .1 Bottom track: single piece.
  - .2 Top track: single piece track **or** double track **or** slotted single top track. Double track or slotted single top track where required to accommodate deflection.
- .3 Bridging: fabricated from same material and finish as studs, 38 x 12 x 1.22 mm minimum thickness.
- .4 Angle clips: fabricated from same material and finish as studs, 38 x 38mm x depth of steel stud, 1.22 mm minimum thickness.
- .5 Tension straps and accessories: as recommended by designer or manufacturer.

**2.4 SOURCE QUALITY CONTROL**

- .1 Prior to commencement of work, submit:
  - .1 Certified copy of mill reports covering material properties.

**PART 3 EXECUTION**

**3.1 GENERAL**

- .1 Do welding in accordance with CSA W59.
- .2 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.
- .3 Do work in accordance with CSSBI S5.

**3.2 ERECTION**

- .1 Erect components to requirements of reviewed shop drawings.
- .2 Anchor tracks securely to structure at 800 mm oc maximum, unless lesser spacing prescribed on shop drawings.
- .3 Erect studs plumb, aligned and securely attached with two screws minimum, or welded in accordance with manufacturer's recommendations.

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**Memorial University of Newfoundland  
Canada Games Facilities Upgrade  
MUN File: AQ-004-19**

**IFT May 16, 2023**

Section 05 41 00 – Structural Metal Stud Framing

Page 4 of 4

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- .4 Seat studs into bottom tracks and top track. Gap between end of stud and web of track not to exceed 4.0 mm. Secure studs with 2 screws minimum (in top and bottom tracks), or in accordance with manufacturer's recommendations.
- .5 Allow minimum deflection gap of 16.5 mm for double track or slotted single top track.
- .6 Install studs at not more than 50.0 mm from abutting walls, openings, and each side of corners and terminations with dissimilar materials.
- .7 Brace steel studs with horizontal internal bridging at 1,200 mm maximum. Fasten bridging to steel clips fastened to steel studs with screws or by welding.
- .8 Frame openings in stud walls to adequately carry loads by use of additional framing members and bracing as detailed on shop drawings.
- .9 Touch up welds with coat of zinc rich primer.

**3.3 ERECTION TOLERANCES**

- .1 Plumb: not to exceed 1/500th of member length.
- .2 Camber: not to exceed 1/1000th of member length.
- .3 Spacing: not more than 3.0 mm from design spacing.
- .4 Gap between end of stud and track web: not more than 4.0 mm.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 61 00 – Common Product requirements.
- .3      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .4      Section 03 30 00 - Cast-in-Place Concrete.
- .5      Section 04 05 00 – Common Work Results for Masonry
- .6      Section 04 05 19 – Masonry Anchorage and Reinforcing.
- .7      Section 05 12 23 - Structural Steel for Buildings.
- .8      Section 05 21 00 – Steel Joist Framing.
- .9      Section 05 31 00 – Steel Decking.
- .10     Section 05 51 29 - Metal Stairs and Ladders.
- .11     Section 09 91 13 – Exterior Painting.
- .12     Section 09 91 23 – Interior Painting.
- .13     Section 10 11 00 – Miscellaneous Specialties.
- .14     Section 13 11 46 – Swimming Pool Accessories

**1.2**            **REFERENCES**

- .1      American Society for Testing and Materials, (ASTM)
  - .1      ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2      ASTM A269, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3      ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2      Canadian Standards Association (CSA)
  - .1      CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
  - .2      CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

- .3 CSA S16, Design of Steel Structures.
- .4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .5 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .3 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet
  - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.
- .2 Shop Drawings
  - .1 Submit shop drawings for all miscellaneous metal components.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

### **1.4 QUALITY ASSURANCE**

- .1 Test Reports: Submit Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Submit Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
- .3 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .2 Steel pipe: to ASTM A53/A53M standard weight, galvanized finish.
- .3 Welding materials: to CSA W59.

- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

## 2.2 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.
- .2 Stainless steel: to ASTM A276, S304, unless other wise noted for specific fabrications.
- .3 Shop coat primer:
- .4 Zinc primer: zinc rich, ready mix.

## 2.3 SURFACE PREPARATION AND SHOP PAINTING

- .1 Clean and prepare structural steel in accordance with SSPC and NACE surface preparation standards.
- .2 Apply paint under cover; on dry surfaces when both surface and air temperatures are above 5° C. Maintain protection and minimum temperature until paint is thoroughly dry.
- .3 Apply one coat of primer or paint (as specified below) in shop to steel surfaces except:
  - .1 Surfaces intended to receive spray-applied fireproofing.
  - .2 Surfaces to be encased in concrete.
- .4 Surface preparation and prime painting schedule:
  - .1 All exterior steel components to be hot-dipped galvanized. Including all supports for roof-top mechanical equipment, roof ladders, and steel supports for wood screen.
  - .2 All steel components located in or exposed to the Aquatics area.
    - .1 SSPC SP-10/NACE No. 2 Near-White Blast Cleaning.
    - .2 One-component, multi-purpose alkyd primer compatible with specified polyurethane coating.
      - .1 Standard of acceptance: Devguard 4160 by PPG.
      - .2 Light grey or off-white tint, different colour from other primers in building for identification purposes.
  - .3 All other steel components:
    - .1 SSPC SP-6/NACE No. 3 Commercial Blast Cleaning.

- .2 CISC/CPMA 2-75: Quick-Drying Primer for use on Structural Steel (suitable for finish coating as per Section 09 91 23 - Interior Painting).

## 2.4 ANGLE LINTELS

- .1 Steel angles (loose lintels): L 102x102x9.5 galvanized in lengths as required for openings. Provide 150 mm minimum bearing at ends.
- .2 Angle lintels or shelf angles anchored to steel structure: galvanized, refer to structural drawings for sizes.
- .3 Finish exposed sections of angles to Section 09 91 13 – Exterior Painting.
  - .1 Paint to match flashing colour.

## 2.5 HANDRAILS AND GUARDS EXPOSED TO POOL ENVIRONMENT

- .1 For all guards and handrails located on the east mezzanine, diving mezzanine, and pool deck area.
- .2 Fabricate guards and railings as indicated on Drawings. All welds to be continuous. Cap and/or close all ends of tube sections.
- .3 Materials:
  - .1 6061-T6 aluminum rectangular tube sections.
    - .1 Minimum wall thickness of 50 mm tubes: 6.35 mm.
    - .2 Minimum wall thickness of 25 mm tubes: 3.175 mm
  - .2 6061-T6 aluminum pipe, schedule 40. Sizes as indicated on drawings. Maximum outside diameter for handrails: 43 mm.
  - .3 6061-T6 aluminum bar/plate, minimum thickness 9.525 mm.
  - .4 Finish: standard mill finish.

## 2.6 PIPE RAILINGS (ENCLOSED EXIT STAIRS)

- .1 Steel pipe: 38 mm nominal outside diameter for handrails unless indicated otherwise on drawings. Formed to shapes and sizes as indicated on drawings.
- .2 Shop coat prime interior and exterior railings after fabrication.
  - .1 Finish to Section 09 91 23 – Interior Painting, or
  - .2 Finish to Section 09 91 13 – Exterior Painting.

## 2.7 EXTERIOR GUARDS AND HANDRAILS

- .1 Fabricate guards and railings as indicated on Drawings. All welds to be continuous.
- .2 Materials: As noted on drawings.

**2.8 TRENCH COVERS AND FRAMES**

- .1 Unless otherwise indicated on drawings, fabricate from 6 mm thick steel set in L 55 x 55 x 6 frame. Include anchors at 1200 mm on centre for embedding in concrete. Supply trench covers in 1200 mm removable lengths.
- .2 Finish: galvanized.

**2.9 CHANNEL OR ANGLE FRAMES**

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
- .3 Shop coat prime interior channel frames after fabrication. Shop coat prime exterior channel frames after fabrication and apply a high build epoxy coating.
- .4 Supply and install all steel channel or angle frames as required to support large penetrations through the metal floor deck whether specifically detailed on the drawings or not.

**2.10 MISCELLANEOUS ANGLES, BRACKETS AND SUPPORTS**

- .1 Supply and install all rods, angles, brackets, cleats, plates, beams, channels, nuts, bolts, lintels and other such ancillary supports and fastenings not specifically mentioned elsewhere in the specifications.
  - .1 Prime all material before installation.
- .2 Supply and install steel support for all mechanical and electrical equipment, pipes, ducts, conduits and other fixtures or equipment required to complete the installation as drawn and/or specified.
- .3 Supply and install steel framing and hangers for lighting and ductwork in pool area.
- .4 Supply and install all steel framing required to support roof-top mechanical equipment.
- .5 Supply and install all steel framing required to support ceiling-hung toilet, shower or other washroom partitions.
- .6 Supply and install all steel framing required to provide lateral support to masonry walls as specified in Section 04 05 19 – Masonry Anchorage and Reinforcement or as illustrated on drawings.
- .7 Supply and install all steel or other metal framing and components required to construct all exterior guards, guard rails, handrails, grates or any other exterior or site-related items illustrated on the drawings.
- .8 Supply and install galvanized sign posts and pipe bollards as illustrated on drawings.

**PART 3      EXECUTION**

**3.1            FABRICATION**

- .1      Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2      Use self-tapping shake-proof flat round oval headed screws on items requiring assembly by screws or as indicated.
- .3      Where possible, fit and shop assemble work, ready for erection.
- .4      Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

**3.2            ISOLATION COATING**

- .1      Isolate aluminum from following components, by means of bituminous paint:
  - .1      Dissimilar metals except stainless steel, zinc, or white bronze of small area.
  - .2      Concrete, mortar and masonry.
  - .3      Wood.

**3.3            SHOP PAINTING**

- .1      Apply primer or paint as indicated in Part 2 of this specification.

**3.4            ERECTION**

- .1      Install all miscellaneous metal components in locations as indicated on drawings.
- .2      Do welding work in accordance with CSA W59 unless specified otherwise.
- .3      Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .4      Provide suitable means of anchorage acceptable to Owner's Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .5      Exposed fastening devices to match finish and be compatible with material through which they pass.
- .6      Provide components for building by other sections in accordance with shop drawings and schedule.
- .7      Make field connections with bolts to CAN/CSA-S16, or weld.
- .8      Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.