



**SPECIFICATIONS FOR STRUCTURAL &  
ARCHITECTURAL WORK**

**AT**

**GORD & IRENE RISK COMMUNITY CENTER**

**2650 FINCH AVE W, NORTH YORK, ON**

**M9M 3A3**

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## TABLE OF CONTENTS

SECTION 01000	GENERAL REQUIREMENTS .....	1
SECTION 01001	GENERAL INSTRUCTIONS .....	12
SECTION 01320	SCHEDULE .....	17
SECTION 01330	SUBMITTALS .....	20
SECTION 01340	SHOP DRAWINGS .....	23
SECTION 01590	SAFETY .....	25
SECTION 01600	PRODUCT REQUIREMENTS .....	29
SECTION 01710	EXAMINATION, PROTECTION AND RESTORATION OF PROPERTY ..	36
SECTION 01740	CLEANING .....	37
SECTION 01780	RECORD DOCUMENTS .....	38
SECTION 04200	UNIT MASONRY .....	39
SECTION 05120	STRUCTURAL STEEL .....	46
SECTION 05500	METAL FABRICATIONS .....	52
SECTION 05530	GRATINGS .....	58
SECTION 06100	ROUGH CARPENTRY .....	63

<b>SECTION 06160</b>	<b>SHEATHING .....</b>	<b>67</b>
<b>SECTION 07260</b>	<b>VAPOUR RETARDERS .....</b>	<b>70</b>
<b>SECTION 07460</b>	<b>METAL SIDING .....</b>	<b>74</b>
<b>SECTION 07520</b>	<b>SBS MODIFIED BITUMEN MEMBRANE ROOFING .....</b>	<b>79</b>
<b>SECTION 07900</b>	<b>SEALANTS.....</b>	<b>87</b>
<b>SECTION 08520</b>	<b>ALUMINUM WINDOWS .....</b>	<b>95</b>
<b>SECTION 08800</b>	<b>GLAZING .....</b>	<b>103</b>
<b>SECTION 09300</b>	<b>TILES .....</b>	<b>108</b>
<b>SECTION 09510</b>	<b>ACOUSTICAL CEILINGS .....</b>	<b>115</b>
<b>SECTION 09900</b>	<b>PAINTING .....</b>	<b>120</b>
<b>SECTION 10800</b>	<b>WASHROOM ACCESSORIES.....</b>	<b>133</b>
<b>SECTION 11000</b>	<b>SLAB STABILIZATION .....</b>	<b>138</b>
<b>SECTION 11001</b>	<b>SLAB LIFTING .....</b>	<b>143</b>

## **1.1 SECTION INCLUDES**

- 1.2 Regulatory Requirements
- 1.3 Site Examination
- 1.4 Co-ordination
- 1.5 Project Co-ordination
- 1.6 Submittals
- 1.7 Temporary Utilities
- 1.8 Temporary Facilities
- 1.9 Material and Equipment
- 1.10 Cutting and Patching
- 1.11 Fire Prevention and Safety
- 1.12 Environmental Control
- 1.13 Requirements of Regulatory Agencies
- 1.14 Site Sign and Notices
- 1.15 Cleaning and Restoration

## **1.2 REGULATORY REQUIREMENTS**

### **.1 Codes and Standards**

Contractor shall:

- .1 Perform work in accordance with the latest named published editions of codes and standards.
- .2 Provide materials and workmanship which meet or exceeds the specifically named code or standard.
- .3 Execute Work in accordance with the applicable Federal, Provincial, Territorial and Municipal statutes, laws, regulations to the location of the Works to be performed.
- .4 In the event of conflict of above statutes, laws, regulations and codes execute the Works in accordance with the requirements of the Authority having jurisdiction.
- .5 Enforce all construction safety measures in accordance with the Ontario Occupational Health and Safety Act and applicable Construction Safety Regulations.

For the purpose of the Occupational Health and Safety Act, the Contractor will be designated the 'Constructor' and shall assume the responsibility of the Constructor as set out in the Act and its regulations. The Engineer will monitor the quality and quantity of work; undertake progress payment inspections and inspections for compliance with the Contract Documents. The Owner will NOT be a 'Constructor' by reason thereof.

Provide the Director of Construction Health and Safety Branch of the Ministry of Labour with the information required under Section 4 of the Ontario Regulation 691/80 prior to commencing work.

.2 Design Standards, Specifications and Materials

When references to the following capitalized abbreviations are made, they refer to specifications, standards, or methods of the respective association. Abbreviations listed herein but not mentioned in the specifications shall be disregarded.

The numbers and letters following the abbreviations denote the association's serial designation for the specifications or standard to which reference is made. All references to these specifications, standards or methods shall, in each instance, be understood to refer to the latest adopted revision, including all amendments.

ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers' Association
AWS	American Welding Society
CBTIC	Clay Brick and Tile Institute of Canada
CGSB	Canadian Government Specifications Board
CISC	Canadian Institute of Steel Construction
CITC	Canadian Institute of Timber Construction
CMHC	Central Mortgage and Housing Corporation
CRCA	Canadian Roofing Contractors Association
CSA	Canadian Standards Association
CWB	Canadian Welding Bureau
MCA	Millwork Contractors Association
NBC	National Building Code of Canada
NFPA	National Fire Protection Association
NLGA	National Lumber Grade Authority
PMBC	Plywood Manufacturers Association of B.C.
ULC	Underwriters Laboratories of Canada (ULI in U.S.A.)

.5 Canadian National Master Construction Specifications (CNMCS)

Canadian National Master Construction Specifications (CNMCS) current at the date of tendering shall apply to this Contract mutatis mutandis. CNMCS specifications are not bound in the Contract Documents, however, the Contractor shall be required to comply with these specifications. If there is a conflict between CNMCS and the Specification, the Specification prevails.

.6 Occupational Health and Safety Act

Should any designated substances be identified at the site, then the cost of their removal will be paid for by the Owner and the Contractor will be entitled to an extension of time on the Contract as full and final settlement thereof. No additional payment will be made in respect of any matters arising out of any delay caused by designated substances.

All designated substances identified by either the Owner, the Contractor or any sub-contractor shall be removed and disposed of in accordance with the Ministry of Labour's regulations issued under the Occupational Health and Safety Act.

.7 Ontario Building Code

Perform work in accordance with the Ontario Building Code O.R. 350/12, latest edition, herein referred to as the 'code' or 'Code' and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

**1.3 SITE EXAMINATION**

.1 Examination of Site

The Contractor, at the time of tendering, shall visit the site of the work before submitting their Tender and satisfy themselves by personal examination as to the local conditions to be met with during the construction and conduct of the work. They shall make their own estimate of the facilities and difficulties to be encountered during the construction. They shall not claim, at any time after submission of this Tender that there was any misunderstanding of the terms and conditions of the Contract relating to site conditions.

.2 Bidders Site Visit

Refer to Instructions to Bidders.

**1.4 COORDINATION**

.1 Schedule Submittals

Within seven (7) days after the receipt of:

- (a) the Contract Documents executed by the Owner and the Contractor or,
- (b) the Owner's written Order to Commence Work,

whichever is the earlier, the Contractor shall submit to the Engineer the proposed schedule of construction, which is based on their tender.

The schedule of construction shall show clearly in daily stages the proposed progress on the main items, structures and sub-trades of the Contract and shall indicate where applicable the labour, construction crews, plant and equipment to be employed.

.2 Restrictions on Use of Site

Use only those areas designated by the Owner for Contractor access except in so far as is necessary for the execution of the Works, and in so doing the Contractor shall not unnecessarily obstruct the normal traffic of, to, from or about the Site; and shall not unreasonably allow any vehicles or materials to stand in front of or near to any buildings on the Site or any access thereto.

Confine operations within areas designated for construction, storage and access as directed by the Engineer.

The Contractor shall limit his access to and from the Site as instructed by the Engineer and/or the Owner.

3. Emergency and Maintenance Measures

The name, address and telephone number of a responsible official of the Contractor shall be given to the Owner and Engineer prior to commencement of work, in the event that the construction site is left unattended by the superintendent. This official shall be available at all times and have the necessary authority to mobilize workmen and machinery and to take any action as directed by the Engineer.

Should the Contractor be unable to carry out immediate remedial measures required, the Owner may carry out the necessary repairs, the costs for which shall be charged to the Contractor.

In case of emergency, the Engineer has the authority to stop the progress of the work, whenever, in that person's opinion such stoppage may be necessary to ensure its proper execution. In any emergency affecting or threatening the safety of life, or of any structure, or of adjoining property, requirements for maintenance (caused by the Contractor's negligence, or any cause whatsoever), the Engineer has authority to make such changes and to order such work as may, in that person's opinion, be necessary.

The Contractor will be entitled to apply for an extension of time in full and final settlement thereof. No additional payment will be made in respect of any delay arising from delays caused by emergency operations.

4. Miscellaneous

The Contractor shall be responsible for cleaning up promptly all streets or other locations where their or their subcontractor's trucks or other equipment deposit earth or other undesirable matter as determined by the Engineer. Should the Contractor fail to carry out such cleaning up, the Engineer may have the necessary work carried out by others and the cost thereof shall be charged against the Contractor.

.5 Other Provisions

a) General

No extra payment will be due to the Contractor for having to schedule any portion of the work during unusual or overtime work periods. The Contractor shall therefore give due consideration to these conditions when preparing the construction schedule and he shall instruct all subcontractors accordingly.

Should the Contractor, after award of the Contract, wish to deviate from the procedures as hereinafter specified, he/she shall submit to the Engineer in writing (duplicate) his proposed alternative(s) for approval.

.6 Other Contractors Within or Adjacent to Contract Limits

The Contractor is advised that other work may be in progress within and adjacent to the limits of this Contract, they shall co-operate with other contractors, Utility Companies, and the Owner and they shall be allowed free access to their work at all times. The Engineer reserves the right to alter the method of operations on this Contract to avoid interference with other work.

**.7 Documents Required on Site**

Maintain at the job site one copy of each of the following:

- Contract Drawings
- Specifications
- Addenda
- Reviewed Shop Drawings
- Contract Change Directives
- Other Modifications to Contract
- Field Test Reports
- Copy of Approved Work Schedule
- Manufacturers Installation and Maintenance Instructions

**.8 Disposal of Materials**

The Contractor shall dispose of all surplus, cleared, removed and any other material not to be incorporated into the completed work outside the Site of the Works at locations arranged by the Contractor unless provided for elsewhere in the Contract. No separate payment will be made for this work except as otherwise provided for in the Contract. The disposal site(s) shall be arranged for by the Contractor and approved by the Engineer prior to use. All agreements shall be in writing and a copy of each agreement shall be given to the Engineer.

The Contractor shall comply with the requirements of the MOE, MTO, the City of Toronto, the Engineer and any other authority having jurisdiction and will be responsible for any damage to the streets/roads used as a haul road.

**.9 Project Quantities**

The Contractor is advised that payment for many of the contract items shall be based on the actual quantities of materials supplied and installed in the work, at the unit rates as outlined in the form of tender. For these items, the Contractor shall prepare a summary sheet of quantities that have been supplied and installed. The item summary shall be maintained on site on a daily basis, showing all items incorporated into the work to that date. The quantity summary shall be submitted to the Engineer and Owner on a weekly basis.

Quantities of items shall be modified as required for proper completion of the work as the work progresses. The contractor shall acknowledge that the proposed quantities may be adjusted at the discretion of the Owner, and the tender quantity of some items may not be fully utilized in the completed contract.

**1.5 PROJECT COORDINATION**



.1 Haulage Road Load Restrictions

The Contractor is responsible for determining any road load size restrictions which may be applicable during the construction period and which may affect the load capacity of any truck using such roads. The Ministry of Transportation and Municipality shall be contacted in this regard. The Contractor will not be compensated for any additional costs incurred due to any load restrictions after the Contract is awarded.

.2 Occupational Health and Safety Act

In order to avoid any misunderstanding as to the nature of the work to be performed herein, the Contractor by executing this contract unequivocally acknowledges that it is the constructor within the meaning of the Occupational Health and Safety Act, and the Contractor undertakes to carry out the duties and responsibilities of a constructor with respect to the work.

It is specifically drawn to the attention of the Tenderer that the Occupational Health and Safety Act provides in addition to other matters that,

“A constructor shall ensure, on a project undertaken by the constructor that,

- (a) the measures and procedures prescribed by this Act and the regulations are carried out on the project:
- (b) every employer and every worker performing work on the project complies with the Act and the regulations; and
- (c) the health and safety of workers on the project is protected.”

.3 WHMIS Legislation

All workers shall be trained accordingly in WHMIS procedures.

**1.6 SUBMITTALS**

.1 Shop Drawings

The term ‘shop drawings’ means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.

Submit 3 sets of shop drawings depicting material, equipment, erection diagrams and all other items to be incorporated into the work.

Only shop drawings bearing the ‘REVIEWED’ notation shall be used on the Work unless otherwise authorized by the Engineer.

Shop drawings marked ‘REVIEWED’ shall not be revised unless resubmitted to the Engineer for further review.

Where manufacturer's literature covers several models or options, the applicable information will be highlighted and redundant information crossed out.

Shop drawings shall be to scale.

Prior to submission to the Engineer, the Contractor shall review all shop drawings. By this review, the Contractor represents that they have determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data or will do so, that they have coordinated this equipment with other equipment to which it is attached and/or connected and that they have verified all dimensions to ensure the proper installation of equipment within the available space and without interference with the work of other trades and that they have checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents.

The Contractor's review of each shop drawing shall be indicated by stamp, date, and signature of responsible person.

Shop drawings will not be reviewed by the Engineer unless they have been previously checked by the Contractor.

The Contractor shall submit shop drawings to the Engineer for his review with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the work of other Contractors. If either the Contractor or the Engineer so requests, they shall be submitted in the form of reproducible transparencies or prints as the Engineer may direct.

At the time of submission, the Contractor shall notify the Engineer in writing of any deviations in the shop drawings from the requirements of the Contract Documents.

The Engineer will review and endeavour to return shop drawings within 5 working days.

The Engineer's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Engineer.

Work which relates to shop drawings shall not be carried out before the Engineer's review of the shop drawings is complete.

Shop drawings shall indicate clearly the materials actually being supplied, all details of construction and accurate dimensions.

.2 Quantity Summary

Quantity summary sheets showing all items supplied and installed in the work shall be Submitted weekly to the Owner and Engineer. The summary sheets shall indicate the Work completed during the week, the work completed prior to the week, and the overall Total of items utilized in the work. The summary sheet shows the quantity of each item used, the tender unit price and cost of work to date at each submittal.

## 1.7 TEMPORARY UTILITIES

### .1 Temporary Telephone, Water and Hydro Power

Use of existing building utilities shall not be allowed unless otherwise authorized by the Owner.

If connection to services is done, make all necessary applications, obtain required permits and pay all fees and charges for such service and its use.

Any temporary power and light system shall be subject to the inspection and approval of the inspection branch of the local Hydro authority.

## 1.8 TEMPORARY FACILITIES

### .1 Enclosure of Structure

The work scaffold shall be fully enclosed with tarpaulins, or mesh screens, to prevent debris from falling outside of the limits of the scaffold.

### .2 Heating and Ventilating

Provide required heat and/or ventilation to properly complete the work. Include all costs in the contract price. The Contractor is advised that work will take place during the winter and any cost required to maintain the site in a heated condition while construction takes place shall be the responsibility of the Contractor.

### .3 Scaffold and Hoarding

The work area shall be provided with temporary scaffold platforms. The scaffold system shall be clearly outlined on shop drawings that bear the seal of a Professional Engineer, registered in Ontario. Shop drawings shall be submitted for review prior to starting work. Scaffold may include a fixed system, supported at the lower level adjacent to the building, or may include suspended equipment. All scaffolds shall be designed, installed and inspected in accordance with requirements of the Occupational Health and Safety Act.

## 1.9 MATERIAL AND EQUIPMENT

### .1 General

Use new material and equipment unless otherwise specified.

Adhere to manufacturer's recommendations with respect to handling, preparation, installation, testing, operation or protection of any product or material to be incorporated in the Works.

Ensure that all materials supplied are compatible with each other unless specific adjacent materials have been specified. Correct any defective work caused by non compatibility of materials.

.2 Inspection

Where practical or desirable, tests will be conducted by the Engineer on materials and equipment to be incorporated into permanent works before delivery to the Site.

Defective products 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.

Should any dispute arise as to quality or fitness of products, decision rests strictly with the Engineer based upon requirements of Contract Documents.

.3 Fastenings - General

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 spaces for securing work.

Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

Obtain the Engineer's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166.

**1.10 CUTTING AND PATCHING**

The Contractor will be required to carry out cutting and patching for various trades. In each case, the work shall be carried out by tradesmen qualified in the work being cut and patched to ensure that it is correctly done. Cutting through structural members shall be done only on the written consent of the Engineer.

**1.11 FIRE PREVENTION AND SAFETY**

Enforce fire protection methods, good housekeeping and adherence to local and underwriter's fire regulations. Provide UL approved fire extinguishers and other fire fighting services except where more explicit requirements are specified.

Maintain clear emergency exit paths for personnel at all times.

Use only fire-resistant tarpaulins, coverings, etc. on site.

**1.12 ENVIRONMENTAL CONTROL**

Conform to all requirements established by jurisdictional authorities for environmental and pollution control.

Prevent dust from spreading to adjoining properties.

Keep roads and sidewalks free from excavated materials, and dirt and debris resulting from this work.

### 1.13 REQUIREMENTS OF REGULATORY AGENCIES

Work shall include protection methods and materials required by The Occupational Health and Safety Act, latest edition, of the Province of Ontario, and as otherwise imposed by jurisdictional authorities.

Ensure that pollution and environmental control of construction activities are exercised as required during the work.

Unless permitted by Authorities, maintain public roads and walks clear of construction material and debris.

### 1.14 SITE SIGNS AND NOTICES

Only Project Identification and Engineer/Contractor signboards approved by the Engineer or notices for safety instruction are permitted on site.

### 1.15 CLEANING AND RESTORATION

#### .1 General

Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

Store volatile wastes in covered metal containers, and remove them from premises at end of each working day.

Prevent accumulation of wastes which create hazardous conditions.

Provide adequate ventilation during use of volatile or noxious substances.

#### .2 Materials

Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

#### .3 Cleaning During Construction

On a daily basis maintain premises free from debris and waste material.

Maintain project site free from accumulations of waste materials and rubbish.

Provide on-site containers for collection of waste materials and rubbish.

Broom clean interior building areas access by construction staff until project completion.

Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces.

.4 Final Cleaning

In preparation for Substantial Performance and/or occupancy, conduct inspection of sight-exposed interior and exterior surfaces.

Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials, from sight-exposed interior and exterior finished surfaces.

.5 Restoration

All disturbed areas must be restored to a condition equivalent to that which existed prior to commencement of construction as determined by the Engineer.

All costs associated with restoration shall be deemed to be included in the Tender Price. No separate payment shall be made for any restoration work.

END OF SECTION

## 1.1 SECTION INCLUDES

- 1.2 General
- 1.3 Standards
- 1.4 Building Code
- 1.5 Lines, levels and dimensions
- 1.6 General Quality of Work
- 1.7 Protection and Safety
- 1.8 Equipment Fuelling, Maintenance and Storage
- 1.9 Access to Site
- 1.10 Contractor's Use of the Site
- 1.11 Project Schedule
- 1.12 Pre-Construction Meeting
- 1.13 Manufacturer's Instructions
- 1.14 Progress Meeting

## 1.2 GENERAL

- .1 Conform to Definitions and General Conditions of the Contract.
- .2 The Contractor shall have responsibility to study Contract Documents to determine extent of work required by each Section and upon which work of other Sections depend and to coordinate scope and extent of work to be performed by each trade. Neither organization of Specifications into Divisions and Sections format nor arrangements of Drawings, Schedules and Standard Drawings shall affect in any way Contractor's control in dividing Work or establishing each trade's scope of work. Claims for additional compensation arising from disputes between trades due to lack of coordination by Contractor will not be considered.
- .3 The Contractor shall promptly, and not later than 10 working days of becoming aware of circumstances which may require a change in the Work or other directions, give written notice to the Engineer outlining such circumstances and requesting written directions. Do not work in affected area, or that would prevent the Engineer from properly assessing situation or evaluating change, without prior written approval. The Engineer will act promptly to give Contractor directions so Work is not unreasonably delayed.
- .4 As applicable, maintain in good condition and order on Site:
  - i. One copy of Addenda,
  - ii. Proposed changes in Work,
  - iii. Change Orders,
  - iv. Test Reports,
  - v. Manufacturer's Installation and Application Instructions,
  - vi. Progress Photographs,
  - vii. As-built Drawings,
  - viii. Approved Progress Schedules,
  - ix. Minutes of Site Meetings
  - x. Any and All Other modifications to the Contract Documents.

## 1.3 STANDARDS

- .1 Where reference is made to specification standards produced by various organizations, conform to edition of standards specified or, if not specified, to latest edition as amended and revised to date of Contract.

- .2 If requested provide copy on Site of such standard(s).
- .3 Where standard designates authorities such as "Consultant", "Owner" "Purchaser" or some other such designation, these designations shall be taken to mean "Engineer".

#### **1.4 BUILDING CODE**

- .1 Comply with The Building Code Act, as amended; and the Building Code, as amended; and Regulations and by-laws of other authorities having jurisdiction including latest amendments thereto: all hereafter referred to as Code, where Code or Contract Documents do not cover particular requirement which is covered by National Building Code, latest edition, conform to requirements of NBC including its related supplements. Where Drawings and/or Specifications exceed Code, requirements satisfy such additional requirements.
- .2 Where material is designated in Contract Documents for certain application, unless otherwise specified, that material shall conform to standards designated in Code and in absence of more restrictive requirement comply with "Large Buildings Part 3" of Code. Similarly, unless otherwise specified, and not required otherwise by Code, installation methods and standards of workmanship shall also conform to standards of Part 3. Where specific requirements for a material are not specified for certain use select from choice offered in Part 3.

#### **1.5 LINES, LEVELS AND DIMENSIONS**

- .1 Lay out work in accordance with lines, levels and dimensions indicated and/or provided on bench marks established by survey.
- .2 Verify lines, levels and dimensions. Report errors or inconsistencies in Drawings and obtain direction before commencing Work. Check layout and work of others.
- .3 Except as provided by survey, provide lines, levels and dimensions necessary to relate the work to work of other Sections.

#### **1.6 GENERAL QUALITY OF WORK**

- .1 Do Work in accordance with industry practice for type of work unless Contract Documents stipulate more precise requirements.

#### **1.7 PROTECTION AND SAFETY**

- .1 Under the Occupational Health and Safety Act, as amended, the Contractor shall undertake the role of the "Constructor" as defined in the Act. Be responsible to provide full safety program for anyone who gets paid for services on Site including management, labour, delivery drivers, service personnel and others involved for services on Site.
- .2 Comply with requirements of Acts and Regulations with respect to health and safety including Occupational Health and Safety Act, as amended, and Workplace Hazardous Materials Information System (WHMIS) Regulation, including following:
  - .2.1 Before commencement of Work, and throughout Contract, maintain on Site, and readily accessible to all those who may be exposed to hazardous materials, list



of hazardous materials proposed for use on Site or Workplace together with current Materials Safety Data Sheet (MSDS). Provide Engineer with copy of list and MSDS.

- .2.2 Ensure hazardous materials used and/or supplied on Site are labeled in accordance with WHMIS requirements.
  - .2.3 Provide detailed written procedures for safe handling, storage and use of such hazardous materials including special precautions, safe clean-up and disposal procedures. Conform to Environmental Protection Act for disposal requirements.
  - .2.4 Ensure that those who handle, and/or are exposed to, or are likely to handle or be exposed to, hazardous materials are fully instructed and trained in accordance with WHMIS requirements.
- .3 Protect excavations, trenches and building from damage by rainwater, ground water, backing up of drains or sewers and other water, frost and other weather conditions. Provide sheeting, piling, shoring, pumps, equipment, temporary drainage, protective covering and enclosures. Provide necessary pumps including spare pump for keeping project free of water throughout construction period.
- .4 Protect active services wherever they are encountered. Wherever inactive services are encountered, cap them off and remove unwanted portion, with approval of authorities having jurisdiction or public utility concerned in manner approved by them.
- .5 Protect work of other Sections from damage resulting from your work.
- .6 Damaged work shall be made good wherever possible by Section whose work is damaged but at expense of those causing damage.
- .7 Protect public and those employed on Work from injury. Equipment (mobile) when not in use shall have keys removed and locked in secure location.

## **1.8 EQUIPMENT FUELLING, MAINTENANCE AND STORAGE**

- .1 Ensure that materials required for clean-up of fuel spillages are readily accessible on Site at all times.
- .2 Carry out refueling of equipment at acceptable refueling areas.
- .3 Ensure that water used for cleaning of equipment does not drain into streams, lakes or watercourses. Do not empty fuel, lubricants and/or pesticides into any watercourse, storm drain or on ground.
- .4 Clean construction equipment prior to entering public roadways to prevent littering. Debris from cleaning equipment shall not be permitted into storm sewers or watercourses.
- .5 Store equipment and materials in orderly manner and in location acceptable to the Engineer.

## **1.9 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to the site, where indicated on the drawings and on the site, as required for construction activities, to the approval of the Municipal Authority and the Engineer.

### 1.10 CONTRACTOR'S USE OF THE SITE

- .1 The Contractor shall have partial use of the site for the execution of the work as indicated on drawings.
- .2 Maintain access from the entrances and exits to the building and adjacent laneway at all times. Provide covered hoarding, lighted as required, to maintain exits and entrances as required at all times.

### 1.11 PROJECT SCHEDULE

- .1 The work under this Contract shall be substantially complete within one year *EH* ~~60 calendar days~~ from the issuance date of the Purchase Order.
- .2 The Contractor shall establish and maintain progress control systems capable of identifying scheduling, monitoring and reporting activities related to the progress of the total project, the extent of detail in the schedules and the degree of control provided by the progress control system shall be such that the needs and objectives of both the Contractor and Owner are satisfied and met.
- .3 The Contractor shall provide within 7 working days of issuance date of the Purchase Order / Order to Proceed a schedule showing dates for:
  - Submission of shop drawings, material lists and samples.
  - Delivery schedules of major installations.
  - Commencement and completion of work of each Section of Specification.
  - Substantial and total completion dates within the time period required by Contract Documents.
- .4 Interim reviews of work progress based on work schedule will be conducted at each project meeting. Schedule to be updated at that time by Contractor and distributed to the Owner and Engineer.
- .5 The Contractor is referred to the Plan's general notes for hours of operation.
- .6 No additional costs will be paid by the Owner for work that has to be done outside of regular working hours that may be necessary to expedite the schedule.

### 1.12 PRE-CONSTRUCTION MEETING

- .1 Within 5 days after of issuance date of the Purchase Order/Order to Proceed, Engineer will request meeting of parties to the Contract to discuss and resolve administrative procedures and responsibilities.
- ..2 Senior representatives of the Owner, Engineer, Contractor to be in attendance.
- .3 Engineer will establish time and location of meeting and notify Contractor.
- .4 Agenda of meeting to include the following:
  - Establish official representatives of participants of the project.

- Review Contractors schedule of the work.
- Review schedule of submission for shop drawings.
- Review delivery schedule of specified equipment.
- Review procedure for contemplated change notices, change orders, required approvals, administrative requirements, record drawings, maintenance manuals, take over procedure, monthly progress claims, inspection and testing agencies.

### **1.13 PROGRESS MEETINGS**

- .1 During the course of the Work, progress meetings will be scheduled as deemed necessary. Progress meeting shall be documented by the Contractor and the Contractor will issue minutes of meets to all parties. Preparation of Meeting Minutes shall be at no additional cost to the Contract.
- .2 Contractor and major Subcontractors involved in the Work and the Owner are to be in attendance.
- .3 The Contractor will record minutes of meeting and circulate to attending and affected parties not in attendance.
- .4 Agenda to include the following:
  - Review, approval of minutes of previous meetings.
  - Review work progress subsequent to last meeting.
  - Field observations, problems, conflicts.
  - Problems which impede construction schedule.
  - Review of off-site fabrication and delivery schedule.
  - Corrective measures and procedures to regain projected schedules.
  - Progress, schedule, during forthcoming work period.
  - Review submitted schedule, expedite as required.
  - Maintenance of quality standards pending changes.
  - Status of Change Orders and pricing of same.
  - Other miscellaneous business as required.

### **1.14 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in the specification, install or erect products in accordance with manufacturer's instruction. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify the Engineer in writing, of conflicts between the specification and manufacturer's instructions, so that the Engineer may establish the course of action.

END OF SECTION

**1 GENERAL**

1.1 The planning, scheduling, management and execution of the Work in accordance with the Contract Documents is the responsibility of the Contractor.

**2 SCHEDULE SUBMITTAL**

2.1 Within fifteen (15) calendar days after receipt of Notification of Award of Contract, submit to the Engineer for approval, a schedule in Gantt Diagram or bar chart form. The submission shall be on clear neat and legible sheets not to exceed 55 cm x 85 cm (22" x 34"). Each sheet shall contain a title block and revision block.

2.2 The schedule shall represent a practical plan to complete the Work within the period specified to achieve Milestones, Substantial Performance and Contract Completion, and shall show in sufficient detail the sequence in which the Work will be performed and the dates on which each portion will be completed.

2.3 In the preparation of the schedule, the Contractor shall recognize the cost breakdown, and shall formulate the schedule to follow closely the format established therein.

2.4 The Contractor shall also co-ordinate with the Engineer in the preparation of the schedule to establish the number of activities required, and the logic sequence of events.

2.5 The schedule shall be based on the dates of Notification of Award, execution of the Work and Substantial Performance and Contract Completion contained in the Contract, and shall include, in addition to the Work to be performed, major material and equipment delivery dates, restraints, interfaces, and Milestones contained elsewhere in Section 01110.

2.6 Once the schedule submitted by the Contractor has been approved in writing by the Engineer, it becomes the Contract Schedule for the Contract, against which progress, delays, etc. will be measured and neither the date for Substantial Performance, Contract Completion nor any Milestones may be changed on the Contract Schedule without the approval and the issuance of a Contract Change by the Engineer.

**3 MONTHLY PROGRESS STATUS REPORTS**

3.1 Submit to the Engineer monthly progress schedule updates with cash and such other information as the Engineer may require, on a monthly basis every first Monday of the month (or Tuesday if Monday is a holiday).

3.2 The progress updates shall show actual progress against the Contract Schedule. Include with each submission a written report of activity progress, the actual start dates for any activity started during the period, the actual completion dates for any activity completed during the period, estimated remaining durations for activities in progress, estimated start dates for activities scheduled to start during the month following the report period, changes in the duration(s) of activities, and/or minor logic changes, and activities not included in the Contract Schedule.

**4 PROGRESS UPDATING**

4.1 The Contractor shall report progress in the following manner:

- .1 Each activity in the Contract Schedule, shall be shown as a solid bar, and shall remain the same for the duration of the Contract.
- .2 Actual progress shall be shown in a different pattern bar directly above the Contract Schedule activity with the percentage complete indicated as of the data date.
- .3 The data date shall coincide with the last calendar day of each month and shall be shown for each update.
- .4 Actual start and finish dates shall be shown for activities in progress.
- .5 Show projection to completion for all outstanding and incomplete activities.

**5 STATUS REPORT DELAYS**

- 5.1 If the Monthly Progress Status Report indicates an actual or potential delay to the Substantial Performance, Contract Completion and/or Milestone(s) dates, as specified in Section 01110, delay(s) shall be treated in a narrative report in one of the following ways:
  - .1 If the delay is within the Contractor's scheduling control as specified in the Contract, the report shall identify the problem, the cause, and the activities affected, and shall provide an explanation of the corrective action required to meet the completion dates involved or to mitigate further delays.
  - .2 If the delay is not within the Contractor's scheduling control, as specified in the Contract, the report shall identify the problem, cause, duration, specific activity affected, and logic constraints of each Work item.

**6 REVISION TO THE CONTRACT SCHEDULE**

- 6.1 A revision to the Contract Schedule shall be made in the same format and detail as the original submittal and shall be accompanied by an explanation of the reasons for such revision.
- 6.2 All revisions shall be subject to the Engineer's approval in the same manner as the Contract Schedule.
- 6.3 A revised Contract Schedule, at no cost to CSE, shall be submitted for approval, when required by the Engineer, for one of the following reasons:
  - .1 A Contract Change affecting a restraint(s), Milestone(s) and/or Substantial Performance and Contract Completion date(s) or Scope of Work.
  - .2 The Contractor's progress, in the opinion of the Engineer, falls significantly behind, or deviates significantly from the Contract Schedule. The revised Contract Schedule shall reflect what actions the Contractor will take to recover lost time and bring the Contract back on schedule, or revise the Contract Schedule to reflect more significantly the execution of the Work. The restraints, Milestones and/or Substantial Performance Contract and/or Completion dates are not to be revised in this case except by approval of the Engineer.

- 6.4 No additional costs will be allowed to the Contractor for overtime, additional manpower, equipment, additional shifts, or similar requirements, if such expediting procedures or measures are necessary to meet the approved Milestone(s) and/or Substantial Performance and Contract Completion date(s).
- 6.5 The Contractor shall the revised schedule using the revision date as the data date and reflecting actual as-built data from Notification of Award through to the date of such revision.
- 6.6 The Contractor shall also revise if necessary, the activity cost distribution and shall also revise if necessary, the estimated monthly cash expenditure(s).
- 6.7 The Contractor shall provide all of the above within fourteen (14) calendar days of notification by the Engineer that such revision is deemed necessary.

## **7 SUSPENSION OF PAYMENTS**

- 7.1 Should the Contractor fail to provide regular schedule updates, and revisions in a timely manner the Engineer may suspend interim progress payments.

## **8 CONTRACT DURATION**

- 8.1 A schedule which shows that the Work will be completed after the required Milestones and/or Substantial Performance and/or Contract Completion date(s) will not be accepted.
- 8.2 A schedule which shows the Work to be completed in less time than required by the Contract Documents shall be considered to have Contract float. Contract float is the duration between the Contractor's target completion date and the completion date required by the Contract Documents.
- 8.3 "Contract float" shall be considered as a "resource" available to both parties to the Contract and shall be utilized in a manner approved by the Engineer.
- 8.4 Time extensions shall not be granted for delays in parts of the Work, whether changed by Contract Change or not, until all float time available for all parts of the Work involved is used, including the "Contract float".

## **9 WEEKLY WORK SCHEDULE**

- 9.1 The Contractor shall submit a two (2) week look ahead schedule on every Friday or the following working day (if Friday is a holiday) showing the work to be carried out in the following two (2) weeks.

END OF SECTION

**1 GENERAL**

1.1 Be responsible for the following:

- .1 Accuracy and completeness of submittals prior to submission.
- .2 Verification of field measurements, field construction criteria, catalogue numbers and similar data.
- .3 Co-ordination of each submittal with requirements of the Work and Contract Documents.
- .4 Notifying the Engineer in writing at time of submission, of any deviation in submittals from requirements of the Contract Documents.

1.2 Make submittals well in advance of schedule dates for fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.

1.3 Accompany each submittal with a letter of transmittal containing all pertinent information required for identification and checking of submittals.

.1 Basic submission information to be included on each letter of transmittal includes:

- .1 Sender's name and address.
- .2 Intended receiver's name and address.
- .3 Unique transmittal identifier.
- .4 Date transmittal is sent.
- .5 Summary of what is being sent under cover of the transmittal.
- .6 What action the sender of the transmittal is expecting of the receiver.
- .7 Indication of attachments or if the document is stand-alone.

.2 Additional information to be included on each letter of transmittal dependant upon nature of submittal includes:

.1 Product Data

- .1 Technical specification section reference.
- .2 Product manufacturer's name and address.
- .3 Product supplier's name and address.
- .4 Planned manufacture date (if applicable).
- .5 Planned delivery date (if applicable).
- .6 Planned installation date (if applicable).
- .7 Dependant milestone date (if applicable).

.2 Shop Drawings

- .1 Technical specification section reference.
- .2 Drawing number(s).
- .3 Revision number.
- .4 Sheet number.
- .5 Contract change reference number.
- .6 Drawing description.

.3 Samples

- .1 Technical specification section reference.
- .2 Product manufacturer's name and address.
- .3 Product supplier's name and address.
- .4 Planned manufacture date (if applicable).
- .5 Planned delivery date (if applicable).
- .6 Planned installation date (if applicable).
- .7 Dependant milestone date (if applicable).
  
- .4 Plan
  - .1 Technical specification section reference.
  - .2 Dependant milestone date (if applicable).
  
- .5 Report
  - .1 Technical specification section reference.
  - .2 Report author.
  
- .6 Certificate
  - .1 Technical specification section reference.
  
- .7 Documentation
  - .1 Technical specification section reference.
  
- .8 Schedule
  - .1 Time period covered.
  
- .9 Warranty
  - .1 Technical specification section reference.
  - .2 Product manufacturer's name and address.
  - .3 Product supplier's name and address.
  - .4 Warranty start date and duration.
  
- .10 List
  - .1 Technical specification section reference.
  
- 1.4 Allow a minimum of fourteen (14) calendar days for the Engineer's review of each submission unless otherwise specified.
  
- 1.5 Provide re-submissions under a new letter of transmission. Include reference to the previous submittal.
  
- 1.6 Do not carry out Work until submittals have been reviewed by the Engineer.
  
- 1.7 Responsibility for errors and omissions in submittals or in the Work, is not relieved by the Engineer's review of submittals.
  
- 2 **SAMPLES**
  
- 2.1 Before delivery of Products to the Site, submit samples of Products as required by the Specifications or as additionally requested by the Engineer.



- 2.2 Affix legible labels to samples with sample specific information. Minimum information is to be included:
- .1 Technical specification number.
  - .2 Product origin and manufacturer.
  - .3 Intended use in the Work and to requirements of Specifications.
- 2.3 Samples must represent physical examples to illustrate materials, equipment or work quality and to establish standards by which completed Work is judged.
- 2.4 Ensure samples are of sufficient size and quantity, if not already specified, to illustrate:
- .1 The quality and functional characteristics of product or material, with integrally related parts and attachment devices.
  - .2 Full range of colours available.
- 2.5 After Engineer's review, samples may be used in construction of the Work.

**3 SHOP DRAWINGS**

- 3.1 Submit shop drawings in accordance with Section 01340.

**4 TEST REPORTS AND CERTIFICATES**

- 4.1 Clearly show on each certification, the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery, and name of manufacturer or fabricating company. Ensure certificates are signed by an authorized representative of the manufacturing or fabricating company.

**5 CERTIFICATION OF PERSONNEL**

- 5.1 Provide certificates to establish qualifications of personnel employed on the Work where such certification is required by authorities having jurisdiction, by the Engineer or by the Contract Documents.

**6 CONTRACT SCHEDULES**

- 6.1 Submit Contract Schedules in accordance with Section 01320.

END OF SECTION

- 1        **GENERAL**
- 1.1      Arrange for the preparation of shop drawings as called for in the Contract Documents.
- 1.2      Before submitting to the Engineer, review all shop drawings to verify conformance to the Contract Documents. This review signifies agreement that all field dimensions, field construction criteria, construction methods, erection details, article and equipment attachments and connections, materials, catalogue numbers and similar data have been checked and each shop drawing has been coordinated with the requirements of the Work and of the Contract Documents. Indicate review of each shop drawing by Contractor or authorized qualified person by stamp, date and signature.
- 1.3      Submit shop drawings for the Engineer's. At the time of submission, the Contractor shall notify the Engineer in writing of any deviations in the shop drawings from the requirements of the Contract Documents.
- 1.4      The Engineer will review and return the shop drawings. The Engineer's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Engineer.
- 1.5      Make any changes in shop drawings which the Engineer may require consistent with the Contract Documents and re-submit unless otherwise directed by the Engineer. When re-submitting the shop drawings, notify the Engineer in writing of any revisions other than those requested by the Engineer.
- 1.6      Drawings submitted by the Contractor as required herein are the property of CSE who may use and duplicate such drawings where required in association with the work of CSE.
- 1.7      Shop drawings shall have distinct, uniform letters, numerals and line thicknesses that will ensure the production of clear legible prints and also facilitate microfilming and reduced reproduction.
- 1.8      Shop drawings shall contain the following identification:
  - .1      CSE's Contract number.
  - .2      Applicable Contract Drawing number(s).
  - .3      Applicable 5-digit Specification Section number specifying the item.
  - .4      Location (facility, station, unit, level, room number, etc.).
  - .5      Name of Product.
  - .6      Name of the Subcontractor or supplier.
  - .7      Stamp, date and signature confirming the Contractor's review.

- 1.9 On submissions subsequent to the first, shop drawings shall contain the following additional identification:
- .1 CSE's shop drawing number.
  - .2 The revision number.
  - .3 Identification of the item(s) revised.
- 1.10 Dimensions and designations of elements shown in the same system of measurement used on the applicable Contract Drawings.
- 1.11 Duplicate reproductions of Contract Drawings submitted as shop drawings will not be accepted.
- 1.12 The Engineer reserves the right to refuse acceptance of shop drawing submissions not meeting the above requirements.
- 1.13 Reviewed shop drawings will be returned to the Contractor. If marked "Returned for Correction", a full re-submission is required prior to commencement of fabrication. If marked "Reviewed as Modified", fabrication can commence but a full re-submission is required with the record documents in accordance with Section 01830. If marked "Reviewed", no further submission is required and fabrication can commence.
- 1.14 No work on any items for which shop drawings are required shall commence until the shop drawings are returned to the Contractor marked "Reviewed" or "Reviewed as Modified".
- 1.15 The Contractor is responsible for dimensions to be confirmed and correlated at the 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 subtrades.

END OF SECTION

## 1 CONSTRUCTOR

- 1.1 For the purposes of the Contract, the term "constructor", as defined in the Occupational Health and Safety Act, shall mean The Contractor who shall be responsible for ensuring that the provisions of the statutes, regulations and by-laws pertaining to the duties, obligations and safe performance of the Work in accordance with the obligations of the "constructor" as set out in the Occupational Health and Safety Act are to be observed.
- 1.2 The Contractor pursuant to the Occupational Health and Safety Act as the "constructor", the Contractor's representative shall be responsible for ensuring that the provisions of statutes, regulations and by-laws pertaining to safe performance of the Work are observed and that the methods of performing the Work do not endanger the personnel employed thereon and the general public, and are in accordance with the latest edition of the Occupational Health and Safety Act.
- 1.3 Prior to the Contractor's representative being absent from the Site, the Contractor's representative will name another person, in writing to the Engineer, who is competent to assume these responsibilities. The Contractor shall advise the Engineer of any change in the individual identified as the Contractor's representative.
- 1.4 At the discretion of the Engineer, the "constructor" designation may be transferred to/from a Contractor at any time at no additional cost to the Owner.

## 2 PROJECT RESPONSIBILITIES

- 2.1 The Contractor's representative shall ensure that:
- .1 All measures and procedures prescribed by the following Acts and Regulations are carried out on Site:
- .1 The Occupational Health and Safety Act;
  - .2 The Regulations for Construction Projects;
  - .3 WHMIS Regulations;
  - .4 The Environmental Protection Act and regulations,
  - .5 All other legislation, regulations and standards as applicable.
  - .6 Notice of Project to the Ministry.
- 2.2 Every employer and every worker performing Work on the Site complies with all of the requirements referred to in 2.1.1 above. In addition to compliance with all occupational health and safety legislation, every employer and every worker performing Work on the Site is required to demonstrate a willingness to participate in occupational health and safety program(s).
- 2.3 The health and safety of workers, employees of the Engineer, Owner and the general public are protected in relation to the Work performed on the Site.
- 2.4 The Contractor shall, at no cost to the Owner, participate in any "Incident Investigation" when required by the Engineer in connection with Contractor's "Incident Reporting Procedure".

2.5 Willing compliance with occupational health and safety legislation and participation in safety programs designed to prevent incidents are conditions whereby persons are permitted on site. Failure to comply with occupational health and safety legislation, or willing participation in programs designed to prevent incidents may be cause for refusing persons from admission to the site.

2.6 The Contractor shall provide a "Site Orientation Program" that includes, but is not limited to the following items:

- .1 Site Safety.
- .2 Incident Reporting.
- .3 Emergency Situations.
- .4 Reporting of Hazards.

### 3 **JOINT HEALTH AND SAFETY COMMITTEE**

3.1 The Constructor shall be responsible for the establishment and operation of the Joint Health and Safety Committee as required by the Occupational Health and Safety Act.

### 4 **DELIVERABLES**

4.1 The Contractor shall deliver to the Engineer one week prior to commencing Work on Site:

- .1 The Contractor's Occupational Health and Safety Policy.
- .2 The Contractor's program to implement the Occupational Health and Safety Policy for the Contract, which will effectively prevent and control accidents for the Contract.
- .3 The Contractor shall provide a completed Ministry of Labour Form 1000, Registration of 'Constructors and Employers Engaged in Construction', to be retained at the Site while the Contractor is employed at the Site.

4.2 The Contractor shall deliver to the Engineer as required:

- .1 A copy of all communications with, and including all orders by, the Ministry of Labour or other occupational health and safety enforcement authority.
- .2 A copy of all accident/injury investigation reports. Each report must identify the cause of the accident/incident/injury and contain a statement of actions that will be taken to prevent a recurrence.
- .3 A copy of all inspection reports made by the Contractor in compliance with the employer's responsibility under the Occupational Health and Safety Act.
- .4 A copy of all safety information pertaining to the Contract made and furnished by the Contractor's own "Safety Personnel" or outside consultants/advisers engaged for the purpose of inspecting the workplace for occupational health and safety.

- .5 A verification that all workers in the employ of the Contractor on Site, have had a WHMIS training or refresher course within the last twelve months.
  - .6 A verification that all workers in the employ of the Contractor have had "Explosive Activated Tool Training" on the type of tools being used.
  - .7 A verification that the instruction manuals are on Site for all tools and equipment being used.
  - .8 A copy of the most recent workers compensation experience rating account and/or an insurance carrier's experience rating account.
  - .9 Statistical information for the purpose of determining injury frequency and severity rates (hours worked, first-aid injuries, medical aid injuries, lost time injuries, restricted workday injuries, near-miss accident/incident and significant occurrence data), in a timely manner as required by the Engineer.
  - .10 The immediate reporting to the Engineer of all instances that are defined in the Occupational Health and Safety Act as "Notices of Injuries" and "Occurrences" under Sections 51, 52 and 53, O. Reg. 213/91 S.11 and any occasion that a worker exercises their "Right to Refuse Unsafe Work" (compliance with Contractor's "Incident Reporting Procedures").
  - .11 A copy of a completed Ministry of Labour Form 1000, for every employer while employer is working on Site. Completed Forms 1000 are retained in the office of the Constructor.
- 4.3 The Engineer reserves the right to require additional or amended deliverables pertaining to safety during the duration of the Work at no additional cost.

## 5 **DUE DILIGENCE**

- 5.1 The Contractor acknowledges that it has read and understands the measures and procedures relating to occupational health and safety as prescribed in 2.1.1 above. The Contractor acknowledges and understands its duties as therein set out and hereby expressly undertakes and agrees to comply with all such requirements and standards in their entirety and at the Contractor's expense.
- 5.2 The Contractor further agrees to fully cooperate with all health and safety requirements, rules, regulations, standards and criteria set out in the Contract Documents, which agreement is in furtherance of the Contractor's duties and responsibilities under occupational health and safety legislation.
- 5.3 The Contractor agrees that if, in the opinion of the Engineer, the health and safety of a person or persons is endangered or the effective operation of the system put in place to ensure the health and safety of workers on the Site is not being implemented, the Engineer may take such action as it deems necessary and appropriate in the circumstances, including, without limitation, the following:
  - .1 Require the Contractor to remedy the condition forthwith at its own expense;

.2 Require that the Site be shut down in whole or in part until such time as the condition has been remedied;

5.4 If a lien is registered in respect to any monies held back, back-charged or assessed in accordance with these paragraphs, the Contractor shall consent to an order vacating such registration and shall indemnify CSE for any and all loss, whereby direct or consequential, which CSE may sustain as a consequence of such registration.

**6 SITE SAFETY PERSONNEL**

6.1 In the event the Engineer deems it necessary, because of the Work, the Contractor shall assign a "Competent Safety Person" to assist the Contractor's representative in the discharging of safety responsibility, at no additional cost to the owner.

END OF SECTION

**1 SPECIFIED PRODUCTS**

- 1.1 Work of this Contract is based on Products specified by:
- .1 Manufacturer's catalogued trade names and/or;
  - .2 References to standards (i.e. CAN, CGSB, CSA, ASTM, ULC, UL) or;
  - .3 Prescriptive Specifications or;
  - .4 Performance Specifications.
- 1.2 When one or more manufacturer's trade name is specified for a Product, any one of the specified Products will be acceptable. Products by other manufacturers are subject to the Engineer's review and acceptance as an equivalent substitution in accordance with the specified requirements for substitutions.
- 1.3 When more than one manufacturer's catalogued trade name Product is specified along with a referenced standard, any one of the specified Products will be acceptable on condition the Product complies with the referenced standard. Products by other manufacturers are subject to the Engineer's acceptance as an equivalent substitution in accordance with the specified requirements for substitutions.
- 1.4 When a Product is specified by reference to a standard only, the Contractor may select any Product that meets or exceeds the specified standard for the intended purpose. The onus shall be on the Contractor to establish that such Products meet the reference standard requirements. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such Products are compatible with the Work with which they are incorporated.
- 1.5 When a Product is specified by prescriptive or performance Specification, any Product meeting or exceeding the Specification will be accepted subject to Engineer's review.
- 1.6 When a Product is specified by reference to a standard or by prescriptive or performance Specification, upon request of the Engineer, obtain from the manufacturer, an independent testing laboratory report showing that the Product meets or exceeds the specified requirements.
- 1.7 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the Work.

**2 SUBSTITUTIONS**

- 2.1 Requests for substitutions will not be accepted prior to the Notification of Award. Substitutions will be considered by the Engineer provided that:
- .1 The proposed substitutions have been investigated and complete data is submitted in accordance with Sections 01330.



- .2 All data relating to changes in the Contract Schedule, if any, and relating to other Work have been submitted.
  - .3 A minimum of the same warranty is given for the substitution as for the original Product specified.
  - .4 All claims are waived for additional costs related to the substitution which may subsequently arise.
  - .5 Installation of the accepted substitution is co-ordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work, including changes to the Contract Drawings, at no extra cost to the Owner.
- 2.2 Substitutions to methods or process described in the Specifications or Contract Drawings, may be proposed for the review of the Engineer. Ensure that such substitutions are in accordance with the following requirements:
- .1 Time spent by the Engineer in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions to the Milestone, Substantial Performance, and/or Contract Completion dates. Allow a minimum of 5 working days for the Engineer to review. In any event, the Contractor will be solely responsible for any delay arising as a result of the Engineer's review of any request for substitution, if such request was made at the discretion of the Contractor.
  - .2 Clearly indicate how the proposed substitutions would be advantageous to the Owner or in the opinion of the Contractor would improve the operation of the installation.
  - .3 Be responsible for substitutions to methods or processes concerning such Work and ensure that the warranty covering all parts of the Work will not be affected.
  - .4 The cost of all changes in the work of Other Contractors, necessitated by the substituted methods or processes, if accepted, is borne by the Contractor.
  - .5 The substituted methods or processes fit into space allotted for the specified methods or processes.
  - .6 Make any Contract Drawing changes required for the substitutions at no cost to the Owner.
- 2.3 The Engineer may reject any request for substitutions at any time in the process if in the Engineer's opinion the proposed substitution is not submitted as a formal request in accordance with article 2.5 below and may:
- .1 Delay or adversely affect the Contract Schedule or disrupt the Work of the Contractor or any Other Contractor.
  - .2 Require substantial revision to the Specifications and/or Contract Drawings.
  - .3 Not offer any benefit to the Owner.

- 2.4 Do not substitute Products or methods or processes into the Work unless such substitutions have been specifically reviewed and accepted for the Work by the Engineer.
- 2.5 Accepted substituted Products shall be subject to the Engineer's inspection and testing procedure, including submission in conformance with Section 01330. Accepted substituted Products shall only be installed after receipt of the Engineer's review and written acceptance on Products Inspection Report.
- 2.6 After the Engineer's review and written acceptance on Products Inspection Report, the accepted substituted Product will be enumerated in the Submittal List.
- 2.7 The Owner will be entitled to any credit that may arise from acceptance of a substitution.

### **3 ACCEPTANCE OF PRODUCTS AND INSTALLATION METHODS**

- 3.1 Wherever in the Specifications it is specified that Products and installation methods shall meet acceptance of jurisdictional authorities, underwriters, the Engineer, or others, such acceptance shall be in writing.

### **4 TRADEMARKS AND LABELS**

- 4.1 Permanent labels, trademarks and nameplates on Products are not acceptable in locations visible to the public, except where required by authorities having jurisdiction, or for operating instructions.
- 4.2 Remove trademarks and labels by grinding, if necessary, painting out where the particular surface is being painted, or if on plated parts, replace with new plain plated or non-ferrous metal parts.

### **5 AVAILABILITY**

- 5.1 If delays in supply of Products are foreseeable, notify the Engineer of such, in order that remedial action may be authorized in ample time to prevent delay in performance of Work.
- 5.2 In the event of failure to notify the Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Engineer reserves the right to direct the Contractor to take the following measures at no increase in Contract Price.
  - .1 Substitute more readily available Products of similar or better quality and character, or
  - .2 Temporarily install another Product until such time as the specified Product becomes available, at which time the temporarily installed product shall be removed and the specified Product installed.

### **6 PRODUCT DELIVERY AND HANDLING**

- 6.1 Be responsible for handling and delivery of Products. Be responsible for all costs of delivery, loading and off-loading, and for transportation back to its origin for correction, if required, due to damage or defect.

- 6.2 Manufacture, pack, ship, deliver, and handle Products so that no damage occurs to structural qualities and finish appearance, nor in any other way which is detrimental to their function and appearance.
- 6.3 Ensure that Products, while transported, are not exposed to an environment which would increase their moisture content beyond the maximum specified.
- 6.4 Schedule early delivery of Products to enable Work to be executed without delay. Before delivery, arrange for receiving at Site.
- 6.5 Deliver packaged Products, in original unopened wrapping or containers, with manufacturer's seals and labels intact.
- 6.6 Label packaged products to describe contents, quantity, and other information as specified.
- 6.7 Labels attesting that materials conform to specified reference standards will be acceptable as verification that contents meet specified requirements. In the absence of labels, submit affidavits to validate conformance of Product to reference standards, as requested by the Engineer.
- 6.8 Hazardous Materials Information:
  - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets (MSDS) in accordance with Occupational Health and Safety Act.
  - .2 Before delivery to Site, and throughout the duration of the Contract, maintain on Site and make readily available to anyone on Site, Material Safety Data Sheets (MSDS). Maintain in the site office an up-to-date inventory showing quantity and storage location of all materials requiring an MSDS.
  - .3 Deliver copies of MSDS to the Engineer on all Products intended for use in the Work and designated as a "controlled product."

## 7 STORAGE AND PROTECTION

- 7.1 Be responsible for storage of Products. Limited storage of Products is permitted on the property.
- 7.2 Handle and store Products, in a manner to prevent damage, adulteration, deterioration and soiling to the Products, other building components, assemblies, other products, the structure, the Site and surrounding property, and in accordance with manufacturer's instructions when applicable.
- 7.3 Store packaged or bundled Products in original and undamaged condition. Keep manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.
- 7.4 Store Products subject to damage from weather in weatherproof enclosures.

- 7.5 Store cementitious Products clear of earth or concrete floors, and away from walls.
- 7.6 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.
- 7.7 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- 7.8 Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous material in bulk within the Work.
- 7.9 Store and mix paints in a heated and ventilated room. Remove oily rags and other combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion. Remove combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion.
- 7.10 Store Products so as not to create any overloading conditions to any part of the building, structure, falsework, form work and scaffolding.
- 7.11 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup specified in Section 01740. Protection shall be easily removable under work of Section 01740 without damage to finishes.
- 7.12 Touch-up damaged finished surfaces to Engineer's satisfaction. Use primer and paint to match original.

## **8 MANUFACTURER'S INSTRUCTIONS**

- 8.1 Unless otherwise indicated in the 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.
- 8.2 Notify the Engineer in writing, of conflicts between the Specifications and manufacturer's instructions, so that the Engineer may establish the course of action.
- 8.3 In cases of improper installation or erection of Products, due to failure in complying with these requirements, the Engineer may direct removal and re-installation at no increase in Contract Price.

## **9 WORKMANSHIP**

- 9.1 Ensure workmanship is of quality consistent with the technical specifications, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Engineer if required Work is such as to make it impractical to produce required results.
- 9.2 Do not employ any unfit person or anyone unskilled in their required duties. The Engineer reserves the right to require the dismissal from the Site, workers deemed incompetent, careless, insubordinate or otherwise objectionable.

- 9.3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Engineer, whose decision is final.
- 9.4 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.
- 9.5 Concealment
- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- 9.6 Compatibility of Dissimilar Materials
- .1 Do not permit materials to come in contact with other materials whether in presence of moisture or otherwise if conditions will result in corrosion, stain or discolouration or deterioration of completed Work.
- .2 Provide compatible, durable separators where such contact is unavoidable. Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.
- 10 **LOCATION OF FIXTURES**
- 10.1 The locations indicated for fixtures, outlets, and mechanical and electrical items are approximate, unless specifically dimensioned.
- 10.2 Consult with the Engineer to determine the actual location of items not dimensioned as may be required to suit job conditions.
- 10.3 Relocation caused by failure to determine the actual locations shall be executed at no increase in Contract Price.
- 11 **FASTENINGS**
- 11.1 Provide metal fastenings and accessories in same texture, colour, sheen and finish as adjacent materials, unless indicated otherwise.
- 11.2 Prevent electrolytic action between dissimilar metals and materials.
- 11.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, unless stainless steel or other material is specified.
- 11.4 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

- 11.5 Conceal fasteners where indicated. Keep exposed fastenings to a minimum, space evenly and install neatly.
- 11.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

END OF SECTION

**1 GENERAL**

- 1.1 The Contractor shall examine, protect and restore if damaged by the execution of the Work, all property adjacent to the Work or that may be affected by the Work, including all equipment and services within the properties.

**2 EXAMINATION OF STRUCTURES**

- 2.1 The Engineer has inspected those properties which, in the opinion of the Engineer, are most likely to be affected by the Work. Inspection reports (as applicable) for these properties will be supplied to the Contractor before the start of construction.
- 2.2 The Contractor, the Engineer and the structure owner shall jointly examine each of these properties prior to the start of construction. Amendments to the inspection reports, if required, will be carried out by the Engineer. The reports shall then be signed by all three parties.
- 2.3 The Contractor, the Engineer and the structure owner shall jointly re-examine each of these properties after construction is completed to record condition differences.
- 2.4 The restriction of joint examination to specific properties does not relieve the Contractor of its responsibility for the examination, protection and restoration of all property adjacent to the Work or which may be affected by the Work.

**3 ACCESS TO PROPERTY**

- 3.1 The Engineer will obtain permission from property owners to enter the property.

**4 EQUIPMENT AND SERVICES WITHIN THE PROPERTY**

- 4.1 Locate, protect, support and maintain all equipment and services affected by the Work.
- 4.2 On completion, restore equipment and services to their original condition, and relocate where necessary, to the satisfaction of the Engineer.

**5 RESTORATION**

- 5.1 Repair and restore any part of the property including equipment and services broken or damaged by operations performed under the Contract.

END OF SECTION

**1 DURING CONSTRUCTION**

- 1.1 Carry out cleaning to maintain the Yard, Work Site and Public Properties free from accumulations of waste materials and rubbish.
- 1.2 Provide on-site containers for collection of waste material, debris and rubbish.
- 1.3 Dispose of waste materials and rubbish off-Site at regular intervals during progress of Work.
- 1.4 Upon completion of any portion of the Work, promptly remove all equipment and surplus materials not to be used at or near the same location during later stages of the Work.
- 1.5 Schedule cleaning operations to prevent dust and other contaminants falling on wet, newly painted surfaces.

**2 SUBSTANTIAL PERFORMANCE**

- 2.1 When the Work is substantially performed, remove surplus Products, tools, construction machinery and equipment not required for the performance of the remaining Work.
- 2.2 Use cleaning materials as recommended by manufacturers of material where surfaces are to be cleaned.
- 2.3 Remove grease, dust, dirt, stains, labels, fingerprints, oxidization and other contaminates from interior and exterior surfaces including glass, plastic and other materials. Clean all lighting components including lighting reflectors, lenses and other lighting surfaces.
- 2.4 Broom clean and wash exterior walks, steps and surfaces. Rake clean exterior grassed areas and planting beds.
- 2.5 Remove dust, dirt and other foreign materials from exposed surfaces.
- 2.6 Vacuum clean and dust building interiors, including grilles, louvres and screens.
- 2.7 Remove stains, spots, marks and dirt from decorative Work, electrical and mechanical fixtures, floors and walls.
- 2.8 Repair, patch and touch-up marred surfaces to specified finishes to match adjacent surfaces.

**3 COMPLETION OF THE WORK**

- 3.1 Leave all areas worked in since Substantial Performance in the condition specified under Substantial Performance.
- 3.2 Upon completion of the Work, remove all plant, temporary buildings, surplus materials, rubbish and other equipment, tools and materials from the spaces and leave the Site in a neat, clean and safe condition acceptable to the Engineer.

END OF SECTION



1           **RECORD DRAWINGS**

- 1.1           Deviations from the Contract shall be marked accurately on one set of Contract Drawing prints in red and in a neat, legibly printed manner and shall be dated. Upon Contract Completion and prior to final inspection, neatly transfer the recorded information to a second set of Contract Drawing prints of the most recent revision to the drawings and submit both sets to the Engineer.
- 1.2           Maintain record drawings up to date as Work progresses. The status of the maintained record drawings may be considered as a condition for validation of applications for payment.
- 1.3           Identify each record drawing as "Contract Record Copy" and maintain the drawings in good condition. Make record drawings available to the Engineer at all times. Do not use for construction purposes.
- 1.4           Record accurately all deviations in the Work caused by:
- .1           Site conditions and deviations originated by the Engineer, and/or by the Contractor.
  - .2           Site instructions.
  - .3           Supplementary instructions.
  - .4           Field orders.
  - .5           Contract Changes.
  - .6           Addenda.
  - .7           Correspondence.
  - .8           Directions of jurisdictional authorities.
  - .9           Shop drawing revisions.
- 1.5           Accurately record locations of subsurface and concealed physical conditions such as buried utilities and services, structures, mechanical and electrical services and similar Work not clearly in view, the location of which is required for maintenance, alteration work and future additions. Do not conceal such Work until the location has been recorded.

END OF SECTION

1           General

1.1          **SECTION INCLUDES**

- .1   Labour, Products, equipment and services necessary for masonry Work in accordance with the Contract Documents.

1.2          **REFERENCES**

- .1   ASTM C207, Specification for Hydrated Lime for Masonry Purposes.
- .2   CAN/CSA A5/A8/A362, Portland Cement/Masonry Cement/Blended Hydraulic Cement.
- .3   CAN3 A165 Series-M, CSA Standards on Concrete Masonry Units.
- .4   CAN3 A370-M, Connectors for Masonry.
- .5   CAN3 A371-M, Masonry Construction for Buildings.
- .6   CAN3 S304-M, Masonry Design for Building.
- .7   CAN/CSA A82.1-M, Burned Clay Brick (Solid Masonry Unit Made from Clay or Shale).
- .8   CAN/CSA G30.3-M, Cold-drawn Steel Wire for Concrete Reinforcement.
- .9   CAN/CSA G30.18-M, Billet-Steel Bars for Concrete Reinforcement.
- .10  CSA A179, Mortar and Grout for Unit Masonry.

1.3          **SUBMITTALS**

.1   Shop drawings:

- .1   Submit shop drawings in accordance with Section 01340. Verify field measurements.
- .2   Indicate special detailing, patterning and locations of control and expansion joints.

.2   Samples:

- .1   Submit samples in accordance with Section 01330
- .2   Submit samples of each masonry unit used, prior to placing order.
- .3   Submit samples of coloured mortar to match masonry samples.
- .4   Submit samples of masonry anchors, and ties.
- .5   Submit 250 mm long samples of backer rod and masonry sealant.
- .6   Submit 250 x 200 mm samples of dampproof course and flashing.

.3   Quality control submittals:

- .1   Submit manufacturer's certificates stating that materials supplied are in accordance with this Specification.

1.4          **QUALITY ASSURANCE**

- .1   Regulatory Requirements: Supply and install plain and reinforced masonry designed in accordance with CAN3-S304-M.

1.5          **DELIVERY, STORAGE, AND HANDLING**

- .1   Comply with CAN3-A371-M.

- .2 Keep masonry materials free from ice and frost. Keep units protected from concrete, mortar and other materials which could cause staining.

## 1.6 **SITE CONDITIONS**

- .1 Do not lay masonry when ambient temperature is at or below 5°C unless temporary protection and heating is maintained until mortar has completely set. Supply and install temporary protection and heating for installed, uncured unit masonry when ambient conditions are at, below, or are likely to go below 5°C, until 7 Days after installation.
- .2 Conform to cold weather masonry requirements of CAN3-A371-M and Recommended Practices for Cold Weather Masonry Construction by Ontario Masonry Contractors' Association.

## 2 Products

### 2.1 **MATERIALS**

- .1 Standard concrete block units: CAN3 A165 Series-M, Classification H/15/A/M, S/15/A/M or Sc/15/A/M, [Ledge Block] [Profile Block, with 2 (3) face scores]; sizes as indicated on Contract Drawings.
- .2 Lightweight concrete block units: CAN3 A165 Series- M, classification H/15/C/M, S/15/C/M or Sc/15/C/M, sizes as indicated on Contract Drawing.
- .3 Acoustical concrete block units: CAN3 A165 Series-M, Classification H/15/C/M, with slots and having a noise reduction coefficient of minimum 0.65, [modular] [ 600 mm x 300 mm x 200 mm] size.
- .4 control joints, solid block where noted, concrete block lintels over openings in concrete block walls and any additional special shapes as indicated.
- .5 Obtain each masonry unit type from same manufacturer. Supply and install units of uniform texture and colour for each kind required.
- .6 Supply masonry units with exposed surfaces free of cracks, chips, blemishes, and broken corners.
- .7 Reinforcing steel: CSA G30.18-M, Grade 400, refer to Contract Drawings for number, size, and location.
- .8 Compressible filler: 75 x 13 mm x continuous roll; Sof-Joint Seal by Emseal Ltd.
- .9 Loose steel lintels and lateral support angles: Supplied as part of Work of Section 05500.
- .10 Mortar net: 250 mm high x thickness to suit cavity; Mortar Net by Mortar Net USA Ltd.
- .11 Concrete fill: 20 MPa compressive strength concrete in accordance with Section 03300.

- .12 Mortar for brick: CSA A179, Portland Cement - Lime Mortars Type N for exterior walls, for interior non-load bearing walls; Type S, load bearing walls.
- .13 Mortar for block: CSA A179, Portland Cement - Lime Mortars, Type S for interior, and load bearing; Type M for foundations below grade.
- .14 Pointing mortar for prefaced concrete block units: [Colour: As selected by Engineer].
- .15 Cement: CAN/CSA A5/A8/A362 [white] normal Portland.
- .16 Hydrated lime: ASTM C207, Type S.
- .17 Masonry sand: CSA A179 [white].
- .18 Water: Clean potable, free from deleterious elements and free from salts that can cause efflorescence.
- .19 Mortar pigment: Extra Strong Mortar Colours by Harcross Limited.

### 3 Execution

#### 3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.

#### 3.2 PROTECTION

- .1 Supply and install temporary waterproof, non-staining coverings, secured against displacement, to extend over walls and down sides to protect masonry Work from snow and wind driven rain, and from drying too quickly, until masonry Work completed and protected by flashings or other permanent construction.
- .2 Supply and install non-staining, protective coverings on horizontal and vertical surfaces to protect Work of this Section from damage, staining, marking, and mortar droppings.

#### 3.3 WORKMANSHIP

- .1 Perform masonry Work in accordance with CAN3 A371-M and as indicated.
- .2 Supply and install masonry Work plumb, level and true to line, with vertical joints in alignment and horizontal courses level, uniform, and straight.
- .3 Minimize use of cut masonry units.
- .4 Distribute variations in colour, texture, and shading evenly throughout masonry Work.

#### 3.4 MASONRY - GENERAL INSTALLATION

- .1 Install masonry Work to a plane flatness and exposed end tolerance of 3 mm in 2400 mm.

- .2 Do not butter corner units, throw mortar droppings into joints, or excessively furrow bed joints. Do not shift or tap units after mortar has taken initial set. If adjustment is necessary after mortar has started to set, remove and replace with fresh mortar.
- .3 Do not use admixtures without Engineer's written acceptance.
- .4 Tool mortar joints slightly concave with non-staining tools unless indicated otherwise and except where waterproofing is scheduled. Strike joints flush in non exposed areas or where shown on Contract Drawings. Use sufficient force to press mortar tight against masonry units on both sides of joints. Remove excess, remaining mortar material and burrs.
- .5 Install masonry walls 25 mm clear of underside of steel building frames, roof or floor deck. [Install masonry with a 19 mm space beneath shelf angles and install compressible filler.]
- .6 Cut masonry units straight with clean, even sharp unchipped edges. Cut units as required, for pattern shown, to fit adjoining Work neatly or for flush mounted electrical outlets, grilles, pipes, conduit, leaving 3 mm maximum clearance. Use full-size units without cutting wherever possible.
- .7 Reinforce masonry walls with continuous masonry/cavity wall reinforcement in every second block and every sixth brick course. In cavity veneer walls extend reinforcement from interior masonry, spanning over cavity into exterior wythe. Supply and install prefabricated L and T sections. Cut, bend and lap reinforcing units as per manufacturer's printed directions for continuity at returns, offsets, pipe enclosures, and other special conditions. Bending of masonry reinforcement or ties is not permitted.
- .8 At openings supply and install extra masonry/cavity wall reinforcement, so that first and second courses above and below openings are reinforced. Extend extra reinforcement 600 mm beyond opening in each direction.
- .9 Install masonry with 10 mm thick joints unless indicated otherwise.
- .10 Maintain plank in cavity and lift as Work progresses.
- .11 Build control joints in masonry walls at intervals and in locations shown. Form joints using sash block units in accordance with details shown. Fill chase and joint with joint filler full height of control joints. Leave a depth of 13 mm for sealing unless otherwise shown.
- .12 Supply and install solid block or metal lath under block and fill block cells solid for lintel bearing and as required to secure built-in anchor bolts and/or anchors as shown.
- .13 Do not tooth intersections of walls except [at existing walls and] as otherwise indicated.
- .14 Supply and install exterior inspection ports in cavity walls by leaving out every sixth brick (or third block) of first course over damp proof courses and flashing until wall panel supported by that course of units is constructed and reviewed. Clean cavity and obtain Engineer's review prior to filling-in inspection ports to match adjacent masonry.

- .15 Install cavity vents in accordance with manufacturer's directions, in exterior wythe of masonry above dampproof courses and flashings. Space cavity vents maximum 600 mm o.c. horizontally. Prevent cavity vents from becoming plugged with mortar or debris.

### 3.5 **DAMPPROOF COURSES AND FLASHING**

- .1 Install dampproof courses beneath first masonry bearing course on slabs-on-grade and at foundation walls. Trim dampproofing to conceal it.
- .2 Install flashings in masonry in accordance with CAN3 A371-M.
- .3 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings and elsewhere as indicated. Where flashings occur over openings in walls extend them past openings a minimum of 200 mm and turn up minimum 150 mm at each end to create a waterproof dam to prevent water draining into cavity.
- .4 Lap dampproofing and flashing 150 mm and seal in accordance with manufacturer's instructions.
- .5 In cavity walls install flashings continuously from front edge of masonry, under outer wythe, turn up backing minimum 200 mm; if concrete backing, insert flashing into reglets; for masonry backing, embed flashing 25 mm in joint.
- .6 At bottom of cavity install mortar net to manufacturer's instructions. Apply additional mortar net layer as required to fill cavity. Place net in continuous layer.
- .7 Before brickwork begins, place dampproofing as specified under first course of brick. Install continuous dampproofing with ends lapped and cut flush with exterior face of wall. Place similar dampproofing over top course.

### 3.6 **MORTAR**

- .1 Measure and batch mortar materials either by volume or weight, to accurately control and maintain proportions. Do not measure materials by shovel.
- .2 Mix mortar with maximum amount of water consistent with workability for maximum tensile bond strength within capacity of mortar.
- .3 Do not use mortar which has begun to set. Use mortar within 2 1/2 hours after initial mixing. Re-temper mortar during 2 1/2 hour period only as required to restore workability.

### 3.7 **CONCRETE BLOCK**

- .1 Lay blocks in running bond except as indicated otherwise. Align block webs vertically and install thicker ends of face shells up.
- .2 Install a full bed of mortar for first courses of masonry, for masonry units 100 mm thick and less, and between solid units. For remaining courses bed face shells, including vertical end joints, fully in mortar.

- .3 Install special shaped and sized concrete block units as indicated and as required for a complete and coordinated assembly and to minimize cut units.
- .4 Supply and install two courses of solid block beneath lintel bearing.
- .5 Stagger end joints in every course. Align joints plumb over each other in every other course.
- .6 Bond intersecting block walls in alternate courses. Where blockwork abuts concrete, anchor each block course to concrete.
- .7 For veneer walls, construct inner wythe to full panel height with full joints struck flush on cavity side before proceeding with balance of cavity wall construction.
- .8 Lay prefaced concrete block with a [running] [stack] bond. [Coursing height is 200 mm for one block and one joint.] Before mortar hardens rake joint to 10 mm depth, clean block faces using soft cloths. After completion of block laying fill joints with pointing mortar, point to concave joints. Repeat cleaning of faces.

### **3.8 LINTELS AND LATERAL SUPPORT ANGLES**

- .1 Install concrete block lintels over openings in masonry except where steel lintels are indicated.
- .2 Set lintels with minimum of 200 mm uniformly distributed bearing at each end.
- .3 Install reinforcing steel and concrete fill in block lintels.
- .4 Install loose steel lintels, as indicated in Contract Drawings. Centre over opening width.
- .5 Install lateral support angles at 1200 mm o.c. along concrete block walls.

### **3.9 BRICK**

- .1 Lay brick in running bond, unless indicated otherwise, and in a full bed of mortar.
- .2 Form angle corners with special shaped brick; cutting of brick is not permitted.
- .3 Erect exterior cavity wall construction as shown on Contract Drawings.
- .4 Install brick to prevent mortar droppings and protrusions from impeding drainage and pressure equalization of rainscreen cavities and drained walls.
- .5 Apply sufficient mortar on end of stretchers to ensure end joints are compressed full when brick is pressed into place. Install inspection port fill-in closures with fully mortared joints on all contacting sides of closure brick.
- .6 Tie brick to cast-in-place concrete substrates for heights over 400 mm with masonry ties secured to cast-in-place concrete back-up at not over 300 mm o.c. vertically and 600 mm horizontally.

### **3.10 BUILT-IN ITEMS**

- .1 Coordinate and locate build-in items required to be built into masonry or supplied under Work of other Sections including hollow metal doors, frames, and screens, anchors, lintels, anchor bolts, sleeves, inserts, shelf angles, masonry flashings, etc. Build-in items to present a neat, rigid, true and plumb installation.
- .2 Build wall openings, slots, and recesses required for ducts, grilles, pipes and other items.
- .3 Coordinate installation of conduit, outlet boxes and other mechanical and electrical built-ins with Work of Divisions 15 and 16.
- .4 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as Work progresses.
- .5 Brace door jambs to maintain plumbness. Set anchors between metal frames and masonry and fill voids between hollow metal frames and masonry walls with mortar.

3.11 **REPAIR AND POINTING**

- .1 Remove and replace masonry units which are loose, chipped, broken, cracked, marked, stained, discolored, or otherwise damaged, or if units do not match adjoining units as intended. Supply and install new units to match adjoining units and install in fresh mortar, and point to eliminate evidence of replacement.
- .2 During tooling of joints, enlarge any cracks, holes, or other defects, point and completely fill with mortar.
- .3 Point-up joints including corners, openings and adjacent Work for a neat, uniform appearance, properly prepared for application of sealant compounds.

3.12 **CLEANING**

- .1 Obtain and follow unit masonry manufacturer's written instructions for cleaning of masonry.
- .2 Clean exposed, masonry surfaces, removing excess mortar as Work progresses. Dry brush installed masonry at end of each day's Work.
- .3 Remove mortar with wood paddles and scrapers before wetting. Saturate masonry with clean water and flush off loose mortar and dirt. Clean blockwork using water, scrubbing brushes and wood paddles only.
- .4 Remove efflorescence in accordance with unit masonry manufacturer's written instructions, subject to Engineer's review and acceptance of materials and methods.
- .5 Clean prefaced concrete block units with a clean, soft sponge or brush and clean water; polish with soft, clean cloths.

END OF SECTION



1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for the structural steel Work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM A325M, Specification for Structural Bolts, Steel, Heat Treated, 102/105 ksi Minimum Tensile Strength.
- .3 ASTM A563M, Specification for Carbon and Alloy Steel Nuts (Metric).
- .4 ASTM C1107 Specification for Hydraulic Cement Grout (Non-Shrinkable) Packaged/Dry.
- .5 ASTM F436, Specification for Hardened Steel Washers.
- .6 CAN/CSA-G40.20M/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steels.
- .7 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .8 CAN/CSA S16.1-M, Limit States Design of Steel Structures.
- .9 CSA S136, Cold Formed Steel Structural Members.
- .10 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- .11 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .12 CSA W59-M, Welded Steel Construction (Metal Arc Welding) (Metric Version).
- .13 CSA W59-S1-M, Supplement No. 1 to W59-M1989 Welded Steel Construction (Metal Arc Welding).
- .14 CAN/CGSB-1.40-M, Primer, Structural Steel, Oil Alkyd Type.
- .15 CAN/CGSB 1.181, Ready Mixed Organic Zinc-Rich Coating.
- .16 CGSB 85-GP-14M, Painting Steel Surface Exposed to Normally Dry Weather.
- .17 CISC Handbook of Steel Construction.
- .18 SSPC Steel Structures Painting Council.

**1.3 DESIGN REQUIREMENTS**

- .1 Design details and connections in accordance with requirements of CAN/CSA S16.1-M and CSA S136 to resist forces, moments, shears indicated or implied and handling, transportation, erection loads and as indicated on the Contract Drawings.
  - .1 Include in design for connections between columns, beams, girders, trusses and braces, and between such members as spandrel angles and beams, hangers, stiffeners and their supporting members.
  - .2 Standard connections such as connections for shear only:
    - .1 Select shear connections from the CISC Handbook of Steel Construction.
    - .2 If forces are not indicated, select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, if no point loads act on beam, assuming fully supported compression flange.
  - .3 Non-standard connections: Designed and stamped by a Professional Engineer licensed in the Province of Ontario.
- .2 Structural design to accommodate active loads including live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .3 Design connections:
  - .1 To safely withstand the combined effects of shear, moment, and torque at applicable design stresses.
  - .2 Taking into account any eccentricity.

**1.4 SUBMITTALS**

- .1 Shop drawings:
  - .1 Submit shop drawings.
  - .2 Include shop and field splices, cuts, copes, camber, connection details, holes, reinforcements, bearing plates, welds, anchors, identification marks, surface preparation and finishes.
  - .3 Indicate welds in accordance with CSA W59-M welding symbols standard.
  - .4 Submit sketches and design calculations for structural members and connections with the corresponding shop drawings.
- .2 Erection drawings:
  - .1 Submit erection drawings.
  - .2 Indicate details and information necessary for assembly and erection purposes such as description of methods, member identification, sequence of erection, type of equipment used in erection, and temporary bracings.
  - .3 Reproduction of the Contract Drawings for use as erection drawings is not permitted. Do not use Contract CADD files.

.3 Test reports:

- .1 4 weeks minimum, prior to structural steel fabrication, submit 2 copies of mill test reports by steel manufacturer indicating chemical and physical properties of steel to be used in the Work and confirming that tests completed conformed to the requirements of CAN/CSA-G40.20M/G40.21M.

.4 Certifications:

- .1 Submit certifications for welding companies under division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and CSA W55.3 for resistance welding of structural components.
- .2 Submit confirmation by the design engineer that fabrication and erection complies with the Contract Documents.

.5 Inspection reports:

- .1 Submit field reports of shop and field inspections.

1.5 **QUALITY ASSURANCE**

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in design, fabrication, and erection of structural steel Work of comparable complexity and scope, to perform following services as part of Work of this Section:
  - .1 Design of structural members and connection.
  - .2 Stamp, and sign shop and erection drawings, design calculations, and amendments.
  - .3 Review and report on manufacturer and fabricator quality control tests and reports for compliance with the Contract Documents.
  - .4 Conduct fabrication and erection inspections, and prepare and submit written inspection reports verifying that the Work is in accordance with the Contract Documents and reviewed shop and erection drawings.

1.6 **DELIVERY, STORAGE, AND HANDLING**

- .1 Exercise care in handling primer finished materials. Do not handle steel until primer paint has cured sufficiently to handle without damage to same. Use nylon slings for handling and a combination of wood or polystyrene blocking between units, in stockpile and in transit. Schedule and sequence the Work so a minimum of handling occurs prior to erection.

2 Products

2.1 **MATERIALS**

- .1 Rolled structural steel shapes, and flat hot-rolled steel Products: CAN/CSA G40.20/G40.21, Grade 300W or as indicated.
- .2 Hollow structural sections: CAN/CSA G40.20/G40.21, Grade 350W, Class H.
- .3 Beam connections, columns, base plates and beams: CAN/CGSB G40.20/G40.21.

- .4 Surface preparation: Remove moisture, oil, grease, dirt, excessive rust, loose mill scale, and clean to SSPC SP6 - Commercial aggregate blast.
- .5 Shop touch-up paint primer (prime painted steel): CAN/CGSB-1.40-M.
- .6 Hot dip galvanizing: CSA G164-M; minimum zinc coating of 600 g/m<sup>2</sup>.
- .7 Shop touch-up primer (galvanized steel): CAN/CGSB-1.181.
- .8 Welding materials: CSA W59-M and certified by the Canadian Welding Bureau.
- .9 Anchor bolts: ASTM A307, Grade C, with hexagon heads and nuts, lengths shown with a minimum of 13 mm projecting beyond the nut. Nuts: ASTM A563.
- .10 High strength bolts: ASTM A325M, Type 1, heavy hexagon high strength bolts, of standard size, of lengths required for thickness of members joined and for type of connection.
  - .1 Lock washers, lock nuts, burr thread to prevent bolts from working loose.
  - .2 ASTM A563; Hexagon semi-finished nuts.
  - .3 ASTM F436; Flat, smooth hardened washers, quenched and tempered.
  - .4 Nylon Grommets to match existing installation.
- .11 Field touch-up primer (prime painted steel): CAN/CGSB-1.40-M.
- .12 Field touch-up primer (galvanized steel): CAN/CGSB-1.181

## 2.2 **FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA S16.1-M and CISC Handbook of Steel Construction fabrication tolerances except as indicated otherwise.
- .2 Splicing of members is not permitted except as shown on the Contract Drawings or as accepted by the Engineer.
- .3 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA S16.1-M.
- .4 Prime structural steel shop steel except if galvanized finish is indicated.
- .5 Do not paint surfaces which will be embedded in concrete.
- .6 Continuously weld structural steel members.
- .7 Grind shop fabrication welds smooth.
- .8 Fabricate structural steel members true and without twists or open joints.
- .9 Weld in accordance with CSA W59 and CSA W59S1.

- .10 Fabricate properly sized holes to accommodate other parts of the Work including holes required for attachment; locate holes to prevent appreciable reduction of structural member strength. Reinforce openings as necessary to maintain strength of structural members.
- .11 Fabricate HSS members with sufficient holes to prevent the accumulation of water.

### 2.3 **STRUCTURAL GROUT**

- .1 Pre-mixed, flowable, non-shrink grout without aggregate fillers: Masterflow 713 by Master Builders Technologies Ltd.; M-Bed OH by Stenson Ltd.

### 3 Execution

#### 3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.
- .2 Obtain the Engineer's written approval prior to field cutting or altering of structural members.

#### 3.2 **MARKING**

- .1 Mark materials in accordance with CAN/CSA G40.20M/G40.21M; do not use die stamping.
- .2 Match marking: Mark bearing assemblies and splices in shop for fit and match.

#### 3.3 **STRUCTURAL STEEL ERECTION**

- .1 Supply and coordinate the location and placement of anchor bolts, and support bracket.
- .2 Erect structural steel in accordance with accepted shop and erection drawings and tolerances of CAN/CSA S16.1-M and CISC Handbook of Steel Construction tolerances except restrict the maximum variation in elevation to 6 mm.
- .3 Splicing of members is not permitted except as shown on the Contract Drawings or as accepted by the Engineer.
- .4 Set steel accurately to lines and elevations indicated. Set column bases and shim to proper elevations. Install structural grouting in accordance with details and the manufacturer's recommendations.
- .5 Assemble structural steel members true, plumb, and level, free of twist and open joints.
- .6 Make high strength bolted connections in accordance with CSA S16.1.
- .7 Weld in accordance with CSA W59-M.
- .8 New Support Bracket System: Tack weld all bolts, washers, steel wedges to structural steel.

**3.4 FIELD TOUCH-UP PAINTING**

- .1 Upon completion of erection, mechanically brush clean bolts, rivets, welds, and burned or scratched surfaces.
- .2 Touch up damaged surfaces and surfaces without shop coat with structural steel primer or galvanized touch-up primer as applicable. Apply primer in accordance with CGSB 85-GP-14M.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for the miscellaneous metal Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A116, Specification for Zinc Coated (Galvanized) Steel Woven Wire Fence Fabric.

.3 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.4 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.5 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.6 ASTM A269, Specification for Seamless and Welded Austenitic Stainless Steel Sanitary Tubing for General Service.

.7 ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

.8 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.9 ASTM A484/484M, Specification for General Requirements for Stainless and Heat-Resisting Steel Bars, Billets, and Forgings.

.10 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.11 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

.12 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

.13 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.14 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.15 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.16 CSA W48.1-M, Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.

.17 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.18 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.

- .19 CAN/CGSB 1.40-M, Primer, Structural Steel, Oil Alkyd Type.
- .20 CGSB 1-GP-181M, Organic Zinc Rich Primer.
- .21 CGSB 85-GP-16M, Painting Galvanized Steel.
- .22 SSPC Steel Structures Painting Council, Steel Structures Painting Manual, Vol. 2.

1.3 **DESIGN REQUIREMENTS**

- .1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1.

1.4 **SUBMITTALS**

- .1 Shop drawings:
  - .1 Submit shop drawings for fabrication and erection of miscellaneous metals in accordance with Section 01340 indicating:
    - .1 Materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
    - .2 Ensure shop drawings are of one uniform size and based on field measurements.

1.5 **QUALITY ASSURANCE**

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in Work of comparable complexity and scope, to perform the following services as part of the Work of this Section:
  - .1 Design metal fabrication items as required to resist live, dead, lateral, wind, and seismic loads.
  - .2 Structural design.
  - .3 Review, stamp, and sign shop drawings.
  - .4 Conduct shop and on-site inspections.
  - .5 Prepare and submit inspection reports.

- .2 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1.
  - .3 Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.
- 2 Products

2.1 **MATERIALS**

- .1 Structural shapes, plates, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.
- .2 Hollow structural sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H.



- .3 Welding materials: CSA W48.1-M and CSA W59-M.
- .4 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming with ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
- .5 Finished fasteners: In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be Z275 zinc coated in accordance with ASTM A653/A653MM. For joining stainless steel components use stainless steel fasteners.
- .6 Primer paint: CAN/CGSB-1.40-M or CPMA 1.73a.
- .7 Galvanized primer paint: CGSB 1-GP-181M; Organic zinc rich primer. For galvanized fabrications where touchup is to remain unpainted in finished work: Inorganic zinc rich primer, Galvafruid by W.R. Meadows of Canada Ltd.
- .8 Steel handrails and posts:
  - .1 Type 1 (EEB's): CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H, HSS sections.
  - .2 Type 2 (elsewhere): ASTM A53, Type S, Schedule 40, Grade A, steel pipe of sizes shown.
- .9 Grab bars: CAN/CSA G40.20/G40.21-M, Grade 230G, solid bar, galvanized after fabrication.
- .10 Grab bar socket: ASTM A53, Grade B, steel pipe of sizes shown, galvanized after fabrication.
- .11 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.

## 2.2 **FABRICATION**

- .1 Verify dimensions of existing Work before commencing fabrications and report any discrepancies to Engineer.
- .2 Fit and assemble Work in shop where possible. Execute Work in accordance with details and reviewed shop drawings. Where shop fabrication is not possible, make trial assembly in shop.
- .3 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use screws for interior metal work. Use welded connections for exterior metal Work unless otherwise found acceptable by Engineer.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1-M.

- .5 Execute shop welding to requirements specified.
- .6 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to Engineer's acceptance.
- .7 Assemble members without twists or open joints.
- .8 Correctly size holes for connecting Work of other trades where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.
- .9 Gratings: Fabricate to size and shape shown.
- .10 Steel handrails and posts: Close open ends of steel handrails with 1.9 mm thick closure neatly welded. Supply railings consisting of top rail and intermediate rail, and with matching vertical standards spaced.
- .11 Handrail bracket: Fabricate as shown. After fabrication, galvanized bracket in accordance with CAN/CSA G164-M.
- .12 Grab bars: Fabricate to size and shape shown.
- .13 Support framing for suspended toilet partitions: Structural channel and angle framing continuously welded and securely anchored to structure above. Design framing and anchorage to support assembly dead loads and live loads, and lateral loads attributable to misuse and vandalism. Finish: Prime painted.
- .14 Channel door frames: Structural channel sections, selected for trueness of web and flange, with joints welded and ground smooth. Supply bar stop and bent bar anchors for anchorage to masonry or concrete as required. Fit frames with temporary spreaders to prevent frame from springing out of shape.
- .15 Lintels: Sized [as shown] width 25 mm maximum less than width of wall. Unless otherwise shown, fabricate lintels in block walls of steel sections.
- .16 Safety chain: 6 mm coil galvanized chain with butt welded steel link and one end equipped with a hook for quick removal.

## **2.3 ANCHORS AND FASTENING**

- .1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.
- .2 Use self-drilling expansion type concrete anchors for attaching to masonry and concrete.
- .3 Do not secure items to steel deck.
- .4 Use steel beam clamps of two bolt design to transmit load to beam web. Do not use C and I clamps.

**2.4 INSERTS AND HANGERS**

- .1 Install inserts, hangers, and supports. Make inserts drilled [lug] type.
- .2 Before openings are cut through structure, obtain Engineer's written acceptance for procedures, locations and reinforcements required.
- .3 Do not weld hangers to structural steel members or burn holes in structural steel.
- .4 Do not suspend items from steel decking.

**2.5 WELDING**

- .1 Perform welding by electric arc process.
- .2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:
  - .1 CSA W48.1-M - for Electrodes. If rods are used, only coated rods are allowed.
  - .2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.
  - .3 CAN/CSA W117.2-M - for safety.
- .3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish painted.
- .4 Test welds for conformance and remove Work not meeting specified standards and replace to Engineer's acceptance.

**2.6 SHOP PAINTING**

- .1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.
- .2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.
- .3 Shop prime galvanized steel in accordance with CGSB 85-GP-16M.
- .4 Clean but do not paint surfaces being welded in field.
- .5 Do not paint surfaces embedded in concrete, but clean as if they were to be primed.
- .6 Do not prime machine finished surfaces, but apply an effective anti-rust compound.
- .7 Take precautions to avoid damage to adjacent surfaces.

**2.7 HOT DIP GALVANIZING**

- .1 After fabrication, hot dip galvanize specific miscellaneous steel items as indicated. Plug relief vents air tight. After galvanizing, remove plugs, ream holes to proper size and re-tap threads. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with zinc rich primer in accordance with manufacturer's printed directions.
  - .2 Hot-dip galvanize members in accordance with CAN/CSA G164-M and requirements of the following ASTM, with minimum coating weights or thicknesses as follows:
    - .1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/meter of actual surface, for 4.8 mm and less thickness members 600 g/m<sup>2</sup> for 6 mm and heavier members 640 g/m<sup>2</sup>.
    - .2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153, Table 1 for the various classes of materials used in the Work.
- 3 Execution
- 3.1 **EXAMINATION**
- .1 Examine previously installed Work, upon which this Section depends, verify dimensions and condition of existing Work, and coordinate repairs, alterations, and rectification if necessary. Commencement of Work of this Section is deemed to signify acceptance of existing, prior conditions.
  - .2 Obtain Engineer's written approval prior to field cutting or altering of structural members.
- 3.2 **ERECTION**
- .1 Fit joints and intersecting members accurately. Make Work in true planes with adequate fastenings. Build and erect Work plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.
  - .2 Perform drilling of concrete and steel as required to fasten Work of this Section.
  - .3 Erect stairs, railings, grab bars, and handrails rigid and free from whip.
  - .4 Continuously weld connections for railings, and anchor directly to steel stringers. Where rails return to wall have end returns and wall brackets.
  - .5 Tunnel handrail brackets: Anchor handrail brackets to tunnel liners as shown on Contract Drawings. In places where tunnel liners have been coated with acoustic treatment, remove acoustic treatment from flange of liner in area directly behind bracket. Do not damage surrounding acoustic treatment.
- 3.3 **FIELD PAINTING**
- .1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.
- END OF SECTION

1 **General**

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for gratings Work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 The following publications of issues listed below form a part of this Specification to the extent indicated by the references thereto:
- .1 CAN3 S16.1-M, Steel Structures for Buildings (Limit State Design).
  - .2 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .3 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
  - .4 CSA W117.2-M, Code for Safety in Welding and Cutting (Requirements for Welding Operators).
  - .5 CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 **SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01340 for products listed in Part 2 and for all metal fabrications.
- .2 Sizes and dimensions shall be based on field measurements. Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcements, details and accessories.

2 **Products**

2.1 **RIVETED, PRESSURE LOCKED, AND WELDED GRATINGS**

- .1 Fabricate gratings to the details and sizes shown on the Contract Drawings.
- .2 Manufacturers:
- .1 Borden Metal Products.
  - .2 ISG Safety Grating Products.
- .3 Band open ends of bars.
- .4 Jointing in built-up sections shall be made with hairline joints in the least conspicuous location and manner. Work shall be assembled securely and reinforced where necessary with similar fastenings. Screws shall be countersunk unless otherwise noted. Exposed surfaces of rolled steel shapes shall be ground or filled perfectly smooth.
- .5 Provide items that are required to be built into concrete and masonry.

- .6 Items shall be fabricated, finished and assembled in the shop as much as possible, consistent with the size and shipping problems. Assembly on Site shall be kept to a minimum.
- .7 Metal mouldings shall be mitre cut for all angles. Butt joints will not be accepted for these locations.
- .8 Galvanize gratings by hot dipping after fabrication.

## 2.2 **MATERIALS**

- .1 Structural Steel Sections and Steel Plates: CAN3-G40.21-M, Grade 300 W, except HSS: Grade 350 W, Class H.
- .2 Galvanizing: All steel specified to be galvanized CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 Welding Materials: CSA W59-M.
- .4 Bolts, Nuts and Washers: ASTM A325.
- .5 Anchors, Bolts, Nuts, Washers for Dissimilar Metals: Of stainless steel alloy with minimum 12% chromium.
- .6 Primer for Galvanized Surfaces Not to be Finish Painted: CGSB 1-GP-178 Ma, Primer, Zinc Dust/Zinc Oxide, Alkyd (for Galvanized Surfaces).
- .7 Touch-Up Paint for Field Welds on Galvanized Surfaces: CGSB 1-GP-181M, Coating, Zinc-Rich, Organic, Ready-Mixed.
- .8 Fastenings: Provide fastenings, anchors and accessories required for the fabrication and erection of the Work.
- .9 Fastenings include, without being limited to, anchor bolts, machine bolts, toggle bolts, self-drilling anchors, lag screws, expansion shields, sleeves, brackets, washers and nuts.
- .10 Ferrous fastenings and accessories for exterior locations, in exterior walls and slabs, and for locations specifically so noted, shall be galvanized after fabrication.
- .11 Supply bolt with all washers and nuts required for a complete installation. Provide lock washers where vibration may occur.
- .12 Ensure thread dimension are such that nuts and bolts will fit without re-threading or chasing threads.
- .13 Bevelled hexagon head bolts: ASTM A307.
- .14 Bolts, Nuts and Washers: ASTM A325.
- .15 Concrete Anchors, chuck end type: by Star Expansion or Canadian Hilti, Phillips Drill Co. of Canada or Dyna Drill by Ramset Limited.

- .16 Fastenings shall be galvanized or stainless steel.
- .17 Toggle bolts: by Star Expansion or Phillips Drill Co. or approved equivalent.
- .18 Hammer-driven anchors: by Star Expansion or Canadian Hilti, Phillips Drill Co. of Canada or Dyna Drill by Ramset Limited or approved equivalent.

2.3 **DESIGNS, FABRICATION, AND MANUFACTURE**

- .1 Conform to CAN/CSA-S16.1-M.
- .2 Verify Site dimensions prior to shop fabrication of items to suit field conditions.
- .3 Fit and assemble Work in shop where possible and deliver to Site in largest possible section.
- .4 Do all welding in accordance with requirements of CSA W59-M. File or grind welds smooth and flush where exposed to view and where specifically indicated on drawings.
- .5 Complete all assembly and welding possible before galvanizing.
- .6 Site assemble by bolting all galvanized items to be left exposed (not finish painted). Perform all welding on such items before galvanizing.
- .7 Fit joints and intersecting members accurately with hairline joints in the least conspicuous locations and manner. Make Work in true planes with adequate fastening, mitre corners unless specified or shown otherwise.
- .8 Supply all fastenings, anchors accessories required for fabrication and erection of Work of this Section. Such items occurring on or in an exterior wall or slab shall be hot dip galvanized.
- .9 Fabricate items from steel unless otherwise noted.
- .10 Use self-tapping shake-proof countersunk flat headed screws on items required to be assembled by screws or as indicated.
- .11 Make exposed metal fastenings and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum evenly spaced and neatly laid out. Make fastenings of permanent type unless otherwise indicated. Counter sink screws unless otherwise noted.
- .12 Fabricate gratings and other items with multiple parts so that a regular pattern is presented in the finished Work with all members lined up or evenly spaced and pattern is unbroken.
- .13 Do not flatten tubular sections at corners and curved changes in plane.
- .14 Weld connections where required; where not required, bolt or otherwise secure in an approved manner.

- .15 Reinforce Work where necessary.
- .16 Shop Prime Painting:
  - .1 After fabrication, thoroughly blast clean all ferrous metals exposed in finished Work in accordance with SSPC-SP6. Clean, brush, scrape and remove rust, grease and extraneous matter from all other surfaces; solvent clean to SSPC-SP1.
  - .2 Apply primer unadulterated, as prepared by manufacturer. Paint on dry, clean surfaces. Do not paint when temperature is below 7°C.
- .17 Galvanizing:
  - .1 All exterior steel elements to be hot dipped galvanized after fabrication.
  - .2 Galvanize items after fabrication.
  - .3 Clean and prepare surfaces and to dip galvanize to CSA G164-M at rate of 0.764 kg per m<sup>2</sup>.
  - .4 After erection touch-up with zinc rich primer in accordance with CSA G164-M.

### 3 **Execution**

#### 3.1 **GENERAL**

- .1 Perform Work in accordance with Article 1.2 - References of this Section.

#### 3.2 **INSTALLATION**

- .1 Build and erect Work plumb, true, square, straight, level and accurate to sized detailed, free from distortion or defects detrimental to appearance and performance.
- .2 Insulate metals where necessary to prevent corrosion due to contact between dissimilar metals.
- .3 Supply adequate instructions, templates and, if necessary, supervise installation of fastenings or accessories requiring to be built-in by other Sections of the Work.
- .4 After erection and installation, thoroughly clean the Work and apply coat field touch-up paint to all damaged surfaces of shop-primed or galvanized material. Work primer well into all joints, crevices, interstices and open spaces.
- .5 Furnish, set and secure framing brackets, hangers, anchors, inserts or similar supports for proper erection of metal fabrication before masonry and concrete is placed.
- .6 Do all cutting, drilling and fitting necessary to attach Work of this Section to adjoining work.
- .7 Secure wall brackets to wall with through bolts and plate where these can be concealed, otherwise use bolts and expansion shields to achieve maximum rigidity of rail. Wood plugs for fixing to walls will not be permitted. Use metal anchoring devices.



- .8 Place exterior metal fabrications to be set into concrete in preset pots, and brace to avoid movement.
- .9 Grind off surplus welding material and provide sharp profiles and arises and smooth curves at outside corners.
- .10 Touch up field welds in galvanized surfaces clean abraded galvanized area to white metal using a power rotary steel brush and touch up with paint specified.
- .11 All field connections for galvanized members to be bolted.

3.3 **CLEAN UP**

- .1 After installation and painting of all metal work, clean all adjacent areas and structures contaminated by painting and erection operations.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for rough carpentry Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A325, Specification for Bolts Quenched/Tempered Steel Nominal Thread Diameter M16 - M36 For Structural Steel Joints.

.2 CSA B111, Wire Nails, Spikes and Staples.

.3 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 CAN/CSA O80 Series M, Wood Preservation.

.5 CSA O121-M, Douglas Fir Plywood.

.6 CAN/CSA O141, Softwood Lumber.

.7 CAN/CGSB-51.32-M, Sheathing, Membrane, Breather Type.

.8 CWC, Canadian Wood Council, Wood Reference Book.

.9 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority

1.3 **QUALITY ASSURANCE**

.1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: Grade mark in accordance with applicable CSA standards.

.3 Each board of fire-retardant treated material to bear ULC label indicating Flame Spread Classification (FSC), and smoke developed.

1.4 **DELIVERY, STORAGE, AND HANDLING**

.1 Protect materials from weather during shipment and site storage, securely wrapping with moisture resistant covers, or storing in dry and ventilated inside areas.

.2 Protect fire-retardant materials against high humidity and moisture.

2 Products

2.1 **MATERIALS**

- .1 Lumber: Softwood, G4S, moisture content 19% or less at time of installation, in accordance with the following:
  - .1 CSA O141 and NLGA Standard Grading Rules for Canadian Lumber.
  - .2 Board quality: Standard or better.
  - .3 Dimension sizes: Standard or better.
  - .4 Post and timber sizes: Standard or better.
- .2 Lumber quality: Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing or making proper connections.
- .3 Lumber defects: Discard wood with defects which will render a piece unable to serve its intended function. Lumber will be rejected by Engineer for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting, whether or not it has been installed.
- .4 Furring, blocking, nailing strips, grounds, bucks, and backing: G2S kiln dried with moisture content 19% or less at time of installation, free from sap, shakes, splits, knots and other defects and in accordance with the following:
  - .1 CSA O141 and NLGA, Standard Grading Rules for Canadian Lumber.
  - .2 Board quality: Construction or better.
  - .3 Dimension sizes: Construction light framing or better.
  - .4 Post and timbers sizes: Construction or better.
- .5 Curbs, blocking, cants, parapets, fascia and sleepers in conjunction with roof system: Jack Pine, Grade No. 2 or better, pressure treated with CCA salt preservative in accordance with CAN/CSA-O80 Series-M.
- .6 Plywood: CSA O121-M, G1S standard construction, laminated with waterproof adhesive, exterior grade.
- .7 Surface applied wood preservative: Green coloured copper naphthenate or 5% pentachlorophenol solution, water repellent preservative or same CCA preservative as used for shop impregnation, in accordance with CAN/CSA 080 series M.
- .8 Nails, spikes and staples: CSA B111; spiral type.
- .9 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.
- .10 Proprietary fasteners: Toggle bolts, expansion shields, lag bolts, screws, inorganic fibre plugs, recommended for purpose by manufacturer.
- .11 Wood screws: Countersunk head, full thread type.
- .12 Galvanizing: CAN/CSA G164-M.
- .13 Fire retardant treatment: To provide flamespread, fuel contributed and smoke developed ratings of 25 or less, Dricon fire retardant chemicals by Hickson Building Products Ltd., or

other approved manufacture. Provide colour dye identification in chemical treatment for treated wood to be concealed in final Work.

.14 [Sheathing Paper: CAN/CGSB-51.32-M.]

3 Execution

3.1 **INSTALLATION**

.1 Fit and install wood furring, strapping, grounds and blocking. Adequately size, correctly place and conceal members for finishes, fitments and for Work under other Sections. Anchor wood members securely in place.

.2 Install rough bucks, nailing strips and linings to rough openings as required for backing for frames and other Work.

.3 Bolt wood blocking or nailing strips to steel framing.

.4 Align and plumb faces of furring and blocking to tolerance of 1:600.

3.2 **BACKBOARDS**

.1 Install plywood backboards, primed and painted white on both sides, with fire retardant paint.

.2 Use minimum 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

3.3 **ROOF WOODWORK**

.1 Install continuous wood nailers around roof perimeters, curbs and roof openings larger than 150 x 150 mm, and at edges of insulation as detailed. Install cut cant strips and continuous nailers on copings and curbs as detailed.

.2 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation and roof hopper.

3.4 **FASTENERS**

.1 Frame, anchor, fasten, tie and brace members for required strength and rigidity.

.2 Use hot dipped galvanized fasteners for exterior Work, Work below grade, and for pressure treated lumber.

.3 Countersink bolts and bolt heads as required for clearance of other Work.

.4 Size fasteners to penetrate base member by half of fastener length minimum. Minimize splitting of wood members by staggering nails in direction of grain.

.5 For plywood use spiral, annular or resin coated nails and staples.

**3.5 SURFACE-APPLIED WOOD PRESERVATIVE**

- .1 Treat raw surfaces, drilled holes and cut ends of pressure treated wood with 2 coats of wood preservative immediately after cutting.
- .2 Apply preservative by dipping, by brush or by pouring into plugged holes to completely saturate surface.

**3.6 FIRE RETARDANT PRESSURE TREATMENT**

- .1 Provide fire retardant pressure treatment of wood against fire complying with CSA O80-C20 for lumber and O80-C27 for plywood, kiln dried after treatment to required moisture content. Pressure fire retardant treat lumber prior to final milling. Provide ULC or WHI label for treated lumber and plywood as received from pressure treating plant. Do not expose pressure treated material to dampness between time material is treated and time finish is applied. Carefully sand surfaces which show surface salt deposits to remove such deposits before finish is applied. Provide identification on materials delivered to site showing that these requirements have been complied with, on each large item, and on bundles of small items.
- .2 Minimize reworking of fire-retardant treated wood. Re-treat surfaces exposed by cutting, trimming or boring with fire retardant chemical before installation to requirements of labelling authority and other authorities having jurisdiction.

**3.7 MISCELLANEOUS CARPENTRY WORK**

- .1 Supply and install all other carpentry indicated on Contract Drawings or as required for completion of work. Co-operate with other trades in installing items supplied by other Sections, cut openings in woodwork when so required and make good disturbed surfaces.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for vapour retarder Work in accordance with the Contract Documents.

1.2 **SUMMARY**

.1 Section Includes:

.1 Wall sheathing.

.2 Related Requirements:

.1 Rough Carpentry in accordance with Section 061000 for plywood backing panels.

1.3 **APPLICABLE STEANDARDS AND REFERENCES**

.1 Manufactured to meet ASTM C1177 and applicable sections of ASTM C1396.

.2 ASTM E2178 (CAN/ULC-S741) Air Barrier Materials.

.3 Component of ASTM E2357 (CAN/ ULC-S742) Air Barrier Assemblies.

.4 UL Evaluation Report UL ER3660-01.

1.4 **SUBMITTALS**

.1 Product data:

.1 Submit manufacturer's Product data in accordance with Section 01330 indicating:

.1 Characteristics, performance criteria, and limitations. Indicate preparation, installation requirements and techniques, Product storage, and handling criteria.

.2 Samples:

.1 Submit samples in accordance with Section 01330.

.3 Certification: Submit installer's certification verifying compliance with specification requirements.

1.5 **QUALITY ASSURANCE**

.1 Qualifications: Execute Work of this Section by manufacturer-approved, skilled, qualified, and experienced workers, trained in installation of Work of this Section.

1.6 **DELIVERY, STORAGE, AND HANDLING**

- .1 Store materials protected against damage from weather, direct sunlight, surface contamination, construction traffic, or other causes. Stack sheathing flat on level supports off the ground, under cover and fully protected from weather. Store and support panels in flat stacks to prevent sagging. Protect materials to keep them dry. Protect panels to prevent damage to edges and surfaces. Comply with Gypsum Association GA-801.

1.7 **EXTENDED WARRANTY**

- .1 Submit a written warranty for Sheathing Work in accordance with General Conditions, except that warranty period is extended to 5 years.
  - .1 Warrant against cracking, splitting, crumbling, shrinkage, loss of adhesion.
  - .2 Coverage: Complete replacement including effected adjacent Work.

2 Products

2.1 **MATERIALS**

- .1 Sheathing
- .2 Thickness: 12.7 mm
- .3 Width: 1220 mm
- .4 Length: 2440 mm
- .5 Edge: Square
- .6 Surface Burning Characteristics: Flame Spread rating of 0 and Smoke Development rating of 0, in accordance with ASTM E84 (CAN/ULC-S102)
- .7 Non-combustibility: Non-combustible when tested in accordance with ASTM E136 (CAN/ULCS114).
- .8 Fire Resistance: Tests are conducted in accordance with ASTM E119 (ANSI/UL 263 and CAN/ULC-S101)

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.
- .2 Verify that existing substrates to receive sheathing are clean, dry, sound, smooth, and continuous.

- .3 Coordinate sealing of interruptions in, and protrusions through sheathing plane. Verify that other Work items projecting through sheathing are in place and are securely installed.
- .4 Have manufacturer's authorized representative verify that conditions are acceptable for installation of sheathing.

END OF SECTION



1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for vapour retarder Work in accordance with the Contract Documents.

1.2 **SUBMITTALS**

.1 Product data:

- .1 Submit manufacturer's Product data in accordance with Section 01330 indicating:

- .1 Characteristics, performance criteria, and limitations. Indicate preparation, installation requirements and techniques, Product storage, and handling criteria.

.2 Samples:

- .1 Submit samples in accordance with Section 01330:

- .1 Two 300 x 300 mm samples of vapour retarder.
- .2 Two samples, 300 mm long, of fastening bar.

- .3 Certification: Submit installer's certification verifying compliance with specification requirements.

1.3 **QUALITY ASSURANCE**

- .1 Qualifications: Execute Work of this Section by manufacturer-approved, skilled, qualified, and experienced workers, trained in installation of Work of this Section.

.2 Mock-up:

- .1 Construct one 10 m<sup>2</sup> mock-up of vapour retarder in location acceptable to Engineer
- .2 Demonstrate one lap joint, one inside corner, one outside corner, and one window/door opening.
- .3 Arrange for Engineer's review and allow 48 hours before proceeding with Work of this Section.
- .4 Mock-up may remain as part of Work if acceptable to Engineer. Remove and dispose of mock-ups which do not form part of Work.

.3 Pre-installation meeting:

- .1 Arrange with manufacturer's representative to inspect substrates and review installation procedures 48 hours in advance of installation.

1.4 **SITE CONDITIONS**

- .1 Do not install the Work of this Section outside of following environmental range without Engineer's and Product manufacturer's written acceptance:

- .1 Ambient air and surface temperature: 0°C to 38°C.
  - .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements before, during, and after installation.
- 1.5 **EXTENDED WARRANTY**
- .1 Submit a written warranty for vapour retarder Work in accordance with General Conditions, except that warranty period is extended to 5 years.
    - .1 Warrant against cracking, splitting, crumbling, shrinkage, loss of adhesion.
    - .2 Coverage: Complete replacement including effected adjacent Work.
- 2 Products
- 2.1 **MATERIALS**  
The following material described is the recommended products and should be used for the contract price. Other products with the same or better specifications can be used as approved by the Engineer.
- .1 Primer:
    - .1 System 4000 Surface Conditioner by W.R. Grace & Co. of Canada Ltd.
    - .2 Blueskin Primer (SA) by Bakor Inc.
  - .2 Mastic:
    - .1 Bituthene Mastic by W.R. Grace & Co. of Canada Ltd.
    - .2 Bakor 230-21 by Bakor Inc.
  - .3 Vapour retarder: 1.5 mm (60 mils) thick minimum; roll (460 mm wide), flashing (300 mm and 915 mm wide), and tape (100 mm and 150 mm wide), length as required.
    - .1 Blueskin SA by Bakor Inc.
    - .2 Perm-A-Barrier System 4000 by W.R. Grace & Co. of Canada Ltd.
  - .4 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.
- 3 Execution
- 3.1 **EXAMINATION**
- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.
  - .2 Verify that existing substrates to receive vapour retarder are clean, dry, sound, smooth, and continuous.

- .3 Coordinate sealing of interruptions in, and protrusions through vapour retarder plane. Verify that other Work items projecting through vapour retarder are in place and are securely installed.
- .4 Have manufacturer's authorized representative verify that conditions are acceptable for installation of vapour retarder.

### 3.2 **MASTIC AND PRIMER**

- .1 Fill substrate voids, gaps, depressions, cracks, and joints with mastic until continuous, smooth, substrate for vapour retarder is achieved.
- .2 Prime substrate surfaces to receive vapour retarder in accordance with manufacturer's instructions, at recommended application rate, allow to dry. Vary coverage to suit surface porosity.
- .3 Prime surfaces. Re-prime surfaces if not covered with vapour retarder within 4 hours.

### 3.3 **VAPOUR RETARDER**

- .1 Do not install vapour retarder during 24 hours drying period following precipitation
- .2 Install mastic where required to ensure integrity of vapour retarder installation at protrusions and other complex details.
- .3 Install vapour retarder horizontally, shingle overlapped, and in accordance with manufacturer's instructions.
- .4 Lap vapour retarder ends and edges 50 mm minimum. Roll vapour retarder and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.
- .5 Extend vapour retarder into openings such as windows, doors, and similar and terminate to accommodate detailed airseal system connection. Apply additional vapour retarder at inside corners of wrapped openings for continuous coverage of head, jambs, and sill.
- .6 Extend vapour retarder as required to connect to other components of Work comprising airseal system.
- .7 Cut and fit vapour retarder as required for passage of ties, pipes, and other protrusions, ensuring continuous adherence to substrate.
- .8 Apply additional reinforcing patch layer of vapour retarder, or trowelled mastic layer, to improve integrity of vapour retarder at protrusions such as masonry ties, mechanical pipes, through vapour retarder; extend patch 75 mm outside protrusion diameter and onto protrusion if possible.
- .9 At end of work day, trowel mastic water cut-off along uppermost edge of incomplete vapour retarder assembly, to prevent loss of adhesion and damage to vapour retarder.

**3.4 FASTENING BARS**

- .1 Supply and install continuous mechanical fastening bar to clamp vapour retarder on both sides of unfilled gaps, cracks, joints, and airseal transitions.

**3.5 REPAIR**

- .1 Repair misaligned or inadequately lapped seams, punctures, or other damage with additional ply of vapour retarder sized to extend 150 mm minimum in all directions from repair edge.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for metal siding Work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ANSI B18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.
- .2 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .3 CAN/CGSB-1.40-M, Primer, Structural Steel, Oil Alkyd Type.
- .4 CAN/CGSB-1.108-M, Bituminous Solvent Type Paint.
- .5 CAN/CGSB-19.24-M, Multi-Component, Chemical Curing, Sealing Compound.
- .6 CAN/CGSB-51.10, Mineral Fibre Board Thermal Insulation.
- .7 CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
- .8 CSA S136, Cold Formed Steel Structural Members.
- .9 CSA S136.1, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

1.3 **DESIGN REQUIREMENTS**

- .1 Design metal siding Work to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads, imposed and other loads.
- .2 Design metal siding Work in accordance with following Climatic Design Data for Toronto contained in Ontario Building Code.
- .1 Design Temperature: January 1%, July 2 1/2%.
- .2 Wind (Hourly Wind Pressures): 1 in 100 year occurrence.
- .3 Earthquake: Seismic Data as listed.
- .3 Design metal siding [and soffit] elements in accordance with CSA S136 and S136.1.
- .4 Design metal siding [and soffit] system to limit deflection under design loads, to L/360.
- .5 Design miscellaneous, additional structural framing members and sag rods, required to complete metal siding system, where not indicated on Contract Drawings.

1.4 **SUBMITTALS**

- .1 Product data:
  - .1 Submit copies of manufacturer's Product data in accordance with Section 01330 indicating:
    - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
    - .2 Product transportation, storage, handling and installation requirements.
  - .2 Shop drawings:
    - .1 Submit shop drawings in accordance with Section 01340 indicating:
      - .1 Dimensions, profiles, fastening and attachment methods, Products, wall elevations, and details.
  - .3 Samples:
    - .1 Submit samples in accordance with Section 01330:
      - .1 300 x 300 mm samples of each siding material, colour and profile.
  - .4 Reports:
    - .1 Submit written field inspection and test report results after each inspection.

1.5 **QUALITY ASSURANCE**

- .1 Retain a licensed Professional Structural Engineer, registered in Province of Ontario, to perform following services for metal siding [and soffits] Work:
  - .1 Design of metal siding Work.
  - .2 Review, stamp, and sign shop and erection shop drawings.
  - .3 Conduct shop and field inspections and prepare and submit inspection reports.
  - .4 Review quality control tests and mill test reports for compliance with design intent.
  - .5 Work has been installed in accordance with accepted shop and Contract Drawings.
- .2 Mock-up:
  - .1 Fabricate, deliver, and erect [one] [full scale] [1200 mm wide x 630 mm high] mock-up panel of metal siding construction, in location acceptable to Engineer.
  - .2 Demonstrate finish, [colours], and quality of workmanship.
  - .3 Mock-up may form part of final Work, if acceptable to Engineer. Remove and dispose of mock-ups which do not form part of Work.

1.6 **EXTENDED WARRANTY**

- .1 Submit warranty for metal siding Work in accordance with General Conditions, except that warranty period is extended to 3 years.
  - .1 Against warping, twisting, joint, and finish failure.

.2 Coverage: Complete replacement including affected adjacent parts.

2 Products

2.1 **MATERIALS**

.1 Metal siding and soffit: ASTM A653/A653M, Z275 hot-dip galvanized steel, 0.76 mm minimum base metal thickness.

- .1 Profile: Double 4" Dutch/Cove Lap
- .2 Nominal width: 4 inches
- .3 Nominal width: 3/4 inches
- .4 Length: 16 feet
- .5 Exposed texture: As selected by the City

.2 Metal siding and soffit finish: 10,000 Series 2 to 3 coat system with Barrier Coat. C

.1 Colour: As selected by Engineer from entire colour range.

.3 Screw fasteners: ANSI B18.6.4, stainless steel Type 304.

.1 Exposed locations: With coloured nylon heads to match metal siding [and soffits].

.4 Fascia, trim, closures, and flashings: Material, finish, colour, and fasteners to match siding [soffit] material, 0.76 mm minimum base metal thickness minimum.

.5 Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.

.6 Hollow structural sections: CAN/CSA-G40.20/G40.21-M Grade 350W, Class H.

.7 Primer paint: CAN/CGSB-1.40-M.

.8 Airseal liner panel: ASTM A653/A653M; 0.70 mm minimum base metal, Z275 [ZF075] hot dipped galvanized steel, with interlocked male and female edge lips, factory caulked with liner sealant.

.9 Isolation coating: CAN/CGSB-1.108-M, Type 2; Bituminous coating, acid and alkali resistant material.

.10 Liner sealant: Type as recommended by liner manufacturer.

.11 Airseal transition membrane as recommended by membrane manufacturer.

.12 Z girts and C channels: CAN/CSA S136-M; Minimum 1.2 mm thick, Z275 galvanized. Depth as indicated on Contract Drawings.

.13 Insulation: CAN/CGSB-51.10; Semi-rigid glass fibre. Thickness as indicated on Contract Drawings.

- .14 Joint backing: Product as recommended by siding sealant manufacturer.
- .15 Siding sealant: CAN/CGSB-19.24-M, Multi-Component, polyurethane sealant, as indicated on the contract drawings.
  - .1 Colour: As selected by Engineer.
- 3 Execution
  - 3.1 **EXAMINATION**
    - .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.
  - 3.2 **STRUCTURAL FRAMING**
    - .1 Supply and install miscellaneous, additional structural framing members, required to complete metal siding system, where not indicated on Contract Drawings.
  - 3.3 **AIRSEAL LINER PANEL**
    - .1 Apply isolation coating to supporting structural framing to isolate airseal liner panel and to prevent galvanic corrosion.
    - .2 Install airseal liner panel to achieve continuous airseal, rigidly secured to resist design wind loading. Seal liner panel laps airtight with sealant.
    - .3 Coordinate airseal transition to adjacent parts of Work.
  - 3.4 **AIRSEAL TRANSITION MEMBRANE**
    - .1 Install primer and airseal transition membrane with 150 mm overlap of metal airseal, continuously onto entire head, jamb, and sill surfaces of openings such as doors, windows, louvres and similar items, and metal siding system perimeter.
    - .2 Install additional layer of airseal transition membrane to serve as flashing over openings in, and at bottom side termination of metal siding panel system.
    - .3 Overlap airseal transition membrane 50 mm along sidelaps and 75 mm on end laps and lap in direction of waterflow.
    - .4 Coordinate airseal transition to adjacent parts of Work.
  - 3.5 **GIRTS AND CHANNELS**
    - .1 Notch Z girts and C channels as required to accommodate airseal liner panel ribs and fins and to allow drainage of rainscreen cavity.



- .2 Install Z girts, fastened through airseal liner, and into structural framing beneath. Orient Z girts to drain water from rainscreen cavity.
- .3 Install C channels to frame openings such as doors, windows, and louvre openings, and orient channel webs to form heads, jambs and sills of openings.

**3.6 SIDING INSULATION**

- .1 Install siding insulation in continuous contact with airseal liner and neatly fitted between Z girts and C channels. Adhere insulation with temporary adhesive.

**3.7 FASCIA, TRIM, CLOSURES, AND FLASHINGS**

- .1 Install fascia and trim including inside and outside corners, flashing, edgings, cap strips, drips, under-sill trim, fillers, closure strips, starter strips, and window or door trim, carefully formed and profiled.

**3.8 METAL SIDING [AND SOFFITS]**

- .1 Install metal siding [and soffits] in accordance with manufacturer's written instructions.
- .2 Install metal siding [and soffits] in one piece, [full height], except as indicated otherwise.
- .3 Maintain joints in exterior siding, plumb, true to line, tight fitting, hairline joints.
- .4 Attach metal siding system components to prevent warping, buckling, and deformation induced by restriction of thermal induced movement.
- .5 Remove and replace damaged metal siding [and soffits]. Do not touch-up damaged panels.

**3.9 JOINT BACKING AND SIDING SEALANT**

- .1 Prepare substrate surface and mask as recommended by sealant manufacturer.
- .2 Install joint backing and sealant at siding system joints and perimeter for weathertight installation. Tool sealant to concave profile.

END OF SECTION

1 General

**1.1 RELATED WORK**

- 1.1.1. Section 01 00 10 General Instructions
- 1.1.2. Section 01 33 00 Submittal Procedure
- 1.1.3. Section 01 35 30 Health and Safety Requirements
- 1.1.5. Section 06 10 00 Rough Carpentry

**1.2 REFERENCE STANDARDS**

- 1.2.1. Use most recent version of listed standards.
- 1.2.2. Perform roofing and sheet metal work in conformance with roofing manufacturer's written recommendations as well as requirements of the ULC laboratories Class C, and Canadian Roofing Contractor's Association (CRCA).
- 1.2.3. CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing.
- 1.2.4. CAN/ULC-S704 Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Board, faced.
- 1.2.5. ASTM D 6162, Standard Specification for SBS Modified Bitumen Sheet Materials using a combination of polyester and fiberglass reinforcement.

**1.3 SUMMARY**

- 1.3.1. Work of this section includes installing 2-ply Modified Bitumen membrane roofing over a Steel deck, including but not limited to the following:
  - 1.3.1.1. Mechanically fastened gypsum board
  - 1.3.1.2. Self-adhesive Vapour Retarder
  - 1.3.1.3. Mechanically Fastened Polyisocyanurate rigid insulation.
  - 1.3.1.4. Insulation Overlay Board in adhesive
  - 1.3.1.5. Self- Adhesive Base and Base Sheet Flashing
  - 1.3.1.6. Self-adhesive Cap and Cap Sheet Flashing

**1.4 COMPATIBILITY**

- 1.4.1. Provide all materials by one manufacturer when possible

**1.5 TECHNICAL DOCUMENTS**

- 1.5.1. Submit two (2) copies of the most current technical data sheets. These documents must describe the materials' physical properties.

**1.6 QUALITY ASSURANCE AND ENVIRONMENTAL MANAGEMENT**

- 1.6.1. Provide proof of manufacturer's ISO 9001 and ISO 14001 Certifications.

**1.7 CONTRACTOR QUALIFICATIONS**

- 1.7.1. Roofing contractors and sub-contractors must, when tendering or performing work, possess a roofing contractor operating license.
- 1.7.2. Roofing contractors and sub-contractors must also be registered with manufacturer's quality program and provide the architect with a certificate to this effect before beginning any roofing work.
- 1.7.3. Only qualified, certified installers employed by a company with the appropriate equipment may execute the roofing work.

**1.8 PRE-INSTALLATION MEETING**

- 1.8.1. Hold a pre-installation meeting prior to start of waterproofing works, with the roofing contractor's representative, the manufacturer and the owner. The purpose of this meeting is to review particular installation conditions to each project. Establish a report for this meeting.

**1.9 STORAGE AND DELIVERY**

- 1.9.1. Deliver and store materials in dry location in their original packaging, displaying the manufacturer's name, product name, weight, and reference standards, as well as all other indications or references considered standard.
- 1.9.2. Store adhesives and waterproofing mastics at a minimum +5 0C. Store adhesives and solvent-based mastics at sufficiently high temperatures to ensure ease of application.
- 1.9.3. Keep membrane materials stored in rolls standing on end, selvage edge up elevated from moisture at temperatures no less than 5 0C.
- 1.9.4. Avoid material overloads that may affect the structural integrity of specific roof areas.

**1.10 WARRANTY**

- 1.10.1. Supply a written document in the owner's name, valid for a twenty [20], year period, stating that manufacturer will repair any leaks in the roofing membrane to restore the roofing system to a dry and watertight condition, to the extent that membrane manufacturing or installation defects caused water infiltration. The warranty must cover for the entire cost of the repair(s) during the entire warranty period. The warranty must be transferable, at no extra cost, to subsequent building owners starting from the date of acceptance.
- 1.10.2. Provide contractor's warranty for this project, valid for a period of two (2) years covering labour, materials and workmanship for entire area of roofing project

**2 Products**

**2.1 SHEATHING BOARDS**

2.1.1. Sheathing board to ASTM C1177. Minimum 16 mm thick, glass mat faced, exterior grade gypsum board. Primed finish

## 2.2 VAPOUR RETARDER

2.2.1. Self-adhesive air/vapour barrier membranes composed of bitumen modified with thermoplastic polymers and high-density polyethylene film. The width of the membrane shall be 1,14 meters (45 inches) to allow the membrane to fit on the top flute of most structural steel decks. The self-adhesive under face is covered with a silicone release sheet. Water vapour permeability: 0.92 ng/Pa•s•m<sup>2</sup> (0.016 Perm)

## 2.3 FASTENERS

2.3.1. Roofing fasteners to steel decking: Use # 12, FM approved, with 3" round metal plates

2.3.2. Insulation fasteners to steel decking: Screws and plates in conformance with Factory Mutual's standard No. 4470 on corrosion and wind lift factors.

2.3.3. Roofing nails: spiral nails with steel round-top cap 25 mm in diameter and 3 mm diameter shank; long enough to penetrate solid wood supports by at least 38 mm and plywood substrates by at least 20 mm.

## 2.4 INSULATION

2.4.1. Closed-cell polyiso foam core integrally laminated with a glass-fiber reinforced organic facer. Meeting requirements of ASTM C1289, Type II, Class 1, Grade 2 and CAN/ULC-S704, Type II.

## 2.5 ADHESIVE

2.5.1. Low-rise two-part urethane adhesive with no solvents. Allows a complete cure in few minutes, with no temperature restrictions.

## 2.6 INSULATION OVERLAY BOARDS

2.6.1. Multi-ply, semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners. Length 1200 mm x width 1500 x thickness 6.4 mm.

## 2.7 PRIMER

2.7.1. Stabilised primer to enhance adhesion of membranes.

## 2.8 MEMBRANES

2.8.1. Roof membrane Base Sheet and Base Sheet Flashing:

2.8.1.1. CGSB 37-GP-56M, Type 2 for covered roofing application, Class C, Plain surfaced, Grade 1

2.8.1.2. Roofing membrane with glass and polyester reinforcement and SBS modified bitumen. Top face sanded, under side self-adhesive. Top face marked with three (3) distinctive blue chalk lines to ensure proper roll alignment.

2.8.2. Roof membrane Cap Sheet and Cap Sheet Flashing:

2.8.2.1. CGSB 37-GP-56M, Type 1 for exposed roofing application, Class A, Granule surfaced, Grade 2

2.8.2.2. Roofing membrane with glass and polyester reinforcement and SBS modified bitumen to ASTM D6162. Top face covered by coloured granules, under face self-adhesive

2.9        **WATERPROOFING MASTICS**

2.9.1. Waterproofing products: Mastic made of synthetic rubbers, plasticized with bitumen and solvents.

2.10       **WATERPROOFING OF PENETRATIONS**

2.10.1. One component polyurethane /bitumen resin to waterproof roof penetrations and complex details.

3           Execution

3.1        **SURFACE EXAMINATION AND PREPARATION**

3.1.1. Complete surface examination and preparation in conformance with manufacturer's recommendations, particularly for fire safety precautions.

3.1.2. Do not begin any work before surfaces are smooth, dry, and exempt of ice and debris. Do not use calcium or salt for ice or snow removal.

3.1.3. Do not install materials during rain or snowfall.

3.2        **METHOD OF INSTALLATION**

3.2.1. Complete waterproofing work in conformance with manufacturer's requirements.

3.2.2. Install roofing elements on clean and dry surfaces, in conformance with manufacturer's instructions and recommendations.

3.2.3. Complete installation in a continuous fashion as surfaces are prepared and weather conditions permit.

3.2.4. Ensure watertight conditions for roofs at all times, including protection during installation work by other trades and progressive protection as work is completed (e.g. vents, drains, etc.)

### **3.3 CLEANING**

3.3.1. Immediately before roofing materials are applied, clean decks of roughness, rubbish, dust, dirt, oil, grease, snow and ice.

### **3.4 EQUIPMENT FOR WORK EXECUTION**

3.4.1. Maintain all roofing equipment and tools in good working order.

3.4.2. Use tools recommended by membrane's manufacturer.

### **3.5 INSTALLATION OF SHEATHING BOARDS**

3.5.1. Lay sheathing board with tightly butted joints. Longitudinal joints must be at right angles to flute direction. Joints occurring along widths of board to be continuously supported on top flute of metal deck.

3.5.2. Mechanically fasten sheathing to deck with self-tapping, non-corroding screws, spaced evenly to each board and to only top flutes. Use 8 fasteners per 4' x 8' panels and 12 fasteners per corner panels

3.5.3. Ensure sheathing is immediately protected with membrane

### **3.6 INSTALLATION OF VAPOUR RETARDER**

3.7.1. Beginning at the bottom of the slope, without adhering the membrane, unroll onto the substrate for alignment. Do not immediately remove the silicone release sheet.

### **3.7 APPLICATION OF ASPHALT PRIMER**

3.6.1. Prime substrates of wood, metal, concrete, masonry or water resistant gypsum board, at a rate of 0.2 to 0.3 l/m<sup>2</sup> (none required for factory-painted metals). All surfaces to be primed must be free of rust, dust or any residue that may hinder adherence. Cover primed surfaces with roofing membrane as soon as possible. Application temperature limit -10°C.

3.7.2. Peel back one end of the silicone release sheet and adhere this part of the membrane to the substrate. Peel back the remaining release sheet at a 45° angle to avoid wrinkles in the membrane.

3.7.3. If the membrane is not properly aligned, do not try to adjust it. Instead, cut the roll and start again, making sure that it is properly aligned and that it overlaps the end of the misaligned piece by 150 mm.

3.7.4. Overlap adjacent membranes by 75 mm. Overlap end laps by 150 mm. Stagger end laps by at least 300 mm.

### 3.8 **INSULATION INSTALLATION**

3.8.1. Mechanically attach insulation in conformance with manufacturer's recommendations. Fasten insulation in place with 4 fasteners per 1220 mm x 1220 mm board. Ensure fasteners are attached to steel deck's upper flutes.

3.8.2. Install insulation in two layers and stagger all joints between layers

3.8.3. Install only as much insulation as can be covered in the same day.

3.8.4. Around the drains lower insulation by 1" to create a sump 4' X 4' in area. Bevel the edge of the insulation on a 45° angle.

### 3.9 **INSTALLATION OF INSULATION OVERLAY**

3.9.1. Install overlay boards with specified adhesive in conformance with manufacturer's recommendations.

3.9.2. Firmly set the insulation boards, long joints continuous and short joints staggered. All boards must be evenly and tightly butted together.

3.9.3. Install only as many boards as can be covered with base sheet in the same day.

3.9.4. At parapets and curbs mechanically fasten overlay board to substrate before installation of self-adhesive base flashings.

### 3.10 **INSTALLATION OF BASE SHEET**

3.10.1. Allow primer to dry before installation of Base Sheet.

3.10.2. Unroll base sheet onto substrate, taking care to align the edge of the first selvedge with drain centre (parallel to roof edge).

3.10.3. Remove the silicone release film to adhere the membrane to the substrate. Remove the protective film from the side lap strip.

3.10.4. Let the membrane relax at least 15 minutes before installing it.

3.10.5. Overlap each selvedge with the previous one along lines provided for this purpose, and overlap by 150 mm (6 in) at the ends. Space end laps by a minimum of 300 mm (12 in).

3.10.6. Adhere the first 50 mm of the self-adhesive side laps using a roller, then heat-weld the last 50 mm.

3.10.7. Avoid creating wrinkles, blisters, and fish mouths.

### 3.11 **BASE-SHEET FLASHING INSTALLATION**

3.11.1. Apply primer to the substrate at a rate of .25 L/m<sup>2</sup>. Primer should be dry before installation of Base Sheet Flashing.

3.11.2. Install base sheet flashing in one- (1) metre widths to cover roofing substrate over 100 mm. Overlap side laps by 75 mm. Stagger side laps by at least 100 mm from base sheet overlaps on roof to avoid excessive layering.

3.11.3. Apply base sheet flashing directly onto substrate by removing silicone paper cover sheet. Proceed from top to bottom. Once in place, apply pressure manually in a uniform fashion to obtain homogenous adherence over entire surface. Preferably seal seams with rubber roller. Nail outside edge at 300 mm o/c.

3.11.4. Avoid forming wrinkles, air pockets or fishmouths.

3.11.5. Always seal overlaps at the end of the workday.

### 3.12 **ROOFING CAP SHEET INSTALLATION**

3.12.1. Beginning at the drains and perpendicular to the slope, install the cap sheet by peeling back the silicone release paper to adhere the membrane to the (primed) base sheet membrane.

3.12.2. Install the cap sheet in parallel strips, staggering the end laps by at least 300 mm

3.12.3. Cut off corners at end laps at areas to be covered by the next roll.

3.12.4. Overlap each selvedge with previous one laterally along lines provided for this purpose, and by 150 mm (6 ") at the ends. Space end laps a minimum of 300 mm (12 in).

3.12.5. Once in place, apply pressure manually in a uniform fashion to obtain homogenous adherence over entire surface. Preferably seal seams with rubber roller.

3.12.6. Adhere the first 50 mm of the self-adhesive side laps using a roller, then heat-weld the last 50 mm.

3.12.7. Apply adhesive for the first 125 mm of the end laps using a trowel with 5 mm notches. Complete the application by welding the last 25 mm of the end lap to the field surface using an electric hot-air welder and a roller.

3.12.8. Repeat last step for all other rolls of membrane

3.12.9. Once cap sheet is installed, carefully check all overlapped joints.



**3.13 CAP SHEET FLASHING INSTALLATION**

- 3.13.1. Install in one-metre-wide strips. The side laps must overlap by 100 mm. and must be staggered by at least 100 mm. with respect to the joints of the cap sheet on the field surface to avoid areas of excessive membrane thickness. At end laps, angle-cut the corners that will be covered by the following roll.
- 3.13.2. The cap sheet must overlap the existing surface by a minimum of 150 mm. (6 in.)
- 3.13.3. Use a chalk line to draw a straight line on the field surface 150 mm. from the upstands and parapets.
- 3.13.4. Prime the surface of the upstand and allow to dry.
- 3.13.5. Position the pre-cut membrane piece. Peel back 100 to 150 mm. (4 to 6 in.) of the silicone release paper to hold the membrane in place at the top of the upstand. As you progressively remove the paper, use the aluminum applicator to ensure good adherence and a perfect transition between the upstand and the field surface.
- 3.13.6. Apply primer before installing the next strip.
- 3.13.7. Smooth the entire membrane surface with a roller for full adhesion.
- 3.13.8. Using a 5 mm (3/16") steel trowel, apply trowel grade adhesive to the first 125 mm. (5 in.) of the lap with the field surface. Note: It's not necessary to remove granulation from the cap sheet on the field surface and upstand borders with the usage of adhesive.
- 3.13.9. Finish by heat-welding the last 25 mm. (1 in.) to the existing surface with an electric hot-air welder and roller. Provide a smooth application, free of wrinkles, fishmouths or air pockets.

**3.14 WATERPROOFING OF PENETRATIONS**

- 3.14.1. Ensure substrate is clear of loose granules and all foreign substances that can impair adhesion.
- 3.14.2. Apply a base coat of liquid waterproofing
- 3.14.3. Trim reinforcing material to conform to shape of penetrations and embed in base coat.
- 3.14.4. Apply a second coat fully saturating the reinforcement.
- 3.14.5. To add colour or match existing granules, apply a thin coat of liquid waterproofing and embed granules before it dries.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
  - .1 Labour, Products, equipment and services necessary for sealant Work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
  - .1 ASTM C920, Standard Specification for Elastomeric Joint Sealant.
  - .2 CAN/CGSB-19.13-M, Sealing Compound, One Component, Elastomeric, Chemical Curing.
  - .3 CAN/CGSB-19.22-M, Mildew Resistant Sealing Compounds for Tubs and Tiles.
  - .4 CAN/CGSB-19.24-M, Multi-Component, Chemical Curing, Sealing Compound.
- 1.3 **SUBMITTALS**
  - .1 Product data:
    - .1 Submit copies of Product data in accordance with Section 01330 indicating:
      - .1 Printed Product literature describing type, composition recommendations or directions for surface preparation, material preparation and material installation.
  - .2 Samples:
    - .1 Submit following samples in accordance with Section 01330.
      - .1 Samples of back-up material, primer and of each type and colour of sealant to be used. Cure samples under conditions anticipated at Site during application.
  - .3 Reports:
    - .1 Submit written pre-installation meeting recommendations, field inspection and test report result after each inspection.
- 1.4 **QUALITY ASSURANCE**
  - .1 Qualifications: Execute Work by applicators trained and approved by manufacturer having 5 years proven experience.
  - .2 Mock-up:
    - .1 Construct mock-up to show location, size, shape and depth of joints complete with bond breaker, joint backing, primer and sealant. Accepted mock-up may become part of finished Work.
    - .2 Allow [24 hours] for inspection of mock-up by Engineer before proceeding with sealant Work.

.3 Pre-installation meetings:

- .1 Arrange with manufacturer's representative to inspect substrates, and to review installation procedures 48 hours in advance of installation.
- .2 Review conditions under which Work will be done.
  - .1 Joint condition and profile.
  - .2 Weather conditions.
  - .3 Submit comments to Engineer in writing.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- .1 Product labels to identify manufacturer's name, brand name, date of manufacture, grade and type, application directions, and expiry date or shelf life.
- .2 Store flammable materials in safe containers to eliminate fire hazards.
- .3 Protect adjacent exposed finished surfaces from damage, by masking or other means, prior to performing Work. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.

1.6 **SITE CONDITIONS**

- .1 Do not install materials when ambient air temperature is less than 5<sup>0</sup> C, when recesses are wet or damp, or to manufacturer's recommendations.

1.7 **EXTENDED WARRANTY**

- .1 Submit a warranty for silicone sealant Work in accordance with General Conditions, except that warranty period is extended for a period of twenty (20) [ten (10)] years against defects and deficiencies. Promptly correct to satisfaction of Engineer and at no expense to Commission, any defects or deficiencies which become apparent within warranty period. Defects include, but are not limited to cracking, crumbling, melting, shrinkage, sag, failure in adhesion, cohesion or reversion, air and moisture leakage, marbling or streaking due to improper mixing, discolouration due to dirt pick-up during curing and staining of adjacent materials spalling or visible evidence of cracking, except for hairline shrinkage cracks. Warranty shall cover complete replacement including affected adjacent Work.

2 Products

2.1 **MATERIALS**

- .1 Use materials as received from manufacturers, without additives or adulteration. Use one manufacturer's Product for each kind of Product specified.

TYPE: S SINGLE COMPONENT SEALANT  
M MULTICOMPONENT SEALANT

GRADE: P POURABLE, SELFLEVELING FOR HORIZONTAL JOINTS  
NS NONSAG, GUNABLE FOR VERTICAL JOINTS

CLASS:	25½ ADHESION/COHESION	WITHSTANDS	MIN.	25%
	INCREASE/DECREASE OF JOINT WIDTH			
	12½ ADHESION/COHESION	WITHSTANDS	MIN.	12½%
	INCREASE/DECREASE OF JOINT WIDTH			

USE:

T	TRAFFIC AREAS, INCLUDING PEDESTRIAN AND VEHICULAR AREAS (WALKWAYS AND PARKING GARAGES)
NT	NONTRAFFIC AREAS
I	SUBMERGED CONTINUOUSLY IN LIQUID
M	MORTAR
G	GLASS
A	ALUMINUM
O	OTHER STANDARD SUBSTRATES

SUBSTRATE OF MAJOR USE:

CLASS M - METAL
CLASS C - CONCRETE OR MASONRY
CLASS G - GLASS

RHEOLOGICAL PROPERTIES:

CLASS 1 - SELF-LEVELLING
CLASS 2 - NON-SAG

MOVEMENT:

CLASS 25 - ±25%
CLASS 40 - ±40%

GLAZING SUITABILITY:

CLASS A - SUITABLE FOR GLAZING; UV RESISTANT
CLASS B - SUITABLE FOR NON-GLAZING APPLICATION; NOT UV RESISTANT

TEMPERATURE:

CLASS L - MIN APPLICATION TEMP. -30 DEG C
CLASS N - MIN APPLICATION TEMP. 5 DEG C

TYPE 1 - SELF-LEVELLING  
TYPE 2 - NON-SAG

CLASS A - GLAZING APPLICATION  
CLASS B - NON-GLAZING APPLICATION

- .2 Polyurethane sealant **Type A**: CAN/CGSB-19.13-M: MCG-2-25-B-N; ASTM C920: Type S, Grade NS, Class 25; One-part, weatherproof non-sag type, in standard colours selected.
- .3 Polyurethane sealant **Type B**: CAN/CGSB-19.24-M, Type 2, Class B; ASTM C920 Type M, Grade NS, Class 25, use NT, M, A and O; Two-part, weatherproof non-sag type, in standard colours selected.

- .4 Polyurethane sealant **Type C**: CAN/CGSB-19.24-M, Type 1, Class B; ASTM C920 Type M, Grade P, Class 25, use T, M, A and O; Two-part, self-levelling type, in standard colours selected.
- .5 Silicone sealant **Type D**: CAN/CGSB-19.22-M; ASTM C920 Type S, Grade NS, use NT, G, A and O. One-part mildew-resistant silicone; FDA Regulation 21 CFR 177.2600, in standard colours selected.
- .6 Silicone Sealant **Type E**: CAN/CGSB-19.13-M, MCG-2-40-B-N, ASTM C920: Type S, Grade N S, Class 25, Use NT, M, G, A, ; one component, structural glazing, glazing, weatherproofing, 100% silicone base chemical curing, in standard colours selected.
- .7 Silicone Sealant **Type F**: CAN/CGSB-19.13-M, MCG-2-40-B-N, ASTM C920: Type S, Grade NS, Use T, NT, M, G, A, O, Class 25; one component, weatherproofing, 100% silicone base chemical curing, in standard colours selected.
- .8 Silicone Sealant **Type G**: CAN/CGSB-19.13-M, MCG-2-40-B-N, ASTM C920: Type S, Grade NS, Use NT, M, G, A, O, Class 25; one component, non-staining weatherproofing, 100% silicone base chemical curing, in standard colours selected.
- .9 Silicone sealant **Type H**: CAN/CGSB-19.13-M, MG-2-25-A-N; ASTM C920: Type S, Grade NS, Use NT, G, A, O, Class 25; One-part, general purpose weatherproofing, non-sag type, in standard colours selected.

## 2.2 ACCESSORIES

- .1 Primers: Type recommended by material manufacturers for various substrates, to promote adhesion and to prevent staining of adjacent surfaces for conditions encountered on project.
- .2 Joint backing: Round, solid section, skinned surface, soft polyethylene foam gasket stock, compatible with primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.
- .3 Bond breaker: Type recommended by material manufacturers to prevent bonding of sealant to back of recess.
- .4 Cleaning agents: As recommended by material manufacturer, harmless to substrates and adjacent finished surfaces.

## 2.3 MIXING

- .1 Follow manufacturer's instructions on mixing, shelf and pot life.
- 3 Execution

## 3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.

### 3.2 PREPARATION

- .1 Prior to the commencement of the sealant application, arrange for sealant manufacture's technical representative to perform a site adhesion test on each substrate type to which each sealant is to be applied, to ensure surface preparation and primer recommendation is compatible with each substrate type.
- .2 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry ferrous surfaces are free from rust and oil.
- .3 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.
  - .1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting. Apply masking tape to metal surfaces adjacent to recesses to prevent smearing or staining of such metal surfaces.
  - .2 Ensure recess is dry.
  - .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings [unless tests have been performed to ensure compatibility of materials]. Remove coatings as required.
- .4 Install joint backing.
- .5 Depth of recess: Maintain depth to 1/2 joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.
- .6 Apply bond breaker to back recess.
- .7 Prime sides of recess, in accordance with sealant manufacturer's instructions.

### 3.3 INSTALLATION

- .1 Apply sealant immediately after adjoining Work is in condition to receive such Work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to fill joint.
- .2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool surface of sealant smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains or other defects.
  - .1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.
  - .2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.

- .3 Tool sealant to smooth, concave profile, free from ridges, wrinkles, air pockets and impurities. Remove excess sealant.
- .4 Make sealant bead uniform in colour.
- .5 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.
- .6 Remove defective sealant.

### 3.4 **FIELD QUALITY CONTROL**

- .1 Conduct field inspection and testing of sealant with manufacturer's representative for a minimum of 20% of joints, including mixing of materials, joint preparation, priming, joint profile, application, adhesion, cohesion and tooling.
- .2 Submit written inspection reports to Engineer. Include confirmation by manufacturer that installation has been satisfactorily completed.

### 3.5 **CLEANING**

- .1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove masking and other residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

### 3.6 **SCHEDULE OF LOCATIONS**

- .1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and determine entire extent of Work of this Section. Generally, seal following locations:
  - .1 Concrete, masonry, wood and stone to metal.
  - .2 Wood to masonry, concrete and stone.
  - .3 Metal to metal.
- .1 **Sealant Type A:**
  - .1 Exterior locations. Metal flashings, metal to metal waterseals.
  - .2 Interior joints in exterior walls.
  - .3 Joints between interior metal frames in adjacent construction in interior partitions.
- .2 **Sealant Type B:**
  - .1 Exterior joints between concrete or masonry and steel or aluminum.
  - .2 Exterior joints between masonry and shelf angle.
  - .3 Exterior joints between wood and steel or aluminum and concrete or masonry.
  - .4 Interior and exterior expansion joints, except in floors.
  - .5 Interior partition head to structure above.

- .6 Door frames, louvre frames, blank-off panels, interior and exterior side.
  - .7 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.
  - .8 Seal thresholds.
  - .9 All other locations where sealing is required or noted on the Drawings except in locations designated for sealants Types: A, C, D, E, F, G, H and except where sealing is specified in other sections.
- .3 **Sealant Type C:**
- .1 Interior and exterior expansion joints, except in walls.
  - .2 Precast slab joints.
  - .3 Expansion and control joints in parking garages, plazas, terraces, decks, floor and sidewalk joints.
- .4 **Sealant Type D:**
- .1 Control and expansion joints in tiled areas.
  - .2 Between vanity and tile.
  - .3 Between vanity and mechanical fixtures/fittings.
  - .4 Between access panels and tile.
  - .5 At corners of tile walls.
- .5 **Sealant Type E:**
- .1 Expansion and control joints for new and remedial applications.
  - .2 Primarily glazing sealant, structural glazing and perimeter sealing of doors and window frames.
  - .3 Suitable as well for wood, vinyl, aluminum surfaces.
  - .4 Not suitable for below grade applications, brass, surfaces continuously emersed in water, interior penetration firestop, building materials that bleed oils (impregnated wood, oil-based caulks, vulcanized rubber gaskets or tapes or bituminous below grade waterproofing and asphalt-impregnated fibreboard), totally confined spaces, surfaces to be painted, surfaces in direct contact with food.
- .6 **Sealant Type F:**
- .1 Expansion and control joints for new and remedial applications.
  - .2 Primarily for joints in building materials, masonry and precast concrete and remedial applications.
  - .3 Suitable as well for glass, metal and plastics in glazing and curtainwall assemblies.
  - .4 Not suitable for below grade applications, brass, surfaces continuously emersed in water, interior penetration firestop, building materials that bleed oils (impregnated wood, oil-based caulks, vulcanized rubber gaskets or tapes or bituminous below grade waterproofing and asphalt-impregnated fibreboard), totally confined spaces, surfaces to be painted, surfaces in direct contact with food.



.7 Sealant **Type G:**

- .1 Expansion and control joints for new applications. where non-staining, non-streaking, considerations are critical.
- .2 Suitable for glass, painted metals, porous surfaces including marble, granite, stone, concrete.

.8 Sealant **Type H:**

- .1 Conventional glazing and replacement glazing of glass and plastic.
- .2 Aluminum sheet cover for insulation on metal pipes in exterior locations.
- .3 Not suitable for structural glazing, below grade applications, surfaces continuously emersed in water, interior penetration firestop, building materials that bleed oils (impregnated wood, oil-based caulks, vulcanized rubber gaskets or tapes or bituminous below grade waterproofing and asphalt-impregnated fibreboard), totally confined spaces, surfaces to be painted, masonry surfaces, application trim, surfaces sensitive to corrosion by acetic vapours.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for aluminum windows Work in accordance with the Contract Documents.

1.2 **REFERENCE**

.1 American Architectural Manufacturers Association (AAMA), Aluminum Association Designation System for Aluminum Finishes.

.2 AAMA 605.2, Voluntary Specification for High Performance Coatings on Architectural Extrusions and Panels.

.3 AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

.4 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.5 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).

.6 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.7 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

.8 ASTM E283, Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

.9 ASTM E331, Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

.10 ASTM E413, Classification for Rating Sound Insulation.

.11 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

.12 CAN/CGSB-1.108-M, Bituminous Solvent Type Paint.

.13 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

.14 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.

.15 CAN/CGSB-12.3-M, Flat, Clear Float Glass.

.16 CAN/CGSB-12.8-M, Insulating Glass Units.

.17 CAN/CGSB-12.20-M, Structural Design of Glass for Buildings.

.18 CAN/CGSB-19.24-M, Multi-Component, Chemical Curing, Sealing Compound.

.19 CAN/CGSB-51.10-M, Mineral Fibre Board Thermal Insulation.

- .20 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steels (Metric Version).
- .21 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .22 CAN/CSA-A440-M/A440.1-M, Windows / User Selection Guide to CSA Standard CAN/CSA A440-M Windows.

1.3 **DESIGN REQUIREMENTS**

- .1 Design aluminum windows system in accordance with following Climatic Design Data for Toronto contained in Ontario Building Code (OBC):
  - .1 Design Temperature: January 1%, July 2 1/2%.
  - .2 Wind (Hourly Wind Pressures): 1 in 100 year occurrence.
  - .3 Earthquake: Seismic Data as listed.
- .2 Design aluminum windows system to accommodate following without detrimental effect:
  - .1 Cyclic 40 degrees C daily, thermal swing of components.
  - .2 Cyclic, dynamic loading and release of loads such as wind loads.
  - .3 [13 mm] vertical deflection in the supporting structure and movement of supporting structure due to live, dead load, and creep or deflection, seismic load, sway displacement and similar items.
- .3 Design aluminum windows system in accordance with following CAN/CSA-A440-M classification ratings:
  - .1 Air tightness: Fixed.
  - .2 Water tightness: DRWP 1/10, minimum B3.
  - .3 Wind load resistance: Minimum C3.
  - .4 Condensation resistance: DTJ -18<sup>0</sup>C, minimum Temperature Index 60.
- .4 Design glass to CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .5 Design and detail controlled drainage path to discharge water, which enters into, or forms within aluminum windows system, to exterior. Prevent accumulation or storage of water within the aluminum window system. Prevent water from entering interior when tested in accordance with ASTM E331.
- .6 Design and detail air barrier, vapour retarder, insulation and rainscreen Products and assemblies into continuous and integrated aluminum window envelope. Optimize aluminum windows design to align envelope layers and to minimize thermal bridges.
- .7 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to L/175 maximum (under uniformly distributed positive load) and 10 mm maximum regardless of span.

- .8 Design anchorage inserts for installation as part of other Sections of the Work. Design anchorage assemblies to accommodate construction and installation tolerances.

#### 1.4 **SUBMITTALS**

- .1 Shop drawings:

- .1 Submit shop drawings in accordance with Section 01340 indicating:

- .1 Plans, sections, and details.
- .2 Products and glazing types.
- .3 Finishes.
- .4 Section reinforcement, anchorage, assembly fixings.
- .5 Anchorage inserts, system installation tolerances
- .6 Detailing, locations, and allowances for movement, expansion, contraction.
- .7 Path of cavity drainage and air pressure equalization.

- .2 Samples:

- .1 Submit following samples in accordance with Section 01330.

- .1 Two 250 mm long samples of fixed frame and finish.
- .2 Two 250 x 200 mm samples of sill flashing.
- .3 Two 250 x 200 mm samples of insulating glass.

- .3 Reports:

- .1 Submit substantiating engineering data, and independent test results of pre-tested, existing aluminum window designs to substantiate compliance with design criteria.
- .2 Submit documentation to substantiate ten years of experience in aluminum window manufacture and installation.

- .4 Project close-out submittals:

- .1 Submit data for windows incorporated into Operation and Maintenance Manual as part of Section 01830.

#### 1.5 **QUALITY ASSURANCE**

- .1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in aluminum window Work of comparable complexity and scope to perform the following services as part of the Work of this Section:

- .1 Design aluminum windows.
- .2 Review, stamp, and sign fabrication and erection shop drawings.
- .3 Conduct shop and on-Site inspections and prepare and submit inspection reports.

#### 1.6 **DELIVERY, STORAGE, AND HANDLING**

- .1 Handle aluminum windows Work in accordance with AAMA CW-10.

- .2 Protect prefinished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

## 1.7 **EXTENDED WARRANTY**

- .1 Submit warranty for aluminum windows Work in accordance with General Conditions, except that the warranty period is extended to 10 years.
  - .1 Warrant against failure to meet the design criteria and requirements such as interior leakage, insulating glass unit failure, finish degradation, frame condensation.
  - .2 Coverage: Complete replacement including affected adjacent Work.

## 2 Products

### 2.1 **MANUFACTURERS AND SYSTEMS**

- .1 Aluminum windows:
  - .1 900 Series Fixed Aluminum Window by Alumicor Limited.
  - .2 Series 350 Windows by Commercial Aluminum.
  - .3 Series 516 by Kawneer Company Canada Limited.

### 2.2 **MATERIALS**

- .1 Aluminum extrusions (such as framing members, pressure plates, caps and similar items): ASTM B211 and ANSI H35.1 AA6063, T5 temper alloy.
  - .1 Profile and dimensions: Refer to Contract Drawings
  - .2 Thermal breaks in frame members: Vertically aligned with glazing.
- .2 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, 1.0 mm aluminum sheet.
- .3 Clear glass (**CGL**): CAN/CGSB 12.3-M; 6 mm thick clear float glass.
- .4 Tempered glass (**TGL**): CAN/CGSB 12.1-M; 6 mm thick clear float glass.
- .5 Tempered/laminated, safety glass (**TLGL**): CAN/CGSB-12.1-M, Type 1, Class B; laminated glass consisting of two 3 mm thick tempered glass panes. Laminating film thickness: 0.4 mm.
- .6 Insulating glass units: CAN/CGSB-12.8-M, 25 mm overall thickness.
  - .1 (**IG1**): Clear glass inside, clear glass outside.
  - .2 (**IG2**): Tempered/laminated inside, clear glass outside.
  - .3 (**IG3**): Tempered/laminated inside, tempered/laminated outside.
- .7 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by glass manufacturer.

- .8 Glazing sealant: Type as recommended by aluminum entrance manufacturer.
- .9 Glazing tape: As specified in Section 08800.
- .10 Glazing gasket: As specified in Section 08800.
- .11 Setting blocks: As specified in Section 08800.
- .12 Spacer shims: As specified in Section 08800.
- .13 Heel bead: As specified in Section 08800.
- .14 Glass presence markers: As specified in Section 08800.
- .15 Decal: As selected by the Engineer.
- .16 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.
- .17 Frame sealant: Type as recommended by the aluminum window manufacturer.
- .18 Aluminum window sealant: CAN/CGSB-19.24-M, Multi-Component, Chemical Curing, polyurethane sealant, Dymeric by Tremco Ltd.; Sikaflex 2C by Sika Canada Inc. Colour as selected by Engineer.
- .19 Airseal sealant: One part silicone neutral cure low modulus sealant. Verify compatibility with insulating glass unit manufacturer's secondary sealant.
- .20 Airseal tape: 19 mm wide butyl tape, thickness as required.
- .21 Transition membrane: EPDM sheet, 1.1 mm thick complete with manufacturer's recommended adhesives for lap seal, by Lexcan Limited or Carlisle Syntech Systems Canada.
- .22 Fastening bar: 25 x 3 mm, Type 304 stainless steel fastening bar, with pre-punched fastening holes at 100 mm o.c.
- .23 Infill panel insulation: CAN/CGSB-51.10; Semi-Rigid glass fibre.
  - .1 AF110 by Owens-Corning Canada.
  - .2 OFI 16 by Ottawa Fibre.
  - .3 Paroc Plus by Partek Insulation Ltd.
  - .4 RXL 20 by Roxul Inc.
  - .5 Thickness: [As indicated on the drawings].
  - .6 Infill panel insulation fasteners: Stik-Clip with retaining washer.
- .24 Infill panel outer [and inner] facing: 3 mm sheet aluminum sheet.
- .25 Airseal backpan: 0.9 mm thick, Z275 galvanized steel sheet.

- .26 Anchors, clips, and angles: Extruded aluminum or stainless steel.
- .27 Shims and blocking for frame: Rigid plastic, wood is not permitted.
- .28 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304.
- .29 Steel reinforcements and anchors: CAN/CSA-G40.20-M/G40.21-M, Grade 300W hot dipped galvanized in accordance with CAN/CSA G164-M requirements. Touch-up primer: CAN/CGSB-1.181 zinc rich paint.
- .30 Isolation coating: CAN/CGSB 1.108-M; Bitumastic coating, acid and alkali resistant material.
- .31 Batt Insulation: Batt by Fibreglass Canada Inc. Div. of Owens-Corning Canada,; Noise Control by Ottawa Fibre ; AFB by Partek Insulation Ltd.; Noise Stop by Roxul Inc.
- .32 Foam insulation: One component polyurethane foam for installation within closures and fillers; Enerfoam by Abisko Manufacturing Inc.

## 2.3 **FABRICATION**

- .1 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.
- .2 Fabricate, fit and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Seal frame with sealant at joints for weatherproof seams.
- .3 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.
- .4 Fabricate insulated infill panel outer [and inner] facing of 3 mm thick aluminum sheet. Wrap edges with aluminum sheet.
- .5 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing. Fabricate filler and closure pieces as necessary for a complete and weathertight installation.
- .6 Do not expose manufacturer's identification labels on aluminum window assemblies.
- .7 Certify aluminum windows as complying with the CAN/CSA A440-M design criteria and requirements using an easily removable label located on the inside face of glazing.
- .8 Fabricate aluminum window flashings, closures and trim from aluminum sheet. Form to profile shown. Make weathertight.

## 2.4 **FINISH**

- .1 Extrusion finish: [Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes. AA-M12C22A41] [PPG Duranar XL in accordance with AAMA 605.2]

- .2 Panel and sheet finish: To match aluminum window extrusion finish.
- 3 Execution
- 3.1 **EXAMINATION**
  - .1 Verify conditions and dimensions of previously installed Work upon which Work of this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.
- 3.2 **INSTALLATION**
  - .1 Install windows in accordance with manufacturer's instructions and CAN/CSA A440-M/A440.1-M.
  - .2 Install Work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.
  - .3 Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.
  - .4 Install aluminum window flashings, closures, and trim pieces.
  - .5 Fill voids between aluminum window framing and adjacent construction with batt [foam] insulation.
  - .6 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.
  - .7 Install infill panels, seal to framing. Conceal fasteners.
- 3.3 **GLAZING**
  - .1 Refer to drawings for glazing type locations.
  - .2 Install glass units in accordance with requirements of Section 08800.
  - .3 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.
- 3.4 **ERECTION TOLERANCES**
  - .1 Tolerances: Non-cumulative.
  - .2 Maximum variation from plumb: 1.5 mm/3 m non-cumulative.
  - .3 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.



- .4 Vertical and horizontal positions: +/- 3 mm.
- .5 Racking of face: 6 mm, nil in elevation.
- .6 Operable units: Consistent with smooth operation and weatherproof performance.
- .7 Maximum perimeter sealant joint between aluminum window and adjacent construction: 13 mm.

**3.5 GLAZING PERIMETER AIRSEAL**

- .1 Install glazing perimeter airseal at entire perimeter of each insulating glass unit to achieve an airseal from insulating glass unit to aluminum window frame. Do not obstruct path of cavity drainage and air pressure equalization.

**3.6 AIRSEAL TRANSITION MEMBRANE**

- .1 Install airseal transition membrane in accordance with manufacturer's instructions, pre-installed onto entire window frame perimeter in factory, sandwiching airseal tape and EPDM sheet with continuous fastening bar.
- .2 Overlap and seal airseal transition membrane 75 mm minimum into continuous boot.
- .3 Supply and install airseal transition boot extended minimum 150 mm beyond window frame to accommodate Site seal. Supply and install airseal tape and fastening bar to building airseal, on Site.

**3.7 JOINT BACKING AND ALUMINUM WINDOW SEALANT**

- .1 Prepare substrate surface, mask as recommended by sealant manufacturer.
- .2 Install joint backing and frame sealant at aluminum window system joints and perimeter for weathertight installation in accordance with aluminum window sealant manufacturer's instructions. Remove excess sealant.
- .3 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in sealant. Seal between sill upstand and window-frame. Seal butt joints in continuous sills.

**3.8 CLEANING**

- .1 Maintain aluminum windows, inside and outside, in clean condition throughout duration of Work.
- .2 Remove protective material, and glass presence markers from prefinished surfaces.
- .3 Remove CAN/CSA A440-M certification labelling when directed by Engineer, in writing.
- .4 Wash aluminum windows with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

1           **General**

1.1          **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for the glass and glazing Work in accordance with the Contract Documents.

1.2          **REFERENCES**

- .1 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.
- .2 CAN/CGSB-1.108-M, Bituminous Solvent Type Paint.
- .3 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.
- .4 CAN/CGSB-12.3-M, Flat, Clear Float Glass.
- .5 CAN/CGSB-12.4-M, Glass, Heat Absorbing.
- .6 CAN/CGSB-12.6-M, Mirrors, Transparent (One-Way).
- .7 CAN/CGSB-12.8-M, Insulating Glass Units.
- .8 CAN/CGSB-12.9-M, Glass, Spandrel.
- .9 CAN/CGSB-12.10-M, Glass, Heat and Light Reflecting.
- .10 CAN/CGSB-12.11-M, Wired Safety Glass.
- .11 CAN/CGSB-12.13-M, Patterned Glass.
- .12 CAN/CGSB-12.20-M, Structural Design of Glass for Buildings.
- .13 CAN/CGSB-19.1-M, Putty, Linseed Oil Type.
- .14 NFPA 80, Fire Doors.

1.3          **DESIGN REQUIREMENTS**

- .1 Design glass to CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

1.4          **SUBMITTALS**

- .1 Shop drawings:
  - .1 Submit shop drawings in accordance with Section 01340 indicating:
    - .1 Manufacturing and installation details.

.2 Samples:

- .1 Submit following samples in accordance with Section 01330.
- .2 Submit sample of each type of glass.
  - .1 250 x 200 mm tempered/laminated.
  - .2 250 x 200 mm wired glass.
  - .3 250 x 200 mm patterned glass.
  - .4 250 x 200 mm insulating glass units.

.3 Certificates:

- .1 Submit manufacturer's certification that glass and glazing materials are compatible.

1.5 **QUALITY ASSURANCE**

- .1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in glazing Work of comparable complexity and scope, to perform the following services as part of Work of this Section:
  - .1 Design glass and glazing Work.
  - .2 Review, stamp, and sign fabrication and erection shop drawings.
  - .3 Conduct shop and on-Site inspections and prepare and submit inspection reports.

1.6 **EXTENDED WARRANTY**

- .1 Submit warranty for glazing Work in accordance with General Conditions, except that warranty period is extended to 10 years.
  - .1 Warrant against failure to meet Product and installation requirements such as insulating glass unit failure and water and airtight and rattle-free installation.
  - .2 Coverage: Complete replacement including affected adjacent Work.

2 **Products**

2.1 **MANUFACTURERS**

- .1 Possible Glass Manufacturers:
  - .1 AFG Glass.
  - .2 Guardian Industries.
  - .3 LOF Glass of Canada Ltd.
  - .4 PPG Industries Ltd.

2.2 **MATERIALS**

- .1 Tempered glass (**TGL**): CAN/CGSB-12.1-M, Type 2, Class B, Category II; [6 mm] thick, clear float glass.

- .2 Tempered/laminated, safety glass (**TLGL**): CAN/CGSB-12.1-M, Types 2 & 1, Class B, Category II; Laminated glass consisting of two panes of [3] [5] [6] mm tempered glass. Laminated film thickness: 0.4 mm.
- .3 Clear glass (**CGL**): CAN/CGSB-12.3-M91; glazing quality, 6 mm thick clear float glass.
- .4 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by glass manufacturer.
- .5 Glazing gasket (glass units in exterior location): Visionstrip by Tremco Ltd., extruded composite glazing, size as recommended by manufacturer.
- .6 Glazing gasket for interior locations except fire rated units: Neoprene or EPDM.
- .7 Glazing tape (glass units in interior location): Polyshim II by Tremco Ltd.; Preformed and pre-shimmed tape with paper release. Size as recommended by manufacturer.
- .8 Spacer shims: Neoprene, 60-70 Shore A Durometer hardness, 75 mm long x 6 mm wide x 6 mm high minimum, size designed for glass size and weight of glass unit, self adhesive on face.
- .9 Setting blocks: Neoprene or EPDM, 80-90 Shore A Durometer hardness, 100 mm long x 6 mm high x rebate width minimum, size designed for glass size and weight of glass unit.
- .10 Glazing sealant: Type as recommended by glazing manufacturer. [Verify compatibility with insulating glass unit secondary sealant.]
- .11 Heel bead: Dymonic by Tremco Ltd.

## 2.3 **FABRICATION**

- .1 Verify glazing dimensions on Site.
- .2 Clearly label each glass lite with maker's name and glass type. Do not remove labels until after Work is accepted by Engineer.
- .3 Fabricate glazing not maximum 3 mm smaller than rebate size in either dimension; allow for edge spacers, shims, and setting blocks as necessary.

## 3 **Execution**

### 3.1 **EXAMINATION**

- .1 Verify conditions and dimensions of previously installed Work upon which Work of this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.

### 3.2 **INSTALLATION**

- .1 Refer to the Contract Drawings for glazing type and locations.
- .2 Install glazing to the Work of Sections 08520.
- .3 Remove glazing stops, clean rebate and glass contact surfaces with solvent, wipe dry.
- .4 Apply primer to contact surfaces prior to glazing.
- .5 Apply primer-sealer to contact surfaces, prior to glazing.
- .6 Use setting blocks at 1/4 points and spacers to centre glass unit in frame.
- .7 Install glazing in accordance with manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- .8 Re-install glazing stops ensuring continuous contact and rattle-free installation. Do not distort glass. Trim tape protruding more than 2 mm above stop.
- .9 Install glass presence markers in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.
- .10 Where tempered/laminated glass is used face tempered side facing public areas.
- .11 Remove, dispose of, and replace broken, cut and abraded glass.
- .12 Exterior glass:
  - .1 Glaze units with glazing gasket on exterior side and glazing tape on interior side. Seal junctions in glazing materials, seal exterior gasket watertight, seal interior glazing water and airtight.
  - .2 Where glass is installed from interior side apply heel bead to perimeter of glass unit.
  - .3 Install glazing tape continuously onto the rebate perimeter; do not expose glazing tape above the rebate stop.
- .13 Interior glass:
  - .1 Install wired glass in fire rated metal doors with 10 mm gap between glazing stops, in accordance with ULC and NFPA 80 requirements. Strike and point exposed joints between metal and glass.
  - .2 Glaze interior glass using glazing gasket glazing tape.
  - .3 Install spacer shims at 600 mm o.c. to centre balustrade glazing in rebate space. Install shims 6 mm below sight line. Apply cap bead of glazing sealant to uniform line, flush with rebate sightline and tool to smooth appearance, both sides.

### 3.3 **CLEANING**

- .1 Immediately remove sealant and compound droppings from finished surfaces.

- .2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for ceramic tile Work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ANSI A118.4, Latex - Portland Cement Mortar
- .2 ASTM C144, Specification for Aggregate for Masonry Mortar.
- .3 CAN/CGSB-75.1-M, Tile, Ceramic.
- .4 CAN/CSA A5/A8/A362, Portland Cement / Masonry Cement / Blended Hydraulic Cement.
- .5 CAN/CGSB-19.22-M, Mildew Resistant Sealing Compounds for Tubs and Tiles.
- .6 CAN/CGSB-19.24-M, Multi-Component, Chemical Curing, Sealing Compound.
- .7 CGSB 71-GP-22M, Organic Adhesive for Installation of Ceramic Wall Tile.
- .8 TTMAC Installation Manual 200, Ceramic Tile.
- .9 TTMAC, Maintenance Guide.

1.3 **SUBMITTALS**

.1 Product data:

- .1 Submit copies of manufacturer's Product data in accordance with Section 01330 indicating:

- .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations and warranties.
- .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:

- .1 Submit shop drawings in accordance with Section 01340 indicating:

- .1 Tile layout, patterns, colour arrangement.
- .2 Perimeter conditions, junctions with dissimilar materials.
- .3 Setting details.

.3 Samples:

- .1 Submit following sample panels in accordance with Section 01330.

- .1 Each colour, texture, size, and pattern of tile.

- .2 Adhere tile samples to 600 x 600 x 10.5 mm thick cement board complete with selected grout colour in joints.

.4 Certificates:

- .1 Submit manufacturer's certificates stating that materials supplied are in accordance with this specification.
- .2 Submit manufacturer's installation procedures.

.5 Closeout submittals:

- .1 Submit following for incorporation into Operations and Maintenance Manuals in accordance with Section 01830:
  - .1 Recommended maintenance instructions and listing of recommended maintenance Products.

1.4 **QUALITY ASSURANCE**

- .1 Perform Work of this Section by a company that is a member in good standing of the Terrazzo Tile and Marble Association of Canada with proven, acceptable experience on installations of similar complexity and scope.

1.5 **SITE CONDITIONS**

- .1 Do not install Work of this Section outside of the following environmental ranges without the Engineer's and Product manufacturer's written acceptance:
  - .1 Ambient air and surface temperature: 15<sup>0</sup>C to 45<sup>0</sup>C.
  - .2 Precipitation: None.
- .2 Install temporary protection and facilities to maintain the Product manufacturer's, and specified, environmental requirements for 7 Days before, during, and 7 Days after installation.

1.6 **MAINTENANCE**

- .1 Submit extra ceramic tile, amounting to [3%] of gross area covered, allowing proportionately for each pattern and type specified and which are part of the same Production run as installed Products. Store maintenance Products as directed by the Engineer.

2 Products

2.1 **MATERIALS**

- .1 Porcelain tile (**CFT4**): CAN/CGSB-75.1-M, Type 4, Class MR1:
  - .1 Surface hardness: MOHS [7] minimum.
  - .2 Dimensional Variation:
    - .1 Length or width: ± 0.6%.



- .2 Edge straightness:  $\pm 0.6\%$ .
- .3 Evenness:  $\pm 0.5\%$ .
- .4 Thickness:  $\pm 0.5\%$ .
  
- .3 Colour: As selected by the City.
- .4 Finish: Slip resistant in accordance with CAN/CSA 75.1-M.
- .5 Dimensions: (600mm x 600mm) and (300mm x 300mm) x 10.5mm thick.
- .6 Accessories: Available accessory trim pieces as required to complete installation.
- .7 Grout joint width: Minimum 4mm.
- .8 Grout base thickness: Maximum 3mm.
- .9 Grout colour: As selected by the City.
- .10 Mortar: Adhesive type, Pre-mixed thinset mortar.
- .11 Manufacturers: Ciot Inc.

## 2.2 ACCESSORIES

- .1 Cement: CAN/CSA A5/A8/A362, Type 10.
- .2 Sand: ASTM C144.
- .3 Polymer additive: Keralastic by Mapei Inc or Full Bond Additive TA 867 by TEC Inc.
- .4 Waterproofing: Planicrete W by Mapei Inc.
- .5 Pre-mixed thinnest mortar: ANSI A118.4:
  - .1 300 x 300 mm tile size or less: #52 Versatile by Flextile; Kerabond with Keralastic by Mapei Inc. or TEC Super-Flex by TEC Inc.
  - .2 Over 300 x 300 mm tile size: #50 Multi-Purpose Medium Bed Mortar by Flextile; Ultra/Flor with Keraply by Mapei Inc. or TEC Medium Bed TA 372 with Full Bond Additive TA867 by TEC Inc.
- .6 Organic adhesive: CGSB 71-GP-22M, Type 1.
- .7 Water: Potable and free of minerals and other contaminants which are detrimental to mortar and grout mixes.
- .8 Grout (floors, bases): 1.5 mm to 3 mm joint width: Polymer Modified Floor Grout by Flextile; Sanded Keracolor Floor Grout with Plastijoint additive by Mapei Inc. or TEC TA 650 with TA 869 additive by TEC Inc.
- .9 Grout (walls) 1.5 mm to 3 mm joint width: Polymer Modified Wall Grout by Flextile; Unsanded Keracolor Wall Grout with Plastijoint additive by Mapei Inc. or TEC TA 610 with TA 869 additive by TEC Inc.
- .10 Grout (walls) over 3 mm joint width: Sanded Keracolor Floor grout with Plastijoints additive by Mapei Inc.; TEC TA 650 with TA 869 additive by TEC Inc.
- .11 Grout colour: As selected by the City from manufacturer's full colour range.

- .12 Joint backing: Round, closed cell, foam rod, oversized by 30% to 50%, Shore A hardness of 20, tensile strength 140 to 200 kPa.
- .13 Tile sealant horizontal floor joints: CAN/CGSB-19.24-M; THC 900 and primer by Tremco Ltd.
- .14 Tile sealant remainder of Work: CAN/CGSB-19.22-M; One-part mildew-resistant silicone; FDA Regulation 21 CFR 177.2600, in standard colours selected.
  - .1 786 Mildew Resistant Silicone Sealant by Dow Corning Inc.
  - .2 Tremsil 600 silicone sealant by Tremco Ltd.

**2.3 MIXES**

- .1 Levelling bed mix:
  - .1 1 part Portland cement.
  - .2 4 parts sand.
  - .3 1 part water (including polymer additive), adjusted for water content of sand.
  - .4 1/10 part polymer additive.

**3 Execution**

**3.1 EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.

**3.2 SURFACE PREPARATION**

- .1 Blastrac surface of existing floors except new, wood float or broom finish concrete.
- .2 Clean and dry surfaces thoroughly. Remove oil, wax, grease, dust, dirt, paint, tar, primers, form release agents, curing compound, and other foreign material from substrate surfaces which may prevent or reduce adhesion.
- .3 Neutralize any trace of strong acids or alkali from the substrate.

**3.3 CONTROL JOINTS**

- .1 Continue control, construction, and cold joints in the structural substrate up through the tile finish, and align with mortar joints where possible. Review joint locations on Site with the Engineer.
- .2 Install joint widths to match grout joint widths, except where a minimum width is indicated.
- .3 Install control joints in the following typical locations:
  - .1 Aligned over structural beams.
  - .2 Aligned over changes in type of substrate.

- .3 At the restraining perimeters such as walls and columns.
- .4 Interior areas (not subject to sunlight): 6 mm minimum width, at 7320 mm o.c. maximum.
- .5 Interior areas (subject to sunlight): 6 mm minimum width, at 3660 mm o.c. maximum.
- .6 Exterior areas: 10 mm minimum width, at 3660 mm o.c. maximum.
- .7 As indicated on the Contract Drawings.

- .4 Seal control joints in accordance with Section 07900.

### 3.4 **LEVELLING BED**

- .1 Install a levelling bed on uneven substrate surfaces, level and plumb substrates in accordance with the following tolerances:
  - .1 Vertical surfaces: 3 mm in 2.4 m maximum.
  - .2 Horizontal surfaces: 3 mm in 2.4 m from finished levels of the surface, or better. On the platform level, the slope is 2%, with the crown at the centreline of a double sided platform.
- .2 Clean structural substrate control joints and blow-clean with compressed air. Grout fill control joints flush to slab with levelling bed.

### 3.5 **TILE WATERPROOFING**

- .1 Prepare substrates for waterproofing in accordance with tile waterproofing manufacturer's written directions and standards.
- .2 Install tile waterproofing in accordance with the manufacturer's instructions. Apply tile waterproofing to a total dry film thickness of [1.1] mm and continue up vertical surfaces 150 mm.

### 3.6 **GENERAL TILE INSTALLATION REQUIREMENTS**

- .1 Mix and install thin set mortar, adhesive, and grout components in accordance with manufacturer's recommended proportions and methods, to achieve maximum bond strength.
- .2 Install tiles in accordance with manufacturer's instructions and TTMAC, Installation Manual 200, Ceramic Tile. Manufacturer's installation instructions govern over TTMAC Installation Manual.
- .3 Lay out Work to produce a symmetrical pattern with minimum amount of cutting. Ensure cut tile at room perimeter is not less than 1/2 full size.
- .4 Set tiles in place and rap or beat with a beating block as necessary to ensure a proper bond and to level surface of tile. Align tile for uniform joints and allow to set until firm. Clean excess mortar from surface of tile with a wet cloth or sponge while mortar is fresh.
- .5 Adjust joints between tile uniform, plumb, straight, even, and true, with adjacent tile flush. Align grout joints in both directions unless indicated otherwise.

- .6 Align floor, base and wall tile grout joints.
- .7 Install tile accessory fittings for a complete and fully coordinated tile assembly.
- .8 Install wall tile full height unless indicated otherwise.
- .9 Cut and fit tile neatly around piping, fittings, projections and around recesses items e.g. washroom accessories. Where surface mounted equipment and accessories are installed on tiled surfaces, extend tile over surfaces. Cut edges smooth, even, and free from chipping; chipped and broken edges are not acceptable.
- .10 Do not proceed with grouting until minimum 48 hours after tile has set, to prevent displacement of tiles.
- .11 Apply grout in accordance with grout manufacturer's directions to produce watertight, filled joints without voids, cracks and excess grout. Thoroughly compact and tool floor grout. Finish grout flush to edge thickness of tile and remove excess grout with soft burlap or sponge moistened with clean water.

**3.7 AGGLOMERATED GRANITE TILE REQUIREMENTS**

- .1 In addition to General Tile Installation Requirements, specific to agglomerated granite tiles:
  - .1 Wash and dry AGT tiles to remove dust or other residue which would impair mortar bond.
  - .2 Back butter AGT tiles for 100% mortar contact and a void-free installation.
  - .3 Allow mortar to cure 24 hours before grout installation.
  - .4 Prior to grouting, apply pre-grout sealer to AGT Tiles.

**3.8 CLEANING**

- .1 Clean and polish floor and wall tile after grout has cured in accordance with TTMAC recommendations in the Maintenance Guide; do not use acid for cleaning.
- .2 Re-point joints after cleaning as required to eliminate imperfections, then re-clean as necessary. Avoid scratching tile surfaces.

**3.9 JOINT BACKING AND TILE SEALANT**

- .1 Install joint backing under sealant as necessary.
- .2 Install tile sealant around piping and fittings extending through tiled surfaces.
- .3 Seal tile control joints.
- .4 Seal internal tile to tile junctions. Tool to a smooth, flush surface, free from air bubbles and contamination.

**3.10 PROTECTION**

- .1 Prevent traffic over tiled areas, and protect tiled assemblies from weather, freezing, and water immersion, for 72 hours minimum, after final installation.
- .2 Prevent direct impact, vibration and heavy hammering on adjacent and opposite walls for 24 hours minimum, after final installation.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for acoustical ceilings Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM C423, Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.3 ASTM C635, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

.4 ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

.5 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.

.6 CAN/CGSB-92.1-M, Sound Absorptive Prefabricated Acoustical Units.

1.3 **DESIGN REQUIREMENTS**

.1 Design acoustical ceiling suspension system in accordance with ASTM C636 and manufacturer's printed directions.

.2 Design suspended ceiling system for adequate support of electrical fixtures as required by current bulletin of Electrical Inspection Department of Ontario Hydro.

.1 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.2 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation / relocation of light fixtures.

.3 Design ceiling system to withstand positive and negative wind loads, uplift of piston effect of up to 1.25 kPa, and train wind load of 44 m/s.

.4 Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or other equipment prevent regular spacing of hangers.

1.4 **SUBMITTALS**

.1 Product data:

- .1 Submit copies of manufacturer's Product data in accordance with Section 01330 indicating:
  - .1 Suspension system and acoustic tiles. If manufacturer's catalogues are submitted, clearly distinguish specific items proposed.
- .2 Shop drawings:
  - .1 Submit shop drawings in accordance with Section 01340 indicating:
    - .1 Suspension system layout including hangers.
    - .2 Conditions at abutting, intersecting, and penetrating construction.
    - .3 Dimensioned locations of lighting fixtures, diffusers, sprinkler heads and other items that pierce the ceiling plane.
- .3 Samples:
  - .1 Submit following samples in accordance with Section 01330:
    - .1 600 mm long samples of suspension system parts, including trim.
    - .2 250 x 200 mm sample of each type of acoustic tile.
- .4 Certificates:
  - .1 Submit fire-resistance rated floor/ceiling and roof/ceiling assembly certification from a Canadian Certification Organization accredited by Standards Council of Canada.
  - .2 Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Inspection Department of Ontario Hydro.
- .5 Reports:
  - .1 Submit written test results for suspension anchor inserts; include data on design loading per anchor and tensile strength of hangers.
- .6 Closeout submittals:
  - .1 Submit following for incorporation into Operations and Maintenance Manuals in accordance with Section 01830:
    - .1 Recommended maintenance instructions and a listing of recommended maintenance Products.
    - .2 Precautions on cleaning methods and Products detrimental to acoustical ceiling system components.
- 1.5 **EXTENDED WARRANTY**
  - .1 Submit a warranty in accordance with the General Conditions, except that the warranty period is extended to 15 years.

**1.6 SITE CONDITIONS**

- .1 Do not install the Work of this Section until:
  - .1 Wet Work including concrete, masonry, plaster, stucco, and terrazzo finishes are complete.
  - .2 Mechanical and electrical Work above the ceiling is complete.
  - .3 Relative humidity is below 80%.
  - .4 Ventilation is adequate to remove excess moisture.
- .2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and after installation.

**1.7 MAINTENANCE**

- .1 Submit extra acoustic ceilings amounting to [2%] of gross ceiling area, allowing proportionately for each pattern and type specified to nearest full carton. Submit Products which are part of same production run as installed Products. Store maintenance Products as directed by Engineer.

**2 Products**

**2.1 MATERIALS**

- .1 Suspension system: ASTM C635.
  - .1 [B-E Safe-T-Lock] by Bailey Metal Products Limited.
  - .2 Donn [DX Fast-Loc] by CGC Inc.
- .2 Galvanized steel sheet: ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.
- .3 Main carrying channels: ASTM C645; Channels formed from galvanized steel sheet, 38 x 19 mm cold rolled.
- .4 Subframing: ASTM C645; Channels formed from galvanized steel sheet, dimensions and spans as required.
- .5 Hangers: 2.6 mm minimum diameter, galvanized steel wire.
- .6 Tie wire: 1.6 mm minimum diameter, soft annealed galvanized steel wire.
- .7 Wall mouldings and accessories, including but not limited to, corner caps, edge mouldings, panel hold over clip, metal closures, and trim. Finish and colour: same as main tees.
- .8 Exposed main, cross tees, and relocatable cross tees: 25 mm exposed face x 38 mm high steel, bulb tee design double steel web, rectangular single spans without exceeding a deflection of 1/360 of the span. Splices to be integral and reversible; cross tee interlocking into main tee.



.1 Colour and finish: Baycoat 5000 Series baked on enamel finish, special white.

.9 Acoustic Panels:

.1 Design: USG Interiors, LLC, "Mars High-NRC/High-CAC Panels 80/35 with plant based binder".

.2 Provide ceiling panels complying with ASTM E 1264.

.3 Type: IV, mineral base with membrane faced overlay

.4 Form: 1 & 2, Nodular and water felted

.5 Pattern: D, smooth and light texture

.6 Edge type: SLT Beveled Reveal

.7 Fire Rating: class A

.8 Noise reduction coefficient (NRC) ULC Classified: Not less than 0.80

.9 Ceiling attenuation class (CAC) ULC Classified: Not less than 35

.10 High light reflective finish (LR): Not less than 0.9

.11 Colour: white

.12 Suspension grid width: DX/DXL, 15/16 inch (24 mm)

.13 Modular size:

.1 600 x 1200 x 22 mm thick (24" x 48" x 7/8" thick.).

.2 600 x 600 x 22 mm thick (24" x 24" x 7/8" thick.).

.14 Recycled Content: 69%

.15 High Recycled Content Products: classified as containing greater than 50% total recycled content. Total recycled content is based on product composition of post-consumer and pre-consumer post-industrial recycled content per FTC guidelines

.16 VOC Emissions: Meets CA Specification 01350, GreenGuard Gold Low VOC

.17 Wall mouldings: Match acoustical ceiling suspension system.

3 Execution

3.1 **SUSPENSION SYSTEM**

.1 Coordinate locations and openings of mechanical and electrical services support, and penetration through the acoustical ceilings. Coordinate field conditions, clearances, measurements, and mechanical and electrical services testing and commissioning, above the acoustical ceilings.

.2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

.3 Install acoustical ceiling systems in accordance with manufacturer's written instructions, reviewed shop drawings, and ASTM C636, listed in order of precedence.

.4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.

- .5 Install additional hangers at lighting fixture and air distribution ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.
- .6 Install acoustical ceiling suspension system to a tolerance of 1:1200 of span and 0.4 mm maximum between adjacent metal members. Tolerances are not cumulative. Refer to Electrical Contract Drawings for fixture layout.
- .7 Do not bend or twist hangers as a means of levelling. Form double loops tightly and lock to prevent vertical movement or rotation within the loop.
- .8 Install edge moulding at intersection of ceiling and vertical surfaces.
- .9 [Centre acoustical ceiling suspension systems on room axis; install equal border pieces.] Install hangers onto the ends of main tee runners at not more than 150 mm from ends of runners, adjacent and perpendicular to walls.
- .10 Support the suspension system independently of walls, columns, ducts, pipes and conduits.
- .11 Install main runners in maximum available lengths. Layout joints in suspension members to avoid the perimeters of recessed fixtures. Lock grid members to form a rigid assembly. Install additional tee, suspension system framing around recessed fixtures, diffusers, grilles and other items for a complete assembly.

### 3.2 **ACOUSTIC TILES**

- .1 Carefully cut and trim acoustic tiles to accommodate Work of Divisions 15 & 16.
- .2 Fit acoustic tiles carefully into place. Remove and replace acoustic tiles with broken edges, or damaged, marked, discoloured, soiled, or stained faces.

### 3.3 **EGGCRATE GRILLES**

- .1 Install moulding continuous around the perimeter and level.
- .2 Install eggcrate grilles with inconspicuous butt and mitred corner joints and seat evenly.

### 3.4 **FIELD QUALITY CONTROL**

- .1 Arrange, pay for, and execute Site load tests at location selected by Engineer, on anchor inserts by an independent, certified testing company. Perform 10 random anchor tests at commencement of Work. Pay for additional tests, required if pull out strength is not acceptable as requested by Engineer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for painting Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 CAN/CGSB-1.57, Interior Alkyd Semigloss Enamel.

.2 CAN/CGSB-1.59, Alkyd Exterior Gloss Enamel.

.3 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.4 CAN/CGSB-1.100, Interior Flat Latex Paint.

.5 CAN/CGSB-1.119, Interior Latex Primer-Sealer.

.6 CAN/CGSB-1.135, Flat Alkyd Enamel for Equipment.

.7 CAN/CGSB-1.GP-180, Coating, Polyurethane, Two-Package, General Purpose.

.8 CAN/CGSB-1.188, Emulsion Filler for Masonry Block.

.9 CAN/CGSB-1.195, Interior Latex Semigloss Paint.

.10 CAN/CGSB-1.198, Cementitious Primer for Galvanized Surfaces.

.11 CAN/CGSB-1.203, Exterior Latex Wood Primer.

.12 CAN/CGSB 85-GP-10M, Protective Coating for Metals.

.13 CAN/CGSB 85-GP-100M, Painting.

.14 Canadian/Ontario Painting Contractors' Association (CPCA/OPCA) Painting Specification Manual.

.15 SSPC Steel Structures Painting Council, Standards.

.16 ECP, Environmental Choice Program.

**1.3 SUBMITTALS**

.1 Product data:

.1 Submit copies of manufacturer's Product data in accordance with Section 01330 indicating:

- .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
- .2 Product transportation, storage, handling and installation requirements.
- .3 Include application procedures used to obtain finishes.

.2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.

.2 Samples:

.1 Submit following samples in accordance with Section 01330.

- .1 Three 300 x 150 mm draw downs of each colour minimum 4 weeks before paints are required.
- .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.

.3 Certificates:

- .1 Submit certified documentation to confirm each airless spray painter has minimum of 5 years experience on applications of similar complexity and scope.
- .2 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

.4 Reports:

- .1 Submit written field inspection and test report results after each inspection.
- .2 Submit Field Quality Control test result reports for alkali content, substrate moisture, and dry film thickness.
- .3 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.

**1.4 QUALITY ASSURANCE**

.1 Comply with requirements of the CPCA/OPCA manual and CAN/CBSB-85.100M except where greater requirements are specified.

.2 Installers' qualifications: Perform Work of this Section by a company that is a member in good standing of CPCA/OPCA.

.3 Supervision: Have Work supervised by a full-time qualified foreperson who has 10 years minimum experience on Contracts of similar complexity and scope.

.4 Mock-up:

- .1 Construct three [10 m<sup>2</sup>] mock-ups of different Paint Schedule code systems, selected by The City, in locations acceptable to City to demonstrate installation workmanship, colour, and hiding power of Products.
- .2 Obtain City's acceptance in writing before proceeding with the Work of this Section.
- .3 Mock-ups may remain as part of the Work if acceptable to Engineer and will serve as a standard for similar code systems.
- .4 Repaint over mock-ups which do not form part of the Work.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- .1 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.
- .2 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO<sub>2</sub> fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.
- .3 Maintain storage enclosures at minimum 10°C and maximum 30°C ambient temperature and to manufacturer's instructions.
- .4 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved sealed containers and remove from Site on a daily basis.

1.6 **SITE CONDITIONS**

- .1 Apply coatings under the following conditions:
  - .1 Exterior and interior coatings: 10° C minimum.
  - .2 24 hours minimum after rain, frost, condensation, or dew.
  - .3 When no condensation on surfaces to be painted has or will form.
  - .4 Relative humidity: 85% maximum.
  - .5 Not in direct exposure to sunlight.
  - .6 Ventilation to remove odours, evaporating solvents and moisture.
  - .7 Adequate lighting be provided at surfaces to be painted.
  - .8 Do not apply finishes in areas where dust is being generated.
- .2 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.
- .3 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.
- .4 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of Work not being painted such as:
  - .1 Light fixtures, fire and smoke detectors.
  - .2 Sprinkler heads.
  - .3 Prefinished diffusers and registers.

- .4 Prefinished equipment.
- .5 Fire rating labels and equipment specification plates.

1.7 **WASTE MANAGEMENT**

- .1 Do not dispose of paints or solvents by pouring on the ground.
- .2 Empty paint cans are to be dry prior to disposal.
- .3 Solvent based paints, wood preservatives, stains and finishes, which cannot be reused, must be treated as hazardous waste and disposed of in an appropriate manner in accordance with hazardous waste regulations.

2 Products

2.1 **MATERIALS**

- .1 Paint:
  - .1 Products in accordance with the CPCA/OPCA Painting Specification Manual, Exterior and Interior Systems;
    - .1 Manufacturer's premium grade, first line Products.
    - .2 Uniform dispersion of pigment in a homogeneous mixture.
    - .3 Ready-mixed and tinted whenever possible.
  - .2 Products within each CPCA paint system code: From single manufacturer.
- .2 Restrict Products to:
  - .1 Amercoat.
  - .2 Benjamin Moore and Company Limited.
  - .3 Colour Your World.
  - .4 Denalt.
  - .5 ICI Paints, (Glidden) Company Limited.
  - .6 Para Paints.
  - .7 PPG Canada Industries Limited.
  - .8 Pratt & Lambert Inc.
  - .9 The Sherwin Williams Company.
  - .10 Sico Coatings Inc.

2.2 **LOW VOC PAINTS AND SURFACE COATINGS**

- .1 Use environmental choice certified paints on gypsum board walls and ceilings in occupied areas.

2.3 **COLOUR SCHEDULE**

- .1 The city will select paint colours at a later date.

- .2 The City will refine choice of colours and gloss when compiling a Colour Schedule for the Contract; allow for colour selection beyond paint manufacturer's standard colour range.
- .3 Conform to gloss reflectance definitions listed in CPCA/OPCA Specification Manual.

**2.4 PAINTING AND FINISHING SCHEDULE**

- .1 Refer to Table 1, CPCA/OPCA Painting and Finishing Schedule coded systems, comply with CPCA/OPCA Painting Specification Manual.
- .2 System references listed are premium grade unless noted otherwise.

<b>Table 1: Painting and Finishing Schedule</b>		
<b>EXTERIOR SUBSTRATES</b>	<b>CPCA/OPCA System, Gloss and Grade</b>	<b>Coating System</b>
Concrete (Clear Water Repellent) (Not to be used on Concrete Block)	EXT. 6-D	Clear water repellent coating (Paintable) or Clear water repellent coating (Not Paintable)
Structural Steel (Factory Primed)	EXT. 11-A Alkyd Semigloss Finish Premium Grade	One (1) coat high wetting primer (solvent type) or One (1) coat universal/barrier type primer for ferrous metals (solvent type) or One (1) coat primer for ferrous metals (solvent type)
		Two (2) coats exterior alkyd flat (CGSB 1.135) or Two (2) coats exterior alkyd enamel (CGSB 1.59)
Metal Fabrications (Factory Primed)	EXT. 11-A Alkyd Semigloss Finish Premium Grade	One (1) coat high wetting primer (solvent type) or One (1) coat universal/barrier type primer for ferrous metals (solvent type) or One (1) coat primer for ferrous metals (solvent type)
		Two (2) coats exterior alkyd flat (CGSB 1.135) or Two (2) coats exterior alkyd enamel (CGSB 1.59)
Galvanized Steel (Zinc Coated Steel) for HM Doors & Frames, Handrails, Bollards, Pipes, Flashing, Posts, Eavestroughs, Miscellaneous	EXT. 12-A Alkyd Semigloss Finish Premium Grade	One (1) coat cementitious primer (CGSB 1.198) for galvanized surfaces or One (1) coat galvanized primer (waterborne) or

<b>Table 1: Painting and Finishing Schedule</b>		
		One (1) coat galvanized primer (solvent base) Two (2) coats exterior alkyd flat (CGSB 1.135) or Two (2) coats exterior alkyd enamel (CGSB 1.59)
Canvas Insulation Covering for Pipes	EXT. 10-A Latex Gloss Finish Premium Grade	Exterior latex primer (CGSB 1.203) Two (2) coats alkyd exterior alkyd enamel (CGSB 1.59)
Copper for Pipes	EXT. 14-A Alkyd Semigloss Finish Premium Gloss	Etch type vinyl wash primer One (1) coat exterior alkyd enamel (CGSB 1.59)
Steel (High Heat) (Temp. Range 315 to 425°C) for Boilers, Pipes, Flues, Heat Exchangers	EXT. 15-F	
<b>INTERIOR SUBSTRATES</b>		
Concrete Walls	INT. 8-A Latex Semigloss Premium Grade	One (1) coat latex block filler (CGSB 1.188) Two (2) coats interior latex semi-gloss (CGSB 1.195)
Concrete Ceilings	INT. 8-A Latex Flat Premium Grade	One (1) coat latex block filler (CGSB 1.188) Two (2) coats interior latex flat (CGSB 1.100)
Concrete Floors ****SPEC. NOTE: Contact Manufacturers	INT. 9-C Polyurethane	Polyurethane two (2) component pigmented gloss [CGSB 1-GP-180M Type 11]
Concrete Block Masonry	INT. 8-A Latex Semigloss Premium Grade	One (1) coat latex block filler (CGSB 1.188) Two (2) coats interior latex semi-gloss (CGSB 1.195)
Structural Steel (Factory Primed)	INT. 12-A Alkyd Semigloss Premium Grade	One (1) coat high wetting primer (solvent type) or One (1) coat universal/barrier type primer for ferrous metal (solvent type) or One (1) coat primer for ferrous metal (solvent type) Two (2) coats interior alkyd semi-gloss enamel (CGSB 1.59)
Metal Fabrications (Factory Primed) for Steel Stairs, Ladders	INT. 12-A Alkyd Semigloss	One (1) coat high wetting primer (solvent type) or



**Table 1: Painting and Finishing Schedule**

	Premium Grade	One (1) coat universal/barrier type primer for ferrous metal (solvent type) or One (1) coat primer for ferrous metal (solvent type)
		Two (2) coats interior alkyd semi-gloss enamel (CGSB 1.59)
Galvanized Steel (Zinc Coated Steel) for HM Doors & Frames, Handrails, Ducts, Pipes, Metal Deck	INT. 13-A Alkyd Semigloss Premium Grade	One (1) coat cementitious primer (CGSB 1.198) or One (1) coat galvanized primer (water borne) or One (1) coat galvanized primer (solvent based) or One (1) coat vinyl wash primer
		Two (2) coats interior alkyd semi-gloss enamel (CGSB 1.57)
Gypsum Board for Walls	INT. 4-A Alkyd Semigloss Premium Grade	One (1) coat interior latex primer sealer (CGSB 1.119)
		Two (2) coats interior alkyd semi-gloss enamel (CGSB 1.57)
Gypsum Board for Walls ECP Certification	INT. 4-B Latex, Semi-gloss Premium Finish	One (1) coat interior latex primer (CGSB 1.119)
		Two (2) coats interior latex semi-gloss (CGSB 1.195)
Gypsum Board for Ceiling	INT. 4-B Latex Flat Premium Grade [ECP Certification]	One (1) coat interior latex primer sealer (CGSB 1.119)
		Two (2) coats interior latex flat (CGSB 1.100)
Acoustic Textured Coatings for Textured Ceilings	INT. 6-A Latex Flat Finish	Two (2) coats interior latex flat (CGSB 1.100)
Copper for Pipes	INT. 16-A Alkyd Gloss Finish Premium Grade	One (1) coat vinyl wash primer
		Two (2) coats interior alkyd gloss enamel
Steel (High Heat) (Temp. Range to 315°C) for Boilers, Pipes, Flues, Heat Exchangers	INT. 14-A Heat Resistant Aluminum Finish	Apply in accordance to manufacturer's instructions.
	INT. 14-B Heat Resistant Enamel Finish	
	INT. 14-C Heat Resistant Inorganic Zinc	

<b>Table 1: Painting and Finishing Schedule</b>		
Steel (High Heat) (Temp. Range 315 to 425°C) for Boilers, Pipes, Flues, Heat Exchangers	INT. 14-D Heat Resistant Aluminum Finish	Apply in accordance to manufacturer's instructions
	INT. 14-E Heat Resistant Enamel Finish	
	INT. 14-F Heat Resistant Inorganic Zinc	
Steel (High Heat) (Temp. Range 425 to 630°C) for Boilers, Pipes, Flues, Heat Exchangers	INT. 14-G	Apply in accordance to manufacturer's instructions
Canvas Insulation Coverings for Pipes, Ductwork, Boilers	INT. 5-A Latex Gloss Finish Premium Grade	One (1) coat interior latex primer sealer (CGSB 1.119)
		Two (2) coats interior alkyd gloss enamel (CGSB 1.60)

### 3 Execution

#### 3.1 EXAMINATION

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.

#### 3.2 PREPARATION

##### .1 General:

- .1 Clean substrate surfaces free from, dust, grease, soiling, or extraneous matter, which are detrimental to finish.
- .2 Patch, repair, and smoothen minor substrate defects and deficiencies e.g. machine, tool and sand paper marks, shallow gouges, marks, and nibs.
- .3 Clean, sweep, and vacuum floors and surfaces to be painted, debris and dust-free prior to painting.
- .4 Refer to CPCA/OPCA Painting Specification Manual Chapter 3 for surface preparation requirements of substrates not listed here.

- .2 Where finish hardware, electrical cover plates, light fixtures, grilles, gratings, louvres, access panels, convector covers, enclosures and other escutcheon and appurtenances has been installed remove, store, re-install finish hardware, to accommodate painting. Do not clean hardware with solvent that will remove permanent lacquer finishes.

- .3 Alkali Content tests and neutralization:
  - .1 Test for ph level using litmus paper on dampened substrate.
  - .2 Neutralize surfaces over 8.5 ph with 4% solution of Zinc Sulphate for solvent based systems and tetrapotassium pyrophosphate for latex based systems, to below 8.0 ph, and allow to dry.
  - .3 Brush-off any residual Zinc Sulphate crystals.
  - .4 Coordinate paint system primer / sealer to be alkali-resistant.
  
- .4 Substrate moisture tests:
  - .1 Test for moisture content over entire surface to be painted, minimum one test/2 m<sup>2</sup> in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
  - .2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before paint system application. Install temporary drying fans if necessary.
  - .3 Re-test employing same criteria.
  
- .5 Mildew removal: Scrub with solution of trisodiumphosphate and sodium hypochlorite (Javex) bleach, rinse with water, and allow to dry completely.
  
- .6 Cementitious and masonry (Concrete, block, brick, stucco, cement rendering):
  - .1 Allow 28 days cure before painting.
  - .2 Coordinate repair of protrusion-chipping and grinding, and honeycomb filling with responsible trades.
  - .3 Remove dirt, loose mortar, scale, powder, efflorescence, and other foreign matter.
  - .4 Remove form oil and grease with trisodiumphosphate, rinse, and allow to dry thoroughly.
  - .5 Prepare surfaces in accordance with CAN/CSA 85-GP-100M.
  - .6 Remove rust stains with solution of sodium metasilicate after thorough wetting; allow to dry thoroughly.
  
- .7 Concrete floors (existing): Remove existing coatings by Blastrac method.
  
- .8 Concrete floors (new):
  - .1 Allow 28 days cure before painting.
  - .2 Remove contamination, acid etch, rinse with water, and allow to dry completely. Test and adjust for neutral ph.
  - .3 Prepare surfaces in accordance with CGSB CAN/CGSB 85-GP-100M [acid etch].
  
- .9 Aluminum (mill finish): Wash with Xylene solvent, apply etching primer, then paint immediately.
  
- .10 Copper (mill finish): Wash with Xylene solvent, apply vinyl etch primer, then paint immediately.
  
- .11 Galvanized steel sheet:
  - .1 Z275 (Heavy Coating): SSPC SP7 brush blast.

- .2 ZF075 (Light Zinc Coating or Satin Coating): Remove contamination, wash with Xylene solvent.
- .3 Touch-up damaged galvanized areas with organic zinc rich primer.
- .12 Galvanized iron and steel: Prepare galvanized and ungalvanized metal surfaces according to CAN/CGSB 85-GP-10M.
  - .1 Unpassivated, unweathered and weathered: Remove contamination, wash with Xylene or Toluol solvent, allow to dry thoroughly. Make paint system primer/sealer an etching type primer.
  - .2 Manufacturer pre-treated (including passivated): SSPC SP7.
  - .3 Touch-up damaged galvanized areas with organic zinc rich primer.
- .13 Structural steel and miscellaneous metal fabrications:
  - .1 Coordinate the following with the responsible trades:
    - .1 Rust, mars, mill scale, and weld-burn touch-ups.
    - .2 Oil, grease, weld flux and other residue removal.
  - .2 Prime paint items, not otherwise indicated to be primed as part of another Section.
  - .3 Touch-up damaged galvanized areas with organic zinc rich primer.
- .14 Gypsum board:
  - .1 Apply primer/sealer paint to reveal defects and deficiencies and to equalize absorption areas.
  - .2 Coordinate repairs and touch-ups with the responsible trade.
  - .3 Re-prime repairs.
- .15 Previously painted surfaces:
  - .1 Prepare existing surfaces to be repainted in accordance with CAN/CGSB-85.100.
- .16 Factory primed surfaces:
  - .1 Touch up damaged areas.
  - .2 Clean as required for top coat.
- .17 Coordinate with other trades to prevent:
  - .1 Damage, and inadvertent activation of fire and smoke detectors.
  - .2 Odour and dust distribution by permanent HVAC systems including fouling of ducts and filters.

### 3.3 MIXING PAINT

- .1 Field-mix Products in accordance with manufacturer's written instructions.
- .2 Do not use kerosene or any such organic solvents to thin water-based paint.

3.4 **APPLICATION**

- .1 Apply painting systems in accordance with the CPCA/OPCA Painting Specification Manual. Apply each Product to manufacturer's recommended dry film thickness.
- .2 Painting systems listed are required minima, apply additional coats if necessary to obtain substrate hiding acceptable to the Engineer.
- .3 Tint prime and intermediate coats lighter than final topcoats for identification of each succeeding coat and to facilitate inspections. Include only manufacturer's recommended reducing and tinting accessories. Do not add adulterants.
- .4 Sand lightly between coats to achieve a tooth or anchor for subsequent coats.
- .5 Apply paint uniformly in thickness, colour, texture, and gloss, as determined by the Engineer under adequate illumination and viewed at a distance of 1500 mm. Apply finishes free of defects in materials and application which, in the opinion of the Engineer, affect appearance and performance. Defects include, but are not limited to:
  - .1 Improper cleaning and preparation of surfaces.
  - .2 Entrapped dust, dirt, rust.
  - .3 Alligatoring, blisters, peeling.
  - .4 Scratches, blemishes.
  - .5 Uneven coverage, misses, drips, runs, and poor cutting in.
- .6 Do not apply coatings on substrates, which are not sufficiently dry. Unless indicated otherwise, allow each painting system coat to cure dry and hard before following coats are applied.
- .7 Repaint entire areas of damaged or incompletely covered surfaces, to the nearest inside or outside corner; patching will not be permitted.
- .8 Miscellaneous painting requirements:
  - .1 Paint all surfaces of projecting ledges above and below sight lines to match adjacent surfaces unless otherwise specified.
  - .2 Paint cabinets, both inside and out.
  - .3 Paint door frames and doors including top, bottom, and edges.
  - .4 Paint access doors and frames.
  - .5 Finish closets and alcoves as specified for adjoining rooms.
  - .6 Paint light coves white whether a light lense is installed or not, unless otherwise indicated.
  - .7 Paint interior columns to match walls of room.
  - .8 Allow for:
    - .1 2 wall colours per room, [lower half of wall one colour, upper half of wall another colour] one ceiling colour per room.
    - .2 Different door colours in each functionally different area.
    - .3 Different colours on both sides of same door.
- .9 Mechanical, electrical and other painting coordination:

- .1 Paint mechanical services in accordance with Division 15 [and as indicated herein].
- .2 Coordinate painting of pipes, ducts, and coverings with the Work of Division 15 to precede pipe colour banding, flow arrows, and other pipe identification labeling installation.
- .3 Paint exposed conduit, pipes, hangers, ductwork, grilles, gratings, louvres, access panels, fire hose cabinets, registers, convector and radiator covers, enclosures, and other mechanical and electrical equipment including services concealed inside cupboard and cabinet Work; apply colour and sheen to match adjacent surfaces, except as noted otherwise.
- .4 Paint portions of surfaces such as duct interiors, piping, ductwork, hangers, insulation, walls, and similar items, visible through grilles, louvres, convector covers etc., matte black in colour.
- .5 Remove the following to accommodate painting, carefully store, clean, then re-install on completion of each area and when dry:
  - .1 Switch and receptacle plates, fittings and fastenings, grilles, gratings, louvres, access panels, convector covers, and enclosures.

### 3.5 **FIELD QUALITY CONTROL**

- .1 Dry film thickness tests:
  - .1 Test for film thickness over entire surface to be painted, minimum one test/2 m<sup>2</sup> in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
  - .2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.
  - .3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Engineer, and repair as directed.
  - .4 Re-test employing same criteria after repair.

### 3.6 **CLEANING**

- .1 Clean and re-install all items that were removed before undertaking painting operations.
- .2 Remove spilled, splashed, and spattered paint promptly as Work proceeds and on completion of Work. Clean surfaces soiled by paint spillage and paint spatters. Repair or replace damaged Work, as directed by Engineer.
- .3 Protect surfaces from paint droppings and dust to approval of Engineer. Avoid scuffing newly applied paint.
- .4 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Engineer.

### 3.7 **PROTECTION**

- .1 Post Wet Paint signs during drying and restrict or prevent traffic where necessary.

- .2 Post sign, after Engineer's inspection and acceptance of each room, reading: PAINTING COMPLETE - NO ADMITTANCE WITHOUT CONTRACTOR'S PERMISSION.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services for washroom accessories Work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A167, Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A312, Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
- .3 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .4 CAN/CSA B651-M, Barrier Free Design.
- .5 CAN/CGSB 12.5M, Mirrors, Silvered.

1.3 **SUBMITTALS**

- .1 Product data:
1. Submit Product data to requirements of Section 01330 indicating:
- .1 Each washroom accessory describing size, finish, details of function, attachment methods, hardware and locks, description of rough-in frame, and building-in details of anchors for grab bars.
- .2 Closeout submittals:
1. Submit for each Product operation and maintenance instructions for incorporating into the Operations and Maintenance Manuals in accordance with Section 01830.
- .1 Supply 2 keys for each lockable washroom accessory to the Facility.
- .2 Master key washroom accessories which are keyed.

1.4 **EXTENDED WARRANTY**

- .1 Submit a warranty for washroom accessories Work in accordance with the General Conditions, except that the warranty period is extended to 15 years.
1. Against cracked or scratched mirrors, spoiling or deterioration of silvering or backing, loosening of fastenings or adhesive
2. Coverage: complete replacement including effected adjacent Work.

2 Products

2.1 **MANUFACTURER**



- .1 Bobrick Washroom Equipment of Canada Ltd.
- .2 American Standard Brands Canada.
- .3 Kohler Canada.
- .4 Dyson Canada.

## 2.2 **MATERIALS**

- .1 Stainless steel:
  - 1. Sheet metal: ASTM A167, Type 304.
  - 2. Tubing: ASTM A312, Type 304.
- .2 Sheet steel: ASTM A653M, Z275; Cold rolled, commercial quality, surface preparation and pretreatment as required for applied finish.
- .3 Fasteners, screws and bolts: ASTM A167, Type 304 stainless steel, tamper-proof.
- .4 Colours: As selected by Engineer for each washroom accessory from the manufacturer's full range.

## 2.3 **ACCESSORIES FOR PUBLIC WASHROOMS**

- .1 Sink (Barrier-Free):
  - 1. Meets or exceeds the following specifications: ASME A112.19.2 for Vitreous China Fixtures, Meets the Americans with Disabilities Act Guidelines and ANSI A117.1 Accessible and Usable Buildings and Facilities
  - 2. Top to front rim mounted 864mm from finish floor
  - 3. American Standard, Murro universal design wall-hang lavatory with Everclean
  - 4. Recessed self-draining deck
  - 5. 0059.020 EC Vitreous china shroud/shroud/knee contact guard
  - 6. ADA and TAS compliant
  - 7. Nominal Dimensions: 520mm deep, 540mm wide
  - 8. Bowl Size: 394mm wide, 343mm front to back, 127mm deep
  - 9. Colour: white
  - 10. Faucet: 7381301-100.0070A Faucet to TMV hose
  - 11. Faucet Finish: Stainless Steel
- .2 Toilet
  - 1. Meets the following specifications: American with Disabilities Act Guidelines and ANSI A117.1 Accessible and Usable Buildings and Facilities

2. Type: AFWALL® MILLENIUM™ FloWise® 1.1 GPF FLUSHOMETER TOILET SYSTEM
  3. Model: 2257.01
  4. Colour: white
  5. ADA and TAS compliant
  6. Nominal Dimensions: 660mm x 356mm x 381mm deep
  7. Battery life: 4 years @ 4,000 flushes per month
  8. System Maximum Performance (MaP) Score: 1,000 grams of miso @ 1.1gpf
  9. Operating Pressure: 25 psi (flowing) – 80 psi (static)
  10. Flow requirements: 25gpm (94.6 L/min.)
  11. Fixture compliance: ASME A112.19.2-2008 / CSA B45.1-08
  12. Valve compliance: ASSE 1037, ANSI/ASME A112.19.2 & ADA compliant
  13. Valve type: SELECTRONIC® FLUSH VALVE
  14. Valve Model: 6065.111
  15. Seat: American Standard #5901.100 Heavy duty open front less cover
- .3 Coat Hanger
1. Type: Kohler #K-14458 Robe Hook
  2. Material: Solid brass & Zinc
  3. Colour: Polished Chrome
  4. Colour Code: CP
  5. Nominal Dimensions: 48mm (Base Dia.) x 35mm (Hook Dia.) x 38mm deep
- .4 Soap dispenser:
1. Type: ClassicSeries Surface-mounted soap dispenser from Bobrick Washroom Equipment, Inc.
  2. Model #: B-2111
  3. Container Material: 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin-finish.
  4. Container Capacity: 40-fl oz (2.1-L)
  5. Container shall be equipped with a clear acrylic refill-indicator window; a locked, hinged stainless steel lid for top filling
  6. Valve Material: Black molded plastic push button and spout
  7. Operation: Valve shall be operable with one hand and with less than 5 pounds of force (22.2 N)
  8. Complies with accessible design guidelines
- .5 Electric hand dryer:
1. Dyson Airblade V model or similar, electric hand dryer, recessed mounted, electronic sensor, hands-free dryer
  2. Motor and voltage: 200-240 V 50&60 Hz with a 1,000 W digital brushless motor

3. Finish: HU02 (Sprayed Nickel) contains antibacterial additive in paint, high gloss, Water ingress protection to IP24
- .6 Toilet Tissue Dispenser
1. Bobrick Washroom Equipment, Inc., #B-2888 multi-roll toilet tissue dispenser equipped with a tumbler lock.
  2. Dimensions: 155mm. x 280 high mm
  3. Finish: Type 304 stainless steel with satin finish
- .7 Sanitary Napkin Disposal:
1. Bobrick Washroom Equipment, Inc., #B-254 , surface mounted
  2. Finish: Type 304 stainless steel with satin finish
  3. Capacity: 1.2-gal (4.6-L)
- .8 Mirror (Barrier Free):
1. Tilt Mirror with Stainless Steel Frame from Bobrick Washroom Equipment, Inc.
  2. Model #: B-293 1830
  3. Mirror Size: 460mm width, 760mm Height
  4. Tilt Mirror Frame: Shall be type 304 stainless steel satin finish with beveled front to hold frame tightly against mirror and designed with horizontal locking bars to secure mirror to wall frame
  5. Mirror: Select float glass mirror and shall be guaranteed for 15 years against silver spoilage
- .9 Horizontal Grab bar:
1. Stainless steel grab bar with snap flange from Bobrick Washroom Equipment, Inc.,
  2. Series: B-6806
  3. Length: 600mm
  4. Outside Diameter: 38mm (1 ½")
  5. Finish: Stain finish
  6. Material: 18-8 S, Type 304, 18-gauge (1.2mm) stainless steel tubing with stain finish
  7. Clearance between the grab bar and wall shall be 38mm (1-1/2")
  8. Concealed mounting flanges: shall be 11-gauge (3.2mm) thick stainless steel plate, 2" x 3-1/8" (50 x 80mm), and equipped with at least two screw holes for attachment to wall.
  9. Flange covers: shall be 22 gauge (0.8mm), 3-1/4" (85mm) diameter x 1/2" (13mm) deep, and shall snap over mounting flange to conceal mounting screws and/or Winglt fasteners
  10. Ends of grab bar: shall pass through concealed mounting flanges and be heliarc welded to form one structural unit
  11. Complies with accessible design guidelines
- .10 L-Shape (90 °) Grab bar:
1. Stainless steel 762 x 762mm 90-degree grab bar from Bobrick Washroom Equipment, Inc.,

2. Series: B-6806.99 (760mm x 760mm)
3. Length: 762mm x 762mm
4. Outside Diameter: 38mm (1 1/2")
5. Finish: Stain finish
6. Material: 18-8 S, Type 304, 18-gauge (1.2mm) stainless steel tubing with stain finish
7. Clearance between the grab bar and wall shall be 38mm (1-1/2")
8. Concealed mounting flanges: shall be 11-gauge (3.2mm) thick stainless steel plate, 2" x 3-1/8" (50 x 80mm), and equipped with at least two screw holes for attachment to wall.
9. Flange covers: shall be 22 gauge (0.8mm), 3-1/4" (85mm) diameter x 1/2" (13mm) deep, and shall snap over mounting flange to conceal mounting screws and/or WingIt fasteners
10. Ends of grab bar: shall pass through concealed mounting flanges and be heliarc welded to form one structural unit
11. Complies with accessible design guidelines

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Coordinate templates, inserts, and rough-in frames and verify exact location of washroom accessories for installation.
- .2 Install washroom accessory fixtures, accessories, and items in accordance with manufacturer's instructions and CAN/CSA B651-M.
- .3 Install washroom accessories plumb, level, and securely and rigidly anchored to substrate surfaces and framing.

END OF SECTION

1           General

1.1   **SECTION INCLUDES**

- .1    Design, labour, Products, equipment and services necessary for the Soil Stabilization Work in accordance with the Contract Documents.

1.2   **REFERENCES**

- .1    ASTM – Publication: Type Test ASTM Title.
- .2    Compressive Strength D1621 – Test Method for Compressive Properties for Rigid Cellular.
- .3    Plastic Tensile Strength 1623 – Test Method for Tensile Properties for Rigid Cellular Plastics.
- .4    Flexural Strength D790 – Test Method for Flexural Properties of Un-reinforced and Reinforced Plastics
- .5    Shear Strength C273 – Test Method of Shear Properties in Flat-wise Plane of Flat Sandwich Construction of Sandwich cores.
- .6    Density D1622 – Test Method for Apparent Density of Rigid Cellular Plastics.
- .7    Dimensional Stability D2126 – Test Method for Response of Rigid Cellular Plastic to Thermal and Humid Aging.
- .8    Coefficient of Expansion D696 – Test Method for Coefficient of Linear Thermal Expansion.
- .9    Plastics Solvent Resistance D543 – Test Method of Resistance of Plastics to Chemical Reagents.
- .10   Fungus Resistance G21 – Recommended Practice for Determining Resistance of Plastics to Bacteria
- .11   Water Absorption D2842 – Test Method of Water Absorption of Rigid Cellular Plastics.

1.3   **DESCRIPTION**

- .1    This item shall include but not be limited to surface preparation, drilling of injection holes, filling voids below concrete slab, compaction grouting and testing.

1.4   **SUBSURFACE DATA**

- .1    . Soil boring locations and logs are shown in the subsurface investigation report which is the Client's responsibility to make available for examination.

1.5   **SUBMITTALS**

- .1 Procedures
  - i. Submit detailed work procedures
  - ii. Include preliminary site preparations, location of injection holes, drilling methods and safety precautions.
  
- .2 Equipment Descriptions
  - i. Submit a list of lifting, undersealing and injection equipment
  - ii. See below the minimum required list of equipment. The listing is a minimum and shall not preclude the use of additional equipment.
    - a. A drilling system capable of drilling 5/8" -3/4" inch holes or a pipe driven injection system.
    - b. A fluid proportioning system, either truck or trailer mounted, with pre-heaters and volumetric controls capable of injecting the high-density polymer material between the slab, sub-base, sub-grade, lower soil strata and capable of controlling the rate of rise of the slab, footing and densifying the sub-surface soils.
    - c. A transit, laser level or similar unit to ensure that the concrete slab or footing is raised to an even plane and the required elevations.
  
- .3 Submit a complete and accurate daily record of all quantities of polymer material employed in the work. The record shall show the following:
  - i. Reference or an identification number,
  - ii. Quantity of polymer material used at each injection probe site,
  - iii. Locations of injection probe sites,
  - iv. Weight of polymer material used,
  - v. Unusual or unexpected conditions encountered during installation
  - vi. Date of work and weather conditions
  
- .4 Test reports:
  - i. 4 weeks minimum, prior to soil injection the contractor is to submit forms indicating chemical and physical properties of injection material to be used in the Work and confirming that tests completed conformed to the requirements of applicable codes.
  
- .5 Certifications:
  - i. Submit soil stabilization contractor certifications and a list of similar jobs the contractor has completed.
  - ii. Submit confirmation by the design engineer that injection complies with the Contract Documents.
  
- .6 Inspection reports:
  - i. Submit field reports of field inspections.

2.1 The medium used for the Soils Stabilization work shall be water blown formulation of high-density polymer material.

2.2 The high-density polymer material used shall exhibit the following physical characteristics and properties:

**Material:**

The medium used for stabilizing base soils at depth shall be water blown high-density hydro-insensitive polyurethane suitable for use in wet environments.

The high-density closed cell polyurethane system shall exhibit the following physical characteristics and properties:

**DISTINGUISHING CHARACTERISTICS**

- Excellent Lifting Capacity
- Good Performance in Wet Environments
- Excellent Compressive Strength

**TYPICAL PHYSICAL PROPERTIES**

Restrained Core Density, ASTM D1622	5.5 pcf
Compressive Strength, ASTM D1621	90 psi
Tensile Strength, ASTM D1623	110 psi
Closed Cell Content	94% (plus)
Water Absorption, ASTM D2842	0.04 lbs./sq.ft
Dimensional Stability, ASTM D2126	Volume Change
Heat age, 200°F, 28 days	-1.5%
Humid age, 158°F, 100% R.H., 28 days	-1.0%
Cold age, -20°F, 28 days	-0.1%
Resistance to Solvents	Excellent
Resistance to Mold & Mildew	Excellent

**MIX RATIO**

	<u>Polyol</u>	<u>Isocyanate</u>
By Weight	100 parts	116 parts
By Volume	100 parts	100 parts

**TYPICAL REACTION PROPERTIES**

	<u>Hand Mix</u> @ 72° F	<u>Machine Mix</u> @ 120° F
Cream Time (sec.)	20	7
Gel Time (sec.)	47	10
Tack Free Time (sec.)	51	14
Rise Time (sec.)	90	15
Density	4 pcf	3 – 4 pcf

The expansion of the polyurethane foam under pressure increases the foam density above the original free rise density value. The compressive strength is a function of the density of the tested material; therefore, the foam produced during the soil densification process will normally have a higher compressive strength than foam produced without restriction (free rise).

When the material used for Soil Stabilization, the final in-place density will be slightly higher than the free rise density, as some packing of the material will occur to insure fill.

**3 INSTALLATION**

**3.1 PREPARATION**

- .1 This item shall include but not be limited to the protection of existing drain and utility lines for which the Contractor will be responsible to locate and mark.
  - i. The contractor shall review a profile of the slab and footing provided by the Client to determine where the concrete slab and footing need to be raised.
  - ii. In addition, the contractor is to complete the surveillance. The results of the surveillance shall be provided to the contractor.

**3.2 DRILLING**

- .1 The injection holes shall be drilled in the following manner. A series of 5/8" - 3/4" holes shall be drilled at three to eight-foot intervals through the concrete or soil. The contractor shall determine the exact location and spacing of the holes.

**3.3 INJECTION**

- .1 The resin material will be injected under the structure or slab. As the material reacts, it will expand and harden, exerting the necessary compacting or lifting forces. The amount of compaction or rise shall be controlled by regulating the rate of injection of the material via the injection process. When the nozzle is removed from the hole, any excess material shall be removed from the area and the hole sealed with a non-expansive grout, if drilled through concrete.

**3.4 CURING-TIME**

- .1 The installed material shall reach 90% of full compressive strength within 15 minutes of injection and fully cure within 24 hours.

**3.5 VARYING SITE CONDITIONS**

- .1 The contractor shall be prepared to execute adjustments in the scope of work to accommodate varying site conditions. Increases or reductions in the cost of the work required to accommodate varying site conditions shall require approval of an appropriate Change of Order to the Contract. Approval shall not be unreasonably withheld for items of work required of the contractor in this specification.

**3.6 DEFECTS IN EXISTING CONSTRUCTION**

- .1 Should the proposed work damage other items of work or adjoining construction at the project site and such damages are the result of defective as-built construction, design deficiencies, non-conforming construction, or defective materials incorporated into the existing construction, the contractor shall not in any way be held responsible for these damages or any collateral damage.

**3.7 SECONDARY GROUTING**

- .1 Any deficiency work or future requirements to complete reinjection or secondary grouting at the project site, shall be paid to the contractor on the same basis as provided in the following.

**4 MEASUREMENT & PAYMENT**

**4.1 MEASUREMENT**

- .1 The material shall be measured and invoiced either by the pound or by the number of probes undertaken, which will include finishing and injecting material.

**4.2 ALLOWANCES**

- .1 If and where referenced elsewhere in this specification, allowances shall be provided to cover the costs of items of work not quantifiable prior to commencement of the proposed work. Costs in excess of the allowances provided shall require approval of an appropriate Change of Order to the Contract. Approval shall not be unreasonably withheld for items of work required of the contractor in this specification.

**5 WARRANTY**



- .1 Provide the following warranty for the work: Confirmation of whether the base soils that have been treated have been sufficiently densified shall be determined by a third-party engineering firm. The contractor only guarantees the stability of the injected material. The contractor warrants that the injected CCL materials will not shrink or deteriorate for a minimum period of ten (10) years from the date of completion. The contractor will replace, during the warranty period, by re-injection, any materials, which fail to perform as warranted. This limited warranty superseded any other warranties, expressed or implied.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Design, labour, Products, equipment and services necessary for the raising and under-sealing of slab-on-grade concrete slabs in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM – Publication: Type Test ASTM Title.
- .2 Compressive Strength D1621 – Test Method for Compressive Properties for Rigid Cellular.
- .3 Plastic Tensile Strength 1623 – Test Method for Tensile Properties for Rigid Cellular Plastics.
- .4 Flexural Strength D790 – Test Method for Flexural Properties of Un-reinforced and Reinforced Plastics
- .5 Shear Stength C273 – Test Method of Shear Properties in Flat-wise Plane of Flat Sandwich Construction of Sandwich cores.
- .6 Density D1622 – Test Method for Apparent Density of Rigid Cellular Plastics.
- .7 Dimensional Stability D2126 – Test Method for Response of Rigid Cellular Plastic to Thermal and Humid Aging.
- .8 Coefficient of Expansion D696 – Test Method for Coefficient of Linear Thermal Expansion.
- .9 Plastics Solvent Resistance D543 – Test Method of Resistance of Plastics to Chemical Reagents.
- .10 Fungus Resistance G21 – Recommended Practice for Determining Resistance of Plastics to Bacteria
- .11 Water Absorption D2842 – Test Method of Water Absorption of Rigid Cellular Plastics.

1.3 **DESCRIPTION**

- .1 This item shall include but not be limited to surface preparation, drilling of injection holes, filling voids below concrete slab, compaction grouting and testing.

1.4 **SUBSURFACE DATA**

- .1 . Soil boring locations and logs are shown in the subsurface investigation report which is the Client's responsibility to make available for examination.

## 1.5 SUBMITTALS

- .1 Procedures
  - i. Submit detailed work procedures
  - ii. Include preliminary site preparations, location of injection holes, drilling methods and safety precautions.
  
- .2 Equipment Descriptions
  - i. Submit a list of lifting, undersealing and injection equipment
  - ii. See below the minimum required list of equipment. The listing is a minimum and shall not preclude the use of additional equipment.
    - a. A drilling system capable of drilling 5/8" -3/4" inch holes or a pipe driven injection system.
    - b. A fluid proportioning system, either truck or trailer mounted, with pre-heaters and volumetric controls capable of injecting the high-density polymer material between the slab, sub-base, sub-grade, lower soil strata and capable of controlling the rate of rise of the slab, footing and densifying the sub-surface soils.
    - c. A transit, laser level or similar unit to ensure that the concrete slab or footing is raised to an even plane and the required elevations.
  
- .3 Submit a complete and accurate daily record of all quantities of polymer material employed in the work. The record shall show the following:
  - i. Reference or an identification number,
  - ii. Quantity of polymer material used at each injection probe site,
  - iii. Locations of injection probe sites,
  - iv. Weight of polymer material used,
  - v. Unusual or unexpected conditions encountered during installation
  - vi. Date of work and weather conditions
  
- .4 Test reports:
  - i. 4 weeks minimum, prior to soil injection the contractor is to submit forms indicating chemical and physical properties of injection material to be used in the Work and confirming that tests completed conformed to the requirements of applicable codes.
  
- .5 Certifications:
  - i. Submit soil stabilization contractor certifications and a list of similar jobs the contractor has completed.
  - ii. Submit confirmation by the design engineer that injection complies with the Contract Documents.
  
- .6 Inspection reports:
  - i. Submit field reports of field inspections.

**2 MATERIALS**

2.1 The medium used for the Slab-Lifting work shall be water blown formulation of high-density polymer material.

2.2 The high-density polymer material used shall exhibit the following physical characteristics and properties:

**Material:**

The medium used for raising and under-sealing of concrete slabs shall be water blown high-density hydro-insensitive polyurethane suitable for use in wet environments.

The high-density closed cell polyurethane system shall exhibit the following physical characteristics and properties:

**DISTINGUISHING CHARACTERISTICS**

- Excellent Lifting Capacity
- Tolerant to Mixing Variations & Conditions
- Excellent Compressive Strength
- Constant Volume with No Shrinkage

**TYPICAL PHYSICAL PROPERTIES**

Restrained Core Density, ASTM D1622	2.5 pcf
Compressive Strength, ASTM D1621	40 psi
Tensile Strength, ASTM D1623	60 psi
Closed Cell Content	85% (plus)
Water Absorption, ASTM D2842	0.06 lbs./sq.ft
Moisture Vapor Transmission	2-4 perin
Resistance to Solvents	Excellent
Resistance to Mold & Mildew	Excellent
Maximum Service Temperature	180°F

**MIX RATIO**

	<u>Polyol</u>	<u>Isocyanate</u>
By Weight	100 parts	119 parts
By Volume	100 parts	100 parts

**TYPICAL REACTION PROPERTIES**

	<u>Hand Mix</u>	<u>Machine Mix</u>
	@ 140° F	@ 140° F
Cream Time (sec.)	5	3
Tack Free Time (sec.)	11	7
Rise Time (sec.)	90	65
Density	2.5 pcf	2.6 pcf

The expansion of the polyurethane foam under pressure increases the foam density above the original free rise density value. The compressive strength is a function of the density of the tested material; therefore, the foam produced during the soil densification process will normally have a higher compressive strength than foam produced without restriction (free rise).

When the material used for Slab Lifting, the final in-place density will be slightly higher than the free rise density, as some packing of the material will occur to insure fill.

**3 INSTALLATION**

**3.1 PREPARATION**

- .1 This item shall include but not be limited to the protection of existing drain and utility lines for which the Contractor will be responsible to locate and mark.
  - i. The contractor shall review a profile of the slab and footing provided by the Client to determine where the concrete slab and footing need to be raised.

- ii. In addition, the contractor is to complete the surveillance. The results of the surveillance shall be provided to the contractor.

**3.2 DRILLING**

- .1 The injection holes shall be drilled in the following manner. A series of 5/8" - 3/4" holes shall be drilled at three to eight-foot intervals through the concrete or soil. The contractor shall determine the exact location and spacing of the holes.

**3.3 INJECTION**

- .1 The resin material will be injected under the structure or slab. As the material reacts, it will expand and harden, exerting the necessary compacting or lifting forces. The amount of compaction or rise shall be controlled by regulating the rate of injection of the material via the injection process. When the nozzle is removed from the hole, any excess material shall be removed from the area and the hole sealed with a non-expansive grout, if drilled through concrete.

**3.4 CURING-TIME**

- .1 The installed material shall reach 90% of full compressive strength within 15 minutes of injection and fully cure within 24 hours.

**3.5 VARYING SITE CONDITIONS**

- .1 The contractor shall be prepared to execute adjustments in the scope of work to accommodate varying site conditions. Increases or reductions in the cost of the work required to accommodate varying site conditions shall require approval of an appropriate Change of Order to the Contract. Approval shall not be unreasonably withheld for items of work required of the contractor in this specification.

**3.6 DEFECTS IN EXISTING CONSTRUCTION**

- .1 Should the proposed work damage other items of work or adjoining construction at the project site and such damages are the result of defective as-built construction, design deficiencies, non-conforming construction, or defective materials incorporated into the existing construction, the contractor shall not in any way be held responsible for these damages or any collateral damage.

**3.7 SECONDARY GROUTING**

- .1 Any deficiency work or future requirements to complete reinjection or secondary grouting at the project site, shall be paid to the contractor on the same basis as provided in the following.

**4 MEASUREMENT & PAYMENT**

**4.1 MEASUREMENT**

- .1 The material shall be measured and invoiced either by the pound or by the number of probes undertaken, which will include finishing and injecting material.

**4.2 ALLOWANCES**

- .1 If and where referenced elsewhere in this specification, allowances shall be provided to cover the costs of items of work not quantifiable prior to commencement of the proposed work. Costs in excess of the allowances provided shall require approval of an

appropriate Change of Order to the Contract. Approval shall not be unreasonably withheld for items of work required of the contractor in this specification.

5 WARRANTY

- .1 Provide the following warranty for the work: Confirmation of whether the base soils that have been treated have been sufficiently densified shall be determined by a third-party engineering firm. The contractor only guarantees the stability of the injected material. The contractor warrants that the injected CCL materials will not shrink or deteriorate for a minimum period of ten (10) years from the date of completion. The contractor will replace, during the warranty period, by re-injection, any materials, which fail to perform as warranted. This limited warranty superseded any other warranties, expressed or implied.

END OF SECTION