Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 31 19 - Project Meetings

.2 Section 01 33 00 - Submittal Procedures

.3 Section 01 45 00 - Quality Control

.4 Section 01 51 00 - Temporary Utilities

.5 Section 01 52 00 - Construction Facilities

.6 Section 01 55 26 – Traffic Control

.7 Section 01 56 00 - Temporary Barriers and Enclosures

.8 Section 01 74 00 – Cleaning

.9 Section 01 74 19 – Waste Management and Disposal

.10 Section 01 77 00 - Closeout Procedures

.11 Section 01 78 00 - Closeout Submittals

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Contractor's Scope of work for the improvements to the MRF Building at the Commissioners Transfer Station includes but is not limited to remove and replace overhead doors, remove and replace ceiling mounted electrical heaters, remove and replace ceiling mounted exhaust fans, improvements to the fire alarm system, power supply and new receptacles, loading dock area cladding system, structural elements, new roof and new mechanical, fire protection and electrical systems as detailed complete in the Specifications and Drawings. In general, the scope comprises the provision of the following:

.1 Work is to be performed at the Mattress Recycling Facility (MRF) building.

.2 Prepare a detailed construction staging plan.

.3 Provide traffic control plan to mattress recycling operations to continue during the Work of this Project, including the provision of barriers and signage to isolate the construction areas.

.4 Provide all safety requirements and protection necessary or as required by local by-laws and governing authorities, including but not limited to: temporary fence barriers (i.e., Insta-fence) and guardrails to isolate work areas, overhead protection, sidewalk or curb protection and warning notices.

.5 Provide erosion and sediment control measures as required.

.6 Provide specified loading ramp trailer (Dura-Ramp, DR-M30 or approved equivalent) prior to beginning work on existing loading dock.

.7 Remove existing loading dock – structural steel framing, existing wall cladding, existing door and stair assembly, existing roof, existing electrical, mechanical components, and concrete dock structure.

.1 Remove existing dock levellers and protect – to be reinstalled and reused.

.8 Install new driven pile foundation system for loading dock in accordance with Drawings and Specifications.

.9 Install new cast in place loading dock substructure and concrete suspended slab/floor, supported on the driven piles, in accordance with Drawings and Specifications.

.1 After substructure and concrete slab are constructed, reinstall existing load levellers and catch basin cover (including any repairs required for the catch basin).

.10 Install new full length structural steel superstructure in accordance with Drawings and Specifications.

.11 Protect existing asphalt paved areas during construction. Remove and replace asphalt areas damaged or removed to facilitate construction to match existing and in accordance with City of Toronto Standards, at no additional cost.

.12 Install new metal roof deck as per Drawings and Specifications.

.13 Overhead Doors: Replace 6 overhead doors, as indicated on Drawings and as otherwise specified. This work includes the following:

.1 Remove and dispose off existing 6 overhead doors, Door Numbers 1 to 4 on the south elevation; and 13, 14 on the north elevation.

.2 Provide new overhead doors at the above noted locations. New doors are to be spring loaded insulated metal doors, including power operators.

.3 Remove and replace all the perimeter sealant joints at the brick masonry-to steel framing; and install new sealant joints.

.4 Repair the perimeter steel framing at the overhead doors. Remove surface corrosion, prepare the surfaces, prime and paint steel framing in accordance with Specifications.

.5 Perform one mock-up of the overhead door replacement work. The mock-up shall be reviewed and approved by the Contract Administrator prior to proceeding with remaining doors' replacement work.

.6 At the exterior concrete "islands" located between the overhead doors, repair concrete where it is spalled or delaminated. Prepare surfaces and paint the curbs colour "safety yellow".

.14 Brick Masonry: Perform brick repairs on the elevations indicated on Drawings and as otherwise specified. This work includes the following:

.1 Examine the brick masonry walls within the repair area to confirm areas and quantities of re-pointing, and individual brick replacement. Hammer tap the brick masonry units to identify spalled, or otherwise deteriorated brick masonry units. Subsequently verify with the Contract Administrator those areas which are to be repaired and mark out the areas as directed by the Contract Administrator.

.2 Remove, dispose, and replace existing, spalled, cracked, loose or otherwise deteriorated individual brick masonry units.

.3 Re-point all deteriorated and cracked mortar joints.

.4 Clean the brick masonry of efflorescence and grey staining and allow to dry prior to commencing repairs. Cleaning to be performed on the west and the north elevation walls.

.5 Provide new through-wall flashing along the brick masonry and loading dock roof interface. This work includes the following:

.1 Remove and dispose of three (3) courses of the existing face brick, sealants and backing, and existing through-wall flashing, if any, at repair locations.

.2 Provide new through-wall membrane flashing at base of brick wall, at the new roof line. Provide end dam in membrane flashings at all terminations.

.3 Provide new brick masonry, complete with mortar net, brick ties and weep hole vents.

.6 Provide brick masonry opening for the mechanical louver, including through-wall membrane flashing at the lintel, exterior sealants, and prefinished metal sill flashing.

.1 Provide a toothed-in transition between the brick masonry and louver. Do not expose saw-cut face of brick masonry.

.2 Provide new brick masonry units to match existing brick masonry, including mortar joint colour.

.7 Perform mock-up of the above noted masonry repair work, including, cleaning, through-wall replacement, individual brick replacement and re-pointing. The mock-up shall be reviewed by the Contract Administrator prior to proceeding with repairs.

.15 Loading Dock Roof: Provide new sheet metal roof as indicated on Drawings and Specifications. This work shall include the following:

.1 Provide prefinished sheet metal roofing system, including galvanized metal sub girts, clips, self adhering membrane underlayment, insulation, and gypsum board sheathing.

.2 Provide new prefinished sheet metal flashings as indicated on Drawings.

.3 Provide sealants and backing at all locations to achieve watertight seals.

.4 Provide new insulated sheet metal roof with gutters, sloped as per the Drawings. Install and connect downspouts, from perimeter gutters serving new loading dock roof, to existing drainage system.

.5 Coordinate installation of new sheet metal roof flashings with the through-wall flashing repair work.

.6 Provide new flexible membrane expansion joint at the transition between metal roof and wall cladding, to brick masonry.

.16 Loading dock exterior walls: Provide new insulated preformed metal cladding system, as indicated on Drawings and Specifications. This work shall include the following:

.1 Provide new insulated corrugated metal cladding with metal liner as shown in the Drawings. This includes flashing and fasteners.

.2 Provide new flexible membrane expansion joint at the transition between metal wall cladding and the existing brick masonry as shown on Drawings.

.3 Provide all prefinished sheet metal flashings, including base counter flashing, drip flashings, and closure.

.4 Provide sealants and backing at all locations to achieve watertight seals.

.5 Provide a new single, insulated metal swing door, on the west elevation, including associated framing, flashings, and threshold. Prime and paint metal swing door and frame.

.6 Provide new galvanized steel stair with landing complete with guardrails and handrails at the swing door as indicted on Drawings and to match the existing stair / landing assembly (existing to be removed and disposed off). Provide galvanized steel grating for landing and galvanized steel grated stair treads. Submit engineered Shop Drawings for the stair and landing.

.7 Provide sealants and backing at all locations to achieve watertight seals.

.17 Attendant Booth: temporarily re-locate the booth during the project construction and reinstate to pre-existing location. Any associated damages during the relocation and restoration will be the Contractor's responsibility.

.18 Electrical: Undertake the following complete as detailed:

.1 Disconnect existing power connection of overhead doors and provide new power supply to new overhead doors.

.2 Disconnect existing power connection of electrical heaters and provide new power supply to new electrical heaters.

.3 Disconnect existing power connection of exhaust fans and provide new power supply to new exhaust fans.

.4 Modify existing fire alarm panel to suit new/additional fire devices.

.5 Install new electrical panels as shown on Drawings or specified otherwise.

.6 Replace aged manual pull stations, receptacles, and fire horns/strobes and add smoke/CO detectors as shown on the Drawings or specified otherwise.

.7 Electrical scope for new cladding:

(a) Demolish and remove all existing electrical devices (including but not limited to electrical outlets, switches etc.) in existing loading dock area.

(b) Provide new light fixtures and emergency lighting.

(c) Provide new power connection to mechanical equipment.

(d) Provide new smoke/CO detectors.

.19 Mechanical Works: Undertake the following complete as detailed in Drawings or as specified otherwise:

.1 Remove existing roof mounted exhaust fans and replace with new exhaust fans.

.2 Remove existing electric unit heaters and replace with new electric unit heaters.

.3 Install intake weather louver in existing MRF main building.

.4 Remove existing dry system sprinkler heads serving existing loading dock and partial removal/cap-off redundant sprinkler system in the MRF building.

.5 Install new dry system sprinkler heads serving new loading dock and part of supply line inside the MRF building.

.6 Install CO/ NOx gas monitor complete with sensors in new loading dock.

.7 Install exhaust fan and intake louvers in new loading dock area.

.20 Asset Tagging: All newly installed / rehabilitated assets to be tagged as per the City of Toronto's asset tagging standard and assets tags list (both included in the tender attachments).

1.3 CONTRACT METHOD

.1 Refer to the Construction Agreement and Price Form. All the Works specified in the Drawings and Specifications and/or listed in the Summary of Work section need to be completed in all respects by the Contractor, regardless of those are specifically listed in the Price Form or not.

1.4 SUBMITTALS

.1 Submit in accordance with Specification section 01 33 00 - Submittal Procedures.

.2 Submit Project construction progress schedule in accordance with General Conditions.

.3 Sustainable design submittals:

.1 Construction waste management:

.1 Submit Construction Waste Management Plan (CWMP) highlighting recycling and salvage requirements.

.4 Submit site-specific work plan and health and safety plan.

1.5 WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective works and follow instructions from Contract Administrator.

1.6 WORK SEQUENCE

.1 Construct Work in stages to accommodate Owner's continued use of premises during construction.

.2 Always maintain staff and delivery access to the facility.

.3 Always maintain a fire access route to the facility.

.4 Protect workers and public safety.

1.7 EXISTING SERVICES

.1 Notify Contract Administrator and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations and vehicular traffic.

.3 Provide alternative routes for vehicular traffic.

.4 Establish location and extent of service lines in area of work before starting Work. Notify Contract Administrator of findings.

.5 Submit schedule for approval by Contract Administrator for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services to maintain critical building and tenant services.

.7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.8 Where unknown services are encountered, immediately advise Contract Administrator and confirm findings in writing.

.9 Protect and maintain existing active services.

.10 Construct barriers, as required, in accordance with Specifications.

1.8 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy of each document as follows:

- .1 Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Permits.
- .12 Notice of Project.
- .13 Executed Agreement
- .14 Other documents as specified.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work

1.2 ADMINISTRATIVE

.1 Contract Administrator shall schedule and administer project meetings on a bi-weekly basis throughout the progress of the work.

.2 Provide appropriate physical space with-in Contractor site trailer for these meetings.

.3 Representative of Contractor, Subcontractor and Suppliers shall be in attendance as warranted and shall be qualified and authorized to act on behalf of party each represents.

1.3 PRECONSTRUCTION MEETING

.1 Within 10 days after award of Contract, Contract Administrator shall request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Contractor to provide space for meetings in site trailer.

.3 Owner, Contract Administrator, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.4 Contract Administrator shall establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work

.2 Communication Protocol

.3 Emergency Contact List and Numbers (including names of 3 levels of staff for dispute resolution)

.4 Status of Executed Documents, Bonding and Insurance and Order to Commence Work

.5 Schedule of Work, Baseline Schedule and 2 Weeks Look-Ahead Schedules

.6 Notice of Project (Ministry of Labour, Immigration, Training and Skill Development)

.7 Health & Safety

.8 Pre-commencement Activities including Site set-up and record pre-construction photographs

.9 Permits and Approvals

.10 Occupation and Use of Site

.11 Invoicing Requirements/Progress Payments and holdback

.12 Schedule of submission of Shop Drawings, samples, colour chips.

.13 Requirements for temporary facilities, site signage, offices, storage sheds, utilities, fences

.14 Changes in Work - Change Orders, Change Directives, Request for Quotation-procedures, administrative requirements, approvals required etc.

.15 As-built Drawings

.16 Maintenance and operations manuals

.17 Take-over procedures, acceptance, warranties

.18 Construction Waste Management Plan (CWMP)

.19 Appointment of inspection and testing agencies or firms by Contractor

.20 Health and Safety Orientation and City Policies

1.4 PROGRESS MEETINGS

.1 During course of Work and 2 weeks prior to project completion, Contract Administrator shall schedule progress meetings bi-weekly.

.2 Contractor, major Subcontractors involved in Work, City Representative (s), Contract Administrator, Site Inspector are to be in attendance.

.3 Contract Administrator shall notify parties minimum Five (5) days prior to meetings.

.4 Contract Administrator shall record minutes of meetings and circulate to attending parties and affected parties not in attendance within Five (5) days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Construction schedule.

.8 Progress schedule, during succeeding work period and 2 weeks look ahead schedule.

.9 Review submittals schedules: expedite as required.

.10 Review submittals, request for information, Change Orders, Change Directives.

.11 Review Claims.

.12 Maintenance of quality standards.

.13 Review proposed changes for affect on construction schedule and on completion date.

.14 Other business.

1.5 EQUIPMENT TRAINING MEETING

.1 2 weeks prior to project completion, request Contract Administrator to schedule equipment training meeting.

.2 Contractor, major Subcontractors involved in Work, Owner, Contract Administrator, Site Inspector are to be in attendance.

.3 Agenda to include the following:

.1 Introduction to equipment/maintenance manuals
  .1 Recommended scheduled maintenance
  .2 Maintenance logs
  .3 Spare parts
.2 Other business.

1.6 PRE-CLOSEOUT MEETING

.1 At the completion of the testing and commissioning of the Work, the Contractor will attend a Pre-Closeout meeting arranged by the Contract Administrator. The high-level meeting agenda will include the following; for further details, refer to Specification section 01 77 00:

.1 Contract deficiencies list
.2 Substantial Performance
.3 Financial matters
.4 Closeout check list
.5 As-Built Drawings
.6 Operation and maintenance manuals and training
.7 Review of Closeout actions and timelines

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

1.2 REFERENCE STANDARDS

.1 Not Used.

1.3 ADMINISTRATIVE

.1 Submit to Contract Administrator submittals listed for review at the Pre-construction meeting. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered a valid reason for extension of Construction Schedule and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present Shop Drawings, product data, samples, and mock-ups in SI metric units.

.4 Where items or information is not produced in SI metric units converted values are acceptable.

.5 Review submittals prior to submission to Contract Administrator. This review represents that the necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Owner Prepared Documents. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Owner Prepared Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Owner Prepared Documents is not relieved by Contract Administrator’s review.

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

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer to General Conditions.

.2 Shop Drawings means the Drawings, diagrams, illustrations, schedules, performance charts, brochures, Product data, and other data which the Contractor provides to illustrate details of portions of the Work.

.3 Submit Drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion

of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of section under which adjacent items will be supplied and installed. Indicate cross references to Drawings and Specifications.

.5 Allow Ten (10) calendar days for Contract Administrator's review of each submission.

.6 Adjustments made on Shop Drawings by Contract Administrator are not intended to change Agreement Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

.7 Make changes in Shop Drawings as Contract Administrator may require, consistent with Owner Prepared Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.

.8 Accompany all submissions with a transmittal letter containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each Shop drawing, product data and sample.
- .5 Other pertinent data.

.9 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Owner Prepared Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.10 After Contract Administrator's review, distribute copies.

.11 Submit electronic copy of Shop Drawings for each requirement requested in Specification sections and as Contract Administrator may reasonably request.

.12 Submit electronic copies of product data sheets or brochures for requirements requested in Specification sections and as requested by Contract Administrator where Shop Drawings will not be prepared due to standardized manufacture of product.

.13 Submit electronic copies of test reports for requirements requested in Specification sections and as requested by Contract Administrator.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for Project.

.14 Submit electronic copies of certificates for requirements requested in Specification sections and as requested by Contract Administrator.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.15 Submit electronic copies of manufacturers instructions for requirements requested in Specification sections and as requested by Contract Administrator.

.1 Pre-printed material describing installation of product, system or material, including special notices and safety data sheets concerning impedances, hazards and safety precautions.

.16 Submit electronic copies of manufacturer's field reports for requirements requested in Specification sections and as requested by Contract Administrator.

.17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.18 Submit electronic copies of operation and maintenance data for requirements requested in Specification sections and as requested by Contract Administrator.

.19 Delete information not applicable to Project.

.20 Supplement standard information to provide details applicable to Project.

.21 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, electronic copies will be returned, and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and resubmission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.22 The Contract Administrator will review and return Shop Drawings noted as follows:

.1 Reviewed.

.2 Reviewed as noted, resubmission required.

.3 Reviewed as noted, resubmission not required.

.4 Rejected.

1.5 SAMPLES

.1 Not Used.

1.6 MOCK-UPS

.1 Not Used.

1.7 PHOTOGRAPHIC DOCUMENTATION

.1 Not Used

1.8 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board clearance certificate.

.2 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

1.2 REFERENCE STANDARDS

.1 Not Used

1.3 DEFINITIONS

.1 Application Specialist: An individual who performs surface preparation and application of protective coatings and linings to steel and concrete surfaces of complex industrial structures.

1.4 INSPECTION

.1 Allow Contract Administrator and emergency services access to Work. If part of Work is in preparation at locations other than place of Work, allow access to such Work whenever it is in progress. The Contractor will allow access to confined Work spaces, by qualified personnel, including all relevant equipment, as and when required for inspection to be carried out.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals by Contract Administrator.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections, or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work, at no extra costs.

1.5 INDEPENDENT INSPECTION AGENCIES

.1 Independent inspection and testing companies/agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of the Work. All the costs/fees payments to the inspection and testing companies or agencies is responsibility of the Contractor.

.2 Undertake sufficient tests to demonstrate compliance with the work. Refer to Specifications and Drawing details for listing of inspections required. Tests should include but not be limited to:

- .1 Sieve analysis of each type of granular material provided to site
- .2 Daily compaction tests during backfill operations for each lift placed
- .3 Compaction test during asphalt placement
- .4 Analysis of excavated native material to define if suitable for reuse or for disposal off-site, including relevant chemical composition
- .5 Concrete cylinders for each concrete placement and laboratory compressive strength tests
- .6 Concrete slump and air entrainment tests and reports
- .7 Steel reinforcement placement, welds, and general metal fabrication

.8 Steel mill test certificates

.9 Steel Galvanization test certificates

.10 Inspection and testing of the structural steel – welds, bolts, erection tolerances, etc.

.11 Inspection of decking installation

.12 Steel H-Piles – geotechnical supervision/inspection during pile driving

.13 Steel H-Piles – pile driving analyzer testing

.14 Through wall flashing installation at sloped sheet metal roof interface: Perform water tightness testing to ASTM E2128, "Standard Guide for Evaluating Water Leakage of Building Walls".

.15 Perform field adhesion test for sealant application in the presence of the sealant manufacturer's representative and the Contract Administrator

.16 Commissioning of overhead doors by the manufacturer and installer

.17 Arc flash report

.18 Fire verification report

.19 General electrical work testing

.20 Electrical systems inspection, testing, start-up and verification

.21 Electrical distribution system testing and verification

.22 Emergency lighting tests

.23 Air Balance report for exhaust fans

.24 Sprinkler system verification report

.25 Start-up report for electrical unit heaters

.26 Verification report for loading dock Gas detection system

.3 Provide equipment required for executing inspection and testing.

.4 Provide copies of all independent inspection/testing reports to Contract Administrator daily.

.5 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Owner Prepared Documents.

.6 If defects are revealed during inspection and/or testing, undertake additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities and provide retesting and reinspection to demonstrate compliance at no cost to Owner.

1.6 ACCESS TO WORK

.1 Allow inspection/testing companies / agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.7 PROCEDURES

.1 Notify Contract Administrator in advance of requirement for tests, in order that attendance arrangements can be made to witness testing.

.2 Submit samples and/or materials required for testing, as specifically requested in Specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.8 REJECTED WORK

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

.2 Make good other Contractor's work damaged by such removals or replacements promptly, at no extra cost.

.3 If in opinion of Contract Administrator, it is not expedient to correct defective Work or Work not performed in accordance with Owner Prepared Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Owner Prepared Documents, amount of which will solely be determined by Contract Administrator.

1.9 REPORTS

.1 Submit electronic copies of inspection and test reports to Contract Administrator.

.2 Provide copies to manufacturer or fabricator of material being inspected or tested, and to subcontractor of work being inspected or tested.

1.10 CERTIFICATES

.1 Not Used.

1.11 QUALIFICATIONS

.1 Not Used

1.12 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

1.13 MOCK-UPS

.1 Not Used.

1.14 MILL TESTS

.1 Submit mill test certificates as requested, required of Specification sections.

1.15 EQUIPMENT AND SYSTEMS

.1 Not Used.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

1.2 REFERENCE STANDARDS

.1 City of Toronto Construction Specification TS 4.60 – Construction specification for utility cut and restoration.

.2 City of Toronto Standard Drawings T-509.010 - 1 and 2 – Pavement patching for utility cuts.

.3 Provide submittals in accordance with section 01 33 00 - Submittal Procedures.

1.3 INSTALLATION AND REMOVAL

.1 Remove from site all such work after use.

1.4 DEWATERING

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

1.5 WATER SUPPLY

.1 As required to meet Work needs. The Owner will not supply water.

1.6 TEMPORARY HEATING AND VENTILATION

.1 As required to meet Work needs.

1.7 TEMPORARY POWER AND LIGHT

.1 Provide and maintain temporary power throughout the Work area.

.2 Provide and maintain temporary lighting throughout the Project area and for the duration of Works. Ensure level of illumination in all Work areas is not less than 162 lux.

.3 The Owner will not supply power.

1.8 TEMPORARY COMMUNICATION FACILITIES

.1 As required to meet Work needs.

1.9 FIRE PROTECTION

.1 Maintain existing fire routes and fire protection equipment during performance of Work.

.2 Burning rubbish and construction waste materials is not permitted on Site.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation or works have been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work

1.2 REFERENCE STANDARDS

.1 Not Used

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Indicate use of supplemental or other staging area.

.3 Provide construction facilities in order to execute work expeditiously.

.4 Remove from Site all such work after use.

1.5 SCAFFOLDING

.1 If and as required to meet Work needs. Submit Shop Drawings to as requested by the Contract Administrator.

1.6 MOBILE CRANES AND HOISTING

.1 Provide, operate and maintain mobile cranes required for moving of materials and equipment. Make financial arrangements with Subcontractors for their use of cranes.

.2 Cranes to be operated by qualified operator.

.3 Cranes to be operated in accordance with the Ontario Occupational Health and Safety Act (OHSA) and CSA Standard A-50 safety code on mobile cranes.

1.7 ELEVATORS

.1 Not Used.

1.8 SITE STORAGE/LOADING

.1 Confine loading and unloading operations to the area of Work. Do not encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.9 CONSTRUCTION PARKING

.1 Limited parking will be permitted on site provided it does not disrupt performance of Work or Owner's continued use of Site.

.2 Provide and maintain adequate access to project Site.

.3 Clean roadways, site circulation areas and parking areas where used by Contractor's equipment.

1.10 SECURITY

.1 The Contractor is responsible for security of all the Works and products incorporated or to be incorporated in the Works, at all times until Project completion.

1.11 OFFICES

.1 A site trailer dedicated as a field office for the Contract Administrator/Site Inspector is to be provided by the Contractor.

.2 A desk and chair will be provided in the field office for use by the Contract Administrator and/or site inspector.

1.12 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.13 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances, and Ontario Occupational Health and Safety Act.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.14 CONSTRUCTION SIGNAGE

.1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by the Contract Administrator.

.2 No other signs or advertisements, other than warning signs, are permitted on site.

.3 Maintain approved signs and notices in good condition for duration of Project and dispose -off site on completion of project or earlier if directed by Contract Administrator.

1.15 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Contract Administrator.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons, flag-persons, signage, erection of barricades, placing of lights around and in front

of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

.4 Protect travelling public from damage to person and property.

.5 Contractor's traffic on roads selected for hauling material to and from Site to interfere as little as possible with public traffic.

.6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor is responsible for repair of damage to roads caused by construction operations.

.7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.8 Dust control: Always ensure safe construction operations and arrange for dust suppression measures.

.9 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.10 Provide snow removal during period of Work.

1.16 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Provide mechanical sweeping vehicles/power washing as required.

.4 New or salvaged materials are not to be stored in construction facilities.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, as directed by the Contract Administrator and in accordance with requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation or works have been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

.1 Informational and warning devices.

.2 Protection and control of public traffic.

.3 Operational requirements.

1.2 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work

.2 This section describes requirements applicable to all sections within divisions 01 to 31.

1.3 REFERENCE STANDARDS

.1 TAC (Transportation Association of Canada) - Manual of Uniform Traffic Control Devices for Canada, sixth Edition (2021) or latest edition.

.2 Municipal guidelines and regulations enforceable in the place of the work.

1.4 ACCESS TO SITE

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

.2 Prepare construction and traffic control staging plans for review by Contract Administrator.

.3 Provide and maintain emergency and operational staff vehicle access to the Commissioners Transfer Station MRF Building.

1.5 PUBLIC TRAFFIC FLOW

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

1.6 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with requirements of Acts, regulations and by-laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.2 When working on travelled way:

.1 Place equipment in position to present minimum of interference and hazard to traveling public.

.2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.

.3 Do not leave equipment on travelled way overnight.

.3 Do not close any lanes of road without approval of Commissioners Transfer Station management. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in the Manual of Uniform Traffic Control Devices (MUTCD).

.4 Provide detours or temporary pathways to facilitate passage of pedestrians around restricted construction area as indicated:

.1 Place appropriate detour signage.

.2 Ensure detour is safe and clear of debris and/or construction materials.

.5 Provide and maintain road access and egress to property and in other areas as indicated on the Owners Prepared Documents, unless other means of road access exist that meet approval of the Owner.

1.7 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.

.2 Supply and erect signs, delineators, barricades, and miscellaneous warning devices as specified in TAC manual.

.3 Place signs and other devices in locations recommended in TAC manual.

.4 Meet with Contract Administrator prior to commencement of work to prepare list of signs and other devices required for Project. If situation on site changes, revise list to approval of the Contract Administrator.

.5 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Removing or covering signs which do not apply to conditions existing from day to day.

1.8 CONTROL OF TRANSFER STATION TRAFFIC

.1 Provide competent flag persons, trained in accordance with, and properly equipped as specified in municipal guidelines for the following situations:

.1 When traffic is required to pass working vehicles or equipment which block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and traffic is not provided by other traffic control devices.

.7 At each end of restricted sections where pilot cars are required.

.8 Delays to traffic due to Contractor's operators: maximum fifteen (15) minutes.

.2 Where roadway carrying two-way traffic is to be restricted to one lane, a portable traffic signal system is to be provided by the Contractor, if required by the Owner and/or Contract Administrator.

.1 Adjust as necessary, and regularly maintain system during period of restriction.

.2 Signal system to meet requirements of the TAC Manual.

1.9 OPERATIONAL REQUIREMENTS

.1 Maintain existing conditions for traffic throughout period of the Construction Agreement except that, when required for construction under the Construction Agreement and when measures have been taken as specified and approved by the Contract Administrator to protect and control public traffic.

.2 Maintain existing conditions for traffic crossing right-of-way.

.3 Maintain existing conditions for traffic crossing right-of-way except when required for construction.

1.10 FIRE ROUTES

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work

1.2 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.2 CSA Group (CSA)

.3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from Site all such work after use.

1.4 HOARDING

.1 Erect temporary Site enclosures using 1.8m tall temporary steel fencing panels. Secure with external connectors, wide base plates, extra weights.

.2 Provide as required by Contract Administrator.

1.5 GUARD RAILS AND BARRICADES

.1 Provide concrete jersey barricades around work areas.

.2 Provide secure, rigid guard rails and barricades around deep excavations.

.3 Provide as required by Contract Administrator.

1.6 WEATHER ENCLOSURES

.1 Not Used.

1.7 DUST TIGHT SCREENS

.1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.8 ACCESS TO SITE

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

1.9 PUBLIC TRAFFIC FLOW

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

1.10 FIRE ROUTES

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

1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.12 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Contract Administrator locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

1.13 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work.

1.2 REFERENCE STANDARDS

.1 Not Used

1.3 PROJECT CLEANLINESS

.1 Maintain work in tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from Site at daily regularly scheduled times or dispose of as directed by the Contract Administrator. Do not burn waste materials on Site.

.3 Clear snow and ice from work area.

.4 Provide on-Site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling.

.6 Dispose of waste materials and debris off Site.

.7 Clean interior areas daily and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered metal containers and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

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

.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.4 FINAL CLEANING

.1 When work is substantially performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining work.

.2 Remove waste products and debris and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Owner has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

1.2 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work

.2 Section 01 51 00 - Temporary Utilities

.3 Section 01 52 00 - Construction Facilities

.4 Section 02 41 13 - Selective Site Demolition

1.3 REFERENCE STANDARDS

.1 Not Used

1.4 DEFINITIONS

.1 Clean waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.

.2 Construction and demolition waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction and demolition.

.3 Hazardous material: Hazardous Material means any contaminant, pollutant, dangerous substance, potentially dangerous substance, noxious substance, toxic substance, hazardous waste, flammable material, explosive material, radioactive material, urea formaldehyde foam insulation, asbestos, polychlorinated biphenyls, coal tar and any other biological or chemical agent, substance or material named, described, declared or defined to be hazardous, toxic, or a contaminant or pollutant in, or pursuant to, any applicable Laws.

.4 Non-hazardous materials: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.

.5 Non-toxic materials: Not poisonous to humans either immediately or after a long period of exposure.

.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

.7 Recycle: To remove a waste material from the Project Site to another Site for remanufacture into a new product for reuse by others.

.8 Recycling: The process of sorting, cleansing, treating, and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.

.9 Return: To give back reusable items or unused products to vendors for credit.

.10 Reuse: To reuse a construction waste material in some manner on the Project Site.

.11 Salvage: To remove a waste material from the Project Site to another site for resale or reuse by others.

.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.

.13 Source separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.

.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

.16 Volatile Organic Compounds (VOCs): Chemical compounds common in and emitted by many building products over time through outgassing:

.1 Solvents in paints and other coatings.

.2 Wood preservatives; strippers and household cleaners.

.3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.

.4 When released, VOCs can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.

.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate waste management requirements with all divisions of the Work for the Project and ensure that requirements of the Construction Waste Management Plan (CWMP) are followed.

.2 Preconstruction meeting: Arrange a pre-construction meeting in accordance with section 01 31 19 - Project Meetings before starting any Work under the Construction Agreement. The pre-construction meeting is to be attended by the Owner, Contractor, and Contract Administrator and will include the discussion of the CWMP and the development of the mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide required information in accordance with Section 01 33 00- Submittal Procedures.

1.7 PROJECT CLOSEOUT SUBMISSIONS

.1 Not Used.

1.8 QUALITY ASSURANCE

.1 Not Used.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Storage requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the Project waste and the available recycling and reuse programs in the Project area.

.2 Handling requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:

.1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.

.2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.

.3 Hazardous waste and hazardous materials: Handle in accordance with applicable regulations.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 IMPLEMENTATION

.1 Instruction: Provide on-Site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the Project to Subcontractor 's at appropriate stages of the project.

.2 Separation facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:

.1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

.1 Not Used.

3.3 SAMPLE CONSTRUCTION WASTE MANAGEMENT FORMS

.1 Not Used

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 – Summary of Work

.2 Section 01 31 19 – Project Meetings

1.2 REFERENCE STANDARDS

.1 Not Used

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work procedures:

.1 Arrange and conduct a pre-closeout meeting:

.1 Attended by Contract Administrator, Contractor, Owner's Project Manager, Owner's Client Lead, Owner's Business Unit Manager

.2 Agenda to include:

- Contract deficiencies list: review and definition of actions, responsible party(ies) and timelines for resolution of deficiencies
- Substantial Performance: review of status, establishment of date of achievement, definition of responsibilities and timelines for inspections and documentation
- Financial matters - Review status of, and definition of actions, responsible party(ies) and timelines for resolution of the following:
  - Outstanding and/or pending payment certificates
  - Outstanding and/or pending change orders
  - Outstanding and/or pending claims
  - Outstanding and/or pending liens
- Project Closeout check list: review of Project Closeout checklist and definition of actions, responsible party(ies) and timelines for closeout tasks
- Summary review of closeout actions, responsible party(ies) and timelines
- As-built drawings status

.2 Arrange and conduct an equipment training meeting.

.1 Attended by Contract Administrator, Contractor, city's Project Manager, city's Client Lead, city's Business Unit Manager

.2 Agenda to include:

- Introduction to equipment/maintenance manuals
  - Recommended scheduled maintenance
  - Maintenance logs
  - Spare parts
- Summary review of closeout actions, responsible party(ies) and timelines

.3 Contractor's inspection: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Owner Prepared Documents.

.1 Notify Contract Administrator in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Contract Administrator’s inspection.

.4 Contract Administrator’s Inspection:

.1 Contract Administrator and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed by the Contract Administrator.

.5 Completion tasks: submit written certificates confirming that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Owner Prepared Documents.

.2 Defects: corrected and deficiencies rectified to the satisfaction of the Contract Administrator.

.3 Work: complete and ready for final inspection.

.6 Final inspection:

.1 When completion tasks are done, request final inspection of Work by the Contract Administrator

.2 When Work is incomplete according to Contract Administrator, complete outstanding items and request re-inspection.

.7 Declaration of Substantial Performance: when Contract Administrator considers deficiencies and defects corrected and requirements of the Construction Agreement substantially performed, make application for Certificate of Substantial Performance in accordance with the requirements of the General Conditions.

.8 Commencement of lien and warranty periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of place of Work. Refer to General Conditions for details.

.9 Final Payment:

.1 Refer to General Conditions.

.2 When Contract Administrator considers all deficiencies and defects have been corrected and requirements of Construction Agreement have been met, make application for final payment.

.3 When work deemed incomplete by Contract Administrator, complete outstanding items and request re-inspection.

.10 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with Construction Agreement and Construction Act.

1.4 FINAL CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 - Summary of Work.

1.2 REFERENCE STANDARDS

.1 Not Used.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Warranty meeting:

.1 Convene meeting two week prior to Project completion with Contract Administrator to:

.1 Verify Project requirements.

.2 Review warranty requirements.

.2 Contract Administrator to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, four final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.5 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of Project and identify subject matter of contents.

.5 Arrange content by section numbers and sequence of table of contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 As-built and other Drawings: provide with reinforced punched binder tab.

.1 Bind in with text: fold larger drawings to size of text pages.

1.6 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of contents for each volume: provide title of Project:

.1 Date of submission.

.2 Names, addresses, and telephone numbers of Contract Administrator and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten text: as required to supplement product data.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Specifications section 01 45 00 - Quality Control.

1.7 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain one record copy of:

.1 Construction Agreement

.2 Drawings.

.3 Specifications.

.4 Addenda.

.5 Change Orders and other modifications to Construction Agreement.

.6 Reviewed Shop Drawings, product data, and samples.

.7 Field test records.

.8 Inspection certificates.

.9 Manufacturer's certificates.

.2 Store as-built documents and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with section number listings in list of contents of this Project manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry, and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Contract Administrator.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of Drawings.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Drawings and Shop Drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by Change Orders.

.6 Details not on original Drawings.

.7 Referenced Standards to related Shop Drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and Change Orders.

.6 Other Documents: maintain field test records, manufacturer's certifications, inspection certifications, required by individual Specifications sections.

.7 Provide digital photos, if requested, for Site records.

1.9 FINAL SURVEY

.1 Submit final Site survey, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Owner Prepared Documents.

1.10 EQUIPMENT AND SYSTEMS

.1 Operating procedures: include start-up, break-in, and routine normal operating instructions and sequences.

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 Include summer, winter, and any special weather operating instructions.

.2 Maintenance requirements: include routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.3 Provide servicing and lubrication schedule, and list of lubricants required.

.4 Include manufacturer's printed operation and maintenance instructions.

.5 Include sequence of operation by controls manufacturer.

.6 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.7 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.8 Include test and balancing reports as specified in other Specifications sections 01 45 00 - Quality Control

.9 Additional requirements: as specified in individual Specification sections.

1.11 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual Specification sections.

1.12 MAINTENANCE MATERIALS

.1 Spare parts:

.1 Provide spare parts, in quantities specified in individual Specification sections or elsewhere in the Construction Agreement.

.2 Provide items of same manufacture and quality as items in Work.

.2 Special tools:

.1 Provide special tools, in quantities specified in individual Specification sections or elsewhere in the Construction Agreement.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to Site, place and store.

.4 Receive and catalogue items.

1.13 DELIVERY, STORAGE AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by Contract Administrator.

1.14 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to warranties.

.2 Submit warranty management plan, 5 days before planned warranty meeting, to Contract Administrator for approval.

.3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Contract Administrator for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to table of contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principals.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.7 Beginning of time of warranty is determined from Date of Substantial Performance.

.8 Conduct joint 6, 12, 18, and 24 month warranty inspection, measured from Substantial Performance, by Owner.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of the Contractor, subcontractors, manufacturers, or suppliers involved.

.2 Listing and status of delivery of certificates of warranty for extended warranty items, to include motors.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include two-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-reference to specific pertinent operation and maintenance manuals.

.11 Organization, names, and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 6, 12, 18, and 24 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Owner to proceed with action against Contractor.

1.15 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water-resistant tag approved by Contract Administrator.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:

.1 Type of product/material.
.2 Model number.
.3 Serial number.
.4 Contract number.
.5 Warranty period.
.6 Inspector's signature.
.7 Contractor’s name and contact number.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This section includes descriptions for demolishing, salvaging, recycling and removing site work items identified for removal in whole or in part, and for backfilling trenches and excavations resulting from site demolition activities.

1.2 RELATED REQUIREMENTS

.1 Section 01 11 00 - Summary of Work

.2 Section 01 74 00 - Cleaning

.3 Section 01 74 19 - Waste Management and Disposal

1.3 PRICE AND PAYMENT PROCEDURES

.1 Not Used.

1.4 REFERENCE STANDARDS

.1 Not Used.

1.5 DEFINITIONS

.1 Selective demolition: Sequencing demolition activities to allow separation and sorting of selected site materials.

.2 Hazardous substances: dangerous substances, dangerous goods, hazardous commodities and hazardous products, including but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.

1.6 QUALITY ASSURANCE

.1 Regulatory requirements: ensure Work is performed in compliance with applicable regulations.

.2 Comply with hauling and disposal regulations of authority having jurisdiction.

1.7 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate with Owner for the material ownership including the following:

.1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials (including impacted soils and hazardous materials etc.) shall become Contractor's property and shall be removed from the Project site, at no extra cost.

1.8 ACTION AND INFORMATIONAL SUBMITTALS

.1 Not Used.

1.9 SITE CONDITIONS

.1 Environmental protection:

.1 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.2 Fires and burning of waste or materials is not permitted on Site.

.3 Burying of rubbish waste materials is not permitted.

.4 Disposal of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers, is not permitted.

.5 Ensure proper disposal procedures are maintained throughout the Project.

.2 Pumping of water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties, is not permitted.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction.

.4 Protect trees, plants and foliage on site and adjacent properties where required.

.5 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.10 EXISTING CONDITIONS

.1 Hazardous Materials: It is not expected that hazardous materials will be encountered in the work:

.1 Hazardous materials will be as defined in the Hazardous Materials Act.

.2 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Contract Administrator and seek direction.

.3 Site elements that will be demolished are based on their condition at time of examination prior to tendering.

Part 2 Products

2.1 EQUIPMENT

.1 Not Used.

Part 3 Execution

3.1 EXAMINATION

.1 Survey existing conditions and correlate with requirements indicated to determine extent of selective site demolition required.

.2 Consultant or Owner does not guaranty that existing conditions are the same as those indicated in Owner Prepared Documents.

.3 Inventory and record the condition of items being removed and salvaged.

.4 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to Contract Administrator.

.5 Verify that hazardous materials have been remediated before proceeding with site demolition operations.

3.2 PREPARATION

.1 Temporary erosion and sedimentation control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the sediment and erosion control plan prepared by EXP Services Inc.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.

.2 Protection of in-place conditions:

.1 Prevent movement, settlement or damage of adjacent paving, trees, landscaping, properties and adjacent grades.

.1 Provide bracing, shoring and underpinning as required.

.2 Repair damage caused by demolition as directed by Contract Administrator, at no extra cost.

.2 Support affected site elements and, if safety of site element being demolished or services appears to be endangered, take preventative measures, stop work and immediately notify Contract Administrator.

.3 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

.3 Surface preparation:

.1 Disconnect and re-route electrical and other service lines within the Site to be demolished.

.1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of selective site demolition.

.2 Disruption of active or energized traversing Site is not permitted.

3.3 REMOVAL AND DEMOLITION OPERATIONS

.1 Remove items as indicated or as required.

.2 Disruption of items designated to remain in place is not permitted.

.3 Removal of pavements, curbs and gutters:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Contract Administrator.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials.

.4 Excavate at least 300mm below pipe invert, when removing pipes under existing or future pavement area.

.5 Do not remove any trees during demolition.

.1 Obtain written approval of Contract Administrator prior to removal of trees.

.6 Disposal of Material:

.1 Dispose of materials not designated for salvage or reuse on Site at authorized facilities.

3.4 STOCKPILING

.1 Do not stockpile demolished materials including concrete, asphalt and granular materials.

.1 Contractor shall arrange for immediate loading and removal from Site all demolished materials.

3.5 REMOVAL FROM SITE

.1 Transport material designated for alternate disposal using approved facilities and in accordance with applicable regulations.

.2 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

3.6 RESTORATION

.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.7 CLEANING

.1 Progress cleaning: clean in accordance with Specification section 01 74 00 - Cleaning.

.1 Leave work area clean at end of each day.

.2 Remove debris, trim surfaces and leave work site clean, upon completion of work.

.3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

.2 Final cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Specification section 01 74 00 - Cleaning.

.3 Waste management: separate waste materials for recycling in accordance with Specification section 01 74 19 - Waste Management and Disposal.

.1 Remove recycling containers and bins from Site and dispose of materials at appropriate facility.

END OF SECTION

1 General

1.1 SUMMARY

.1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.

.2 Quantities and dimensions enclosed by brackets apply for Project for which the drawings are in imperial units.

.3 Obtain a copy of CSA Standard A23.1 and maintain on site.

1.2 DESCRIPTION

.1 **Related Specification Sections**

03 20 00: Concrete Reinforcement
03 30 00: Cast-In-Place Concrete
05 12 00: Structural Steel
07 92 00: Joints Sealants

.2 **Work Installed but Furnished by Others**

Install anchors, ties, sleeves, bolts, inserts, cast-in miscellaneous metal items, expansion joint components, sub-frames, reglets and other items to be built into or anchored to, or passing through concrete Work, and which are specified for supply in Work of other sections.

.3 **Co-operation with Work of Other Sections**

.1 Check Drawings and Specifications for requirements of other sections which affect construction of formwork.

.2 Inform those performing Work of other sections, in writing or by schedules, of requirements for services, materials and built-in items prepared or supplied by other sections which affect Work of this section.

.4 **Co-operation with Contract Administrator**

.1 Before commencing Work, review with Contract Administrator, Work performed under this section.

.2 Schedule Work to allow sufficient time and access for Contract Administrator to carry out periodic field review.

1.3 QUALITY ASSURANCE

.1 **Reference Standards**

The following reference standards shall govern Work of this section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following standards apply but are not necessarily repeated in following list.

.1 ACI 117-06, Standard Specifications for Tolerances for Concrete Construction and Materials and Commentary, American Concrete Institute.

.2 ASTM D1751-04(2013e1), Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

.3 ASTM D1752-04a(2013), Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.4 CSA A23.1-09 (R2014), Concrete Materials and Methods of Concrete Construction.
.5 CSA S269.1 -1975(R2003), Falsework for Construction Purposes.
.6 CSA S269.3 - M92(R2013), Concrete Formwork.

.2 **Qualifications**

Formwork design engineer shall be insured against professional liability in accordance with section 74 subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable.

.3 **Design of Formwork**

.1 Assume full responsibility for complete structural design and construction of formwork in accordance with CSA Standards S269.1 and S269.3.

.2 Perform structural design of formwork for suspended concrete structural members by a professional engineer experienced in design of formwork and licensed to practise at location of Project. His responsibility shall include design of formwork and shoring, review of Drawings related to this Work, field review of formwork construction including stripping and reshoring, and when requested by regulatory agencies submission of written reports of site review of formwork and shoring.

.4 **Requirements of Regulatory Agencies**

Conform to local and provincial regulations, including construction safety regulations.

.5 **Tolerances**

The indicated tolerances govern unless otherwise specified.
Concrete construction shall meet the specified tolerances.
Tolerances are not cumulative. The most restrictive tolerance controls.
Plus (+) tolerance increases the amount of dimension to which it applies or raises a level alignment. Minus (-) tolerance decreases the amount of dimension to which it applies or lowers a level alignment. A non-signed tolerance means + or -. Where only one signed tolerance is specified (+ or -), there is no limit in the other direction.

.1 **Definitions**

- Arris - The line, edge, or hip in which two straight or curved surfaces of a body, forming an exterior angle meet; a sharp ridge, as between adjoining channels of a Doric column.
- Clear distance - In reinforced concrete, the least distance between the surface of the reinforcement and the referenced surface, i.e., the form, adjacent reinforcement, embedment, concrete, or other surface.
- Concealed surface - Surface not subject to visual observation during normal use of the element.
- Cover - In reinforced concrete, the least distance between the surface of the reinforcement and the outer surface of the concrete.
- Flatness - The degree to which a surface approximates a plane.
- Lateral alignment - The location relative to a specified horizontal plane or line, or to a point in a horizontal plane.
- Level alignment - The location relative to a specified horizontal plane.
- Levelness - The degree to which a line or surface parallels horizontal.

- Relative alignment - The distance between two or more elements in any plane, or the distance between adjacent elements, or the distance between an element and a defined point or plane.
- Tolerance - The permitted variation from a given dimension or quantity or the range of variation permitted in maintaining a specified dimension or the permitted variation from location or alignment.
- Specified surface, plane, or line - A surface, plane, or line specified by the contract documents; specified planes and lines may slope and specified surfaces may have curvature.
- Vertical alignment - The location relative to specified vertical plane or a specified vertical line or from a line or plane reference to a vertical line or plane. When applied to slabs, ramps, or other nominally horizontal surfaces established by elevations, vertical alignment is defined as the vertical location of the surface relative to the specified profile grade and specified cross slope.
- **Class of Surface**
  Class A - For surfaces prominently exposed to public view where appearance is of special importance.
  Class B - Coarse-textured concrete-formed surfaces intended to receive plaster, stucco, or wainscoting.
  Class C - General standard for permanently exposed surfaces where other finishes are not specified.
  Class D - Minimum quality surface where roughness is not objectionable, usually applied where surfaces will be concealed.

.2 **Footings**

.1 Lateral Alignment

Eccentricity measured from centre of gravity of footing as cast to the centre of gravity as specified; 0.02 times width of footing in direction of misplacement, but not more than ..... 50 mm [2"]
Supporting masonry ..... 12 mm [1/2"]

.2 Level alignment

Top of footings supporting masonry ..... 12 mm [1/2"]
Top of other footings ..... +12 mm [+1/2"]; -50 mm [-2"]

.3 Cross-sectional Dimensions

Horizontal dimension of formed members ..... +50 mm [+2"]; -12 mm [-1/2"]
Horizontal dimension of unformed members cast against soil:

- 600 mm [2 feet] or less ..... +75 mm [+3"]; -12 mm [-1/2"]
- Greater than 600 mm [2 feet] but less than 1.8 m [6 feet] ..... +150 mm [+6"]; -12 mm [-1/2"]
- Over 1.8 m [6 feet] ..... +300 mm [+12"]; -12 mm [-1/2"]

.4 Vertical dimension (thickness) ..... - 5 percent

.5 Relative Alignment:

Footing side and top surfaces may slope with respect to the specified plane at a rate not to exceed 25 mm [1"] in 3 m [10 feet].

.3 **Other Cast-in-Place Concrete**

.1 Vertical Alignment:

For heights 30 m [100 feet] or less:
Lines, surfaces, and arrises ..... 25 mm [1"]
Outside corner of exposed corner columns and control joint grooves in concrete exposed to view ..... 12 mm [1/2"]

.2 Lateral Alignment

Members ..... 25 mm [1"]
In slabs, centreline location of openings 300 mm [1 foot] or smaller, and edge location of larger openings ..... 12 mm [1/2"]
Sawcuts, joints, and weakened plane embedment in slabs ..... 20 mm [3/4"]

.3 Level Alignment

Top of slabs:
Elevation of slabs-on-grade ..... 20 mm [3/4"]
Elevation of top surfaces of formed slabs before removal of supporting shores ..... 20 mm [3/4"]
Elevation of formed surfaces before removal of shores ..... 20 mm [3/4"]
Lintels, sills, parapets, horizontal grooves, and other lines exposed to view ..... 12 mm [1/2"]

.4 Cross-sectional Dimensions
300 mm [12"] dimension or less ..... +10 mm [+3/8"]; -6 mm [-1/4"]
More than 300 mm [12"] dimension but not over 1000 mm [36"] dimension ..... +12 mm [+1/2"]; -10 mm [-3/8"]
Over 1000 mm [36"] dimension ..... +25 mm [+1"]; -20 mm [-3/4"]

.5 Relative Alignment

Stairs
Difference in height between adjacent risers ..... 3 mm [1/8"]
Difference in width between adjacent treads ..... 6 mm [1/4"]
Grooves
Specified width 50 mm [2"] or less ..... 3 mm [1/8"]
Specified width more than 50 mm [2"] but not more than 300 mm [12”] ..... 6 mm [1/4"]

Formed surfaces may slope with respect to the specified plane at a rate not to exceed the following amounts in 3 m [10 feet]:
Vertical alignment of outside corner of exposed corner columns and control joint grooves in concrete exposed to view . 6 mm [1/4"]
All other conditions ..... 10 mm [3/8"]

Offset between adjacent pieces of formwork facing material shall not exceed, for Class of surface:

Class A	3 mm	[1/8"]
Class B	6 mm	[1/4"]
Class C	12 mm	[1/2"]
Class D	25 mm	[1"]

.6 Openings Through Members

Cross-sectional size of opening	-6 mm [-1/4"];	+25 mm [+1"]
Location of centreline of opening	12 mm [1/2"]	

1.4 **SUBMITTALS**

.1 **Professional Liability Insurance**

.1 Submit proof of formwork design engineer's professional liability insurance coverage specified above.

.2 **Shop Drawings**

.1 Submit Shop Drawings showing type, extent and locations of items to be built into concrete.

.2 Sleeving drawings
Submit drawings showing sleeves required through floors, roof and other structural members.

.3 Conduits & piping
Submit drawings showing size and spacing of conduits and piping, if requested by Contract Administrator.

.4 Do not commence placing sleeves, conduits or piping before drawings have been reviewed and Contract Administrator's comments incorporated on drawings issued to site.

.5 Coordinate with other divisions prior to submittal.

.6 Prior to submission to Contract Administrator, Contractor shall review all submitted drawings. By this review, Contractor represents to have determined and verified field measurements, site conditions, materials, catalogue number and similar data and to have checked and coordinated each drawing with the requirements of Work and of contract documents. Contractor's review of each drawing shall be indicated by stamp, date and signature of a responsible person.

.7 At time of submission Contractor shall notify Contract Administrator in writing of any deviations in drawings from requirements of contract documents.

.8 Contract Administrator will review and return submitted drawings in accordance with an agreed schedule.

.9 Contract Administrator's review will be for conformity to design concept and for general arrangement and shall not relieve Contractor of responsibility for errors or omissions in submitted drawings or of responsibility for meeting requirements of contract documents.

.10 Contractor shall make any changes in submitted drawings which Contract Administrator may require, consistent with contract documents and resubmit unless otherwise directed by Contract Administrator.

.11 When resubmitting, Contractor shall notify Contract Administrator in writing of any revisions other than those requested by Contract Administrator.

.12 Assume responsibility for accuracy of Work. Review of submitted shop drawings does not relieve Contractor from compliance with requirements of Contract Documents.

.13 Submit Shop Drawings for review before any Work commences to the Contract Administrator, in pdf format.

.14 **Required by Regulatory Agencies**
Submit Shop Drawings bearing signature and seal of Professional Engineer responsible for falsework design and formwork design, as may be required by regulatory agencies. Proceed with construction of falsework and formwork only with their approval.

.3 **Re-Shoring**

.1 Submit to Contract Administrator for review information requested in re-shoring section.

.4 **Quality Control Check List**

.1 Submit quality control check list included at end of this section, to Contract Administrator before each and every concrete pour.

1.5 **PRODUCT DELIVERY, STORAGE AND HANDLING**

.1 Protect formwork to prevent functional damage and damage to faces affecting appearance of concrete surfaces exposed to view.

.2 Prevent damage to fibre column forms and protect against moisture.

2 Products

2.1 **MATERIALS**

.1 Generally, in accordance with reference standards.

.2 Wood products: to Forest Stewardship Council (FSC) certification and from regional sources, extracted, processed and manufactured within 800 km [500 miles] if shipped by truck or 2400 km [1500 miles] by rail or boat.

.3 For permanently exposed concrete surfaces, formwork materials brought on Site shall be new.

.4 Use metal forms only with approval of Contract Administrator.

.5 **Plywood**

.1 Generally: Douglas Fir, minimum thickness of 17.0 mm [11/16"], to CSA Standard 0121, finished one side, fabricated specially for use as concrete form panels, with sealed edges, except as noted in the following paragraphs.

.2 Vertical Surfaces Exposed to View: Use High Density Overlaid (HDO) form panels:
- Pourform HDO, G1S with 120/30 overlay combination, by Ainsworth Lumber Co. Ltd. or approved equivalent

.3 Soffit Surfaces Exposed to View: Use Medium-Density Overlaid (MDO) form panels.

- Proface MDO, by Scott Forest Products or approved equivalent.

.6 **Voidform**

Honeycomb cellular core structure manufactured from Kraft fibre. Top and sides protected with wax coated corrugated board, and bottom unprotected.

-Waxmat (by Shearmat Structures Ltd., Winnipeg, Manitoba), distributed by National Concrete Accessories (Acrow-Richmond), Rexdale, Ontario.
- Allied Concrete Void Form by Wallace Construction Specialties Ltd, Regina, Saskatchewan.
- SureVoid by Falcon Manufacturing Co., Englewood, Colorado.
- Approved equivalent.

.7 **Form Ties**

.1 At architectural concrete surfaces: snap ties, with plastic cone, 25 mm [1"] break back, and grey plastic plugs, to Contract Administrator's approval, and to provide 6 mm [1/4"] reveal.

.2 At other surfaces: snap ties, with spreader washer and 25 mm [1"] break back.

.8 **Chamfers**

Cut from 19 mm x 19 mm [3/4" x 3/4"] wood, smooth, with no open defects.

.9 **Joint Tape**

Non-staining, water impermeable, self-release, as approved by Contract Administrator.

.10 **Lintel and Shelf Angle Anchors**

Built-in, adjustable, with askew head bolts, washers and nuts.
- Acrow Richmond Peerless Wedge Adjustable Anchor Slot.
- Blok-Lok, LW-340 Malleable Iron Wedge Insert
- Approved equivalent

.11 **Dovetail Anchor Slots**

0.55 mm [0.021"] thick galvanized steel, glass fibre filled.

.12 **Waterstops**

.1 **Bentonite**

.1 **Construction Joints, Internal Waterstop**

Bentonite butyl rubber-based water-stop containing 75 percent sodium bentonite.
Where 75 mm [3"] minimum concrete cover is available:
- RX 101T, 32 mm x 12.7 mm [1¼" x ½"] trapezoidal with polyshim reinforcement, by DRE Industries Inc.

Where only 50 mm [2"] concrete cover is available.
- RX 102, 19 mm x 9.5 mm [¾" x 3/8"] half circle, by DRE Industries Inc.
- Approved equivalent

.13 **Expansion Joint Filler and Isolation Joint Filler**

.1 **Bituminous Type**

Pre-moulded, resilient, non-extruding, asphalt impregnated fibre, to ASTM D1751.

.2 **Non-Bituminous Type**

Pre-moulded, resilient, non-extruding, to ASTM 1752, and compatible with polysulphide urethane, polyepoxide urethane, or neoprene sealants, as applicable.

.14 **Form Release Agent**

.1 VOC limit: 350 grams/litre, as per South Coast Air Quality Management District (SCAQMD) Rule 1113 (July 2007).

.2 Regionally based: extracted, processed and manufactured within 800 km [500 miles] if shipped by truck or 2400 km [1500 miles] by rail or boat.

.3 Use non-petroleum based form release agent wherever possible, such as soy-based release agents, where such agents are available and will produce satisfactory finish.

.4 Verify that product will perform properly in cold weather conditions.

.1 Suggested Product: Crete-Lease 880, by Cresset Chemical Company, Inc., Weston, Ohio.

.2 Approved equivalent

3 Execution

3.1 EARTH FORMS

.1 Where soil conditions are suitable, earth forms for wall foundations may be used with geotechnical engineer's approval.

.2 Trim edges of excavation vertical and smooth. Completely remove trimmings.

.3 Provide wood stringers for suspension of reinforcement.

.4 Provide wood forms where earth form sides have collapsed, or if footing excavation will be over-sized.

3.2 FORMWORK CONSTRUCTION

.1 Build formwork with joints sufficiently tight to prevent leakage of grout or cement paste.

.2 Provide specified chamfers at external corners exposed to view.

.3 Bed mud sills on sand, gravel or crushed stone placed over unfrozen, dry, solid and stable sub-grade.

.4 **Forms for surfaces to be waterproofed**

.1 Construct forms with joints taped with specified tape and edges backed to prevent separation of plywood panels at joints.

.2 For metallic or crystalline (chemical) waterproofed surfaces, form continuous reglets at junctions of floors and walls, and at other locations noted on drawings.

.5 **Forms for surfaces which will be exposed or painted**

.1 Construct panels with full size plywood sheets as far as possible, and continuous and level horizontal joints, unless otherwise indicated on drawings.

.2 Back all edges of plywood to prevent separation of plywood panels at joints.

.3 Construct corners so that concrete is not placed against panel edges.

.4 Seal joints between panels with specified tape.

.5 Where tie marks will show, place ties in regular pattern as approved by Contract Administrator or as indicated on drawings.

.6 Reuse forms only if their surfaces are not marred in any manner and where established pattern of holes can be maintained with no alteration to panels.

.7 Use galvanized nails.

.8 Fill unused nail holes where forms are re-used.

.9 Use formwork type for exposed surfaces as specified above.

.6 **Voidform**

Provide specified void-form, and place 7.5 mm [5/16"] thick plywood over voidform to provide firm surface for supporting reinforcement.

.7 **Elevation Survey**

.1 Before every pour of slabs spanning more than 8 m [26 ft.], as agreed with Contract Administrator, survey area and record elevation of top surface of soffit formwork at each column or other permanent support at mid-point between columns, and at centre of each bay area.

.2 Submit to the Contract Administrator one copy of the formwork elevation survey before each pour.

.8 **Notify Contract Administrator**

Advise Contract Administrator when an area of formwork will be ready for review. Allow sufficient time for review before starting concrete placing.

3.3 **BUILT-IN WORK**

.1 Form openings and build in anchors, inserts, sub-frames, sleeves, miscellaneous metal items, flashing reglets and similar items furnished under Work of other sections, which are indicated on Drawings and on Shop Drawings of other trades, and as required for proper completion of Project.

.2 Do not embed wood in concrete.

.3 Shelf angle anchors: Install anchors specified above, and/or as indicated on Drawings and Shop Drawings.

.4 **Anchor Bolts**

.1 Use template to position anchor bolts.

.2 Tie anchor bolts securely in position to prevent displacement during concrete placing.

.3 Verify that anchor bolts have specified projection above concrete.

.5 **Openings or Sleeves Not Shown on Drawings**

.1 Obtain Contract Administrator's written approval before forming openings or sleeves:

.1 through columns and beams;

.2 through slabs within 1 m [3'-0"] of supports;

.3 larger than 200 mm [8"] square or round in any location.

.2 Do not relocate or interfere with bottom bar structural integrity reinforcement which extends from column to column. Report any interferences to Contract Administrator.

.6 **Embedded Pipe or Conduit Not Shown or Detailed on Drawings**

Obtain Contract Administrator's written approval before placing conduit or pipe which would be embedded in finished structure.

.7 Confirm that built-in items that penetrate surface waterproofing are installed to meet requirements of waterproofing trade.

.8 **Dovetail Anchor Slots**

.1 Build in dovetail anchor slots for masonry anchors in locations directed by mason.

.2 Install dovetail anchor slots for full height of vertical concrete surfaces faced with masonry that exceed a height of 400 mm [16"] and that are not waterproofed.

.3 Install slots continuous and vertical at 600 mm [24"] centres maximum, with at least one slot at each surface 600 mm [24"] or less in width.

.4 At junctions of masonry walls and partitions with concrete walls and columns, install one continuous vertical slot at centre line of partition for full height.

.5 Supply of dovetail anchor slots is specified in masonry sections.

3.4 CONSTRUCTION & EXPANSION JOINTS

.1 Form construction and expansion joints with bulkheads to ensure straight lines.

.2 Immediately before subsequent pour at a construction joint, remove bulkhead and tighten forms so that concrete surfaces will be on same plane with no overlapping of concrete.

.3 Review with Contract Administrator proposed location and details of construction joints in walls, columns, beams and slabs.

.4 **Construction Joints**

.1 Construction joints shall present appearance of normal form panel joint.

.2 Install continuous shear key in construction joints in walls and framed floors which are 150 mm [6"] or more thick.

.3 Locate construction joints in framed floors at point in span where shear will be equal to zero (normally at mid-span under uniformly distributed load).

.4 Form vertical construction joints in walls at not more than 23 m [75'-0"] centre to centre, and in exposed-to-the-exterior retaining walls at not more than 12 m [40'-0"] centres.

.5 Provide water-stops in walls that retain earth, in construction joints in tunnel slabs and in other locations where shown on Drawings.

.6 Join water-stops in floors to water-stops in walls.

.7 Bentonite Water-stops

.1 Provide specified bentonite water-stops at construction joints in new construction.

.2 Install in accordance with manufacturer's instructions.

.3 Butt end of water-stops at joints.

.4 Nail waterstop to concrete in cold weather.

.5 **Expansion Joints**

.1 Install expansion joints in locations and as detailed and noted on Drawings.

.2 In exterior cantilever retaining walls locate expansion joints at 12 m [40'-0"] centres, maximum.

.3 Provide specified internal PVC water-stops with tear web, in expansion joints in foundation walls, walls retaining earth, and floor framing.

.4 Use prefabricated factory-made sections at junctions (at "L", "T", "cross" & "transition" joints), for both flat and vertical junctions as applicable.

.5 Place water-stops with equal embedment each side of joint.

.6 Join water-stops in floors to water-stops in walls.

.7 Heat seal joints in PVC water-stops to make watertight, using mitred joints, in accordance with manufacturer's instructions.

.8 Tie edges to adjacent reinforcing bars to prevent displacement during concrete placement.

.9 Fill joints at each side of water-stop with pre-moulded expansion joint filler specified above. For joints to be caulked, stop joint filler 45 mm [1.75"] back of concrete face, to allow for backer rod and sealant.

.10 Install and anchor expansion joint hardware supplied under Work of other sections.

.6 **Slab-on-Grade Isolation Joints**

.1 Install 12 mm [1/2"] thick joint filler specified above, around perimeter of slabs-on-grade at junction of vertical surfaces, equipment bases and where indicated on Drawings.

.2 Install joint filler for full depth of slabs.

3.5 TREATMENT OF FORMWORK SURFACES

.1 **Form Release Agent**

.1 Coat formwork with form release agent before reinforcement, anchors, accessories, and other built-in items are installed.

.2 Do not coat plywood forms pre-treated with release agent.

.3 On surfaces to receive finish materials, adhesives, sealers, paint or other coatings or materials, use a compatible release agent.

.4 Use form release agent specified above.

3.6 STRIPPING OF FORMWORK

.1 Be responsible for safety of structure, both before and after removal of forms, until concrete has reached its specified 28-days strength.

.2 Pour Strip: Do not remove forms supporting beams and slabs adjacent to pour strip until concrete infill in pour strip has reached at least 75% of specified 28-days strength. Provide shoring of sufficient capacity to support load from full span length of adjacent beams and slabs. Do not rely on beams and slabs to cantilever to pour strip.

.3 Strip formwork for soffits of beams, slabs and other spanning members which support weight of concrete only when concrete has reached its specified 28-days strength, except as specified hereafter.

.4 Formwork may be stripped when concrete has reached 75 percent of specified 28-days strength, but only in accordance with re-shoring procedures specified in this section.

.5 Strip formwork on vertical surfaces when concrete has hardened sufficiently that no damage will result from stripping operations.

.6 Leave plywood forms in place as long as possible to permit maximum shrinkage away from concrete.

.7 Do not remove plywood formwork by jerking loose or by metal pinch bars. Use wood wedges and gradually force panels loose.

.8 Take particular care not to damage external corners when stripping formwork.

.9 When forms are stripped during curing period, cure and protect exposed concrete in accordance with Specification section 03 30 00.

3.7 RE-SHORING

.1 Re-shore concrete when formwork is stripped, as follows:

- .1 When floor is to support weight of newly placed concrete from floors above during construction: re-shore and maintain in place as specified hereafter.
- .2 When floor is not required to support weight of newly placed concrete from floors above during construction, and formwork is stripped before specified 28-days strength is attained: re-shore and maintain in place until specified 28-days strength is reached.

.2 Submit for Contract Administrator's review proposed schedule for stripping, methods of re-shoring, and controls to prove that 75 percent of specified 28-days strength of concrete has been reached.

.3 Re-shore in two directions so that no large areas of Work are permitted to support their own weight.

.4 Locate re-shores:

- .1 At mid-span of slabs and beams, but at not greater spacing than 3 m [10'-0"] centres.
- .2 At slab edges at pour strips, at not greater spacing than 2 m [6'-6"] centres, and in adjacent back-spans, and maintain in place until pour strip is cast and reaches specified 28-days strength.

.5 Place each tier of shoring concentric with the one below.

.6 Tighten re-shores to carry weight of new construction and any loads imposed thereon. Do not overstress new construction by over-tightening.

.7 Leave at least two storeys of shores or re-shores in place beneath framed floors which support weight of newly placed concrete above, and until newly placed concrete has reached at least 75 percent of its specified 28-days strength.

3.8 DEFECTIVE WORK

.1 Defective Work performed under this section shall include, but not be limited to the following:

- .1 Variations in excess of specified tolerances
- .2 Failure of materials or workmanship to meet requirements of this Specification section, and which cannot be repaired by approved methods.
- .3 Movement and displacement of formwork during construction.
- .4 Visible variation in beam formed surfaces that are not acceptable to the Contract Administrator.
- .5 Disfigured surfaces that cannot be repaired by approved methods.
- .6 Honeycombing and voids.
- .7 Debris in formwork.
- .8 Over-pour (concrete leakage onto surface below or adjacent surface)
- .9 Leakage of cement paste at column bases.

.2 Replace defective Work, as directed by Contract Administrator.

.3 Testing and replacement of non-compliant concrete in place:

- .1 When initial inspection and tests indicate non-compliance with the contract documents, subsequent re-inspection and re-testing shall be performed by the same inspection company at the Cost of the Contractor.
- .2 Contractor shall replace or reconstruct deficient formwork as directed by Contract Administrator and pay for all testing and related expenses for replaced Work until approved by Contract Administrator.

FORMWORK CHECK LIST

This form to be submitted to Contract Administrator before any concrete placement and before any form removal.

	Item	√	
1	Forms are adequately braced and tied to prevent bulges and distortions		
2	Bottom of all beam forms are cleaned of all dirt and debris		
3	Bottom of all column form are cleaned of all dirt and debris		
4	Top of columns are cleaned of all dirt & debris		
5	Bottom of all column forms are sealed against leakage of cement paste		
6	Bottom of all wall and balustrade forms are cleaned of all dirt and debris		
7	Slab edges are prepared for chemical waterproofing & chemical waterproofing applied		
8	Depth and width of chases in floors for expansion joint nosings are **exact**		
9	Depth and width of chases in vertical surfaces such as columns for expansion joint upturns		
10	Depth and width of chases in vertical surfaces at roof level parking to receive upturned waterproofing membrane		
11	Depth and width of beams and columns and other members		
12	Clearance under all beams meets minimum required clearance		
13	Elevations of formed surfaces		
14	Alignment of formwork each side of expansion joints		
15	Water-stops are securely in place at construction joints in floors & walls		
16	Top of columns & walls do not project more than 10 mm above slab or beam soffit		
17	Formed openings conform to reviewed sleeving drawings		
18	Top of slab elevations taken before formwork removed		
19	No large areas (greater than half slab or beam span) of formwork are removed before the area is re-shored		
20	In architectural concrete:		
	- galvanized nails are used		
	- unused nail holes are filled		
	- joints are made watertight		

Name of Trade *Contractor*'s Quality Control Manager _____ (print)

Date _____ _____ (signature)

− End of Section −

1 General

1.1 SUMMARY

.1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.

.2 Quantities and dimensions enclosed by brackets apply for Project for which Drawings are in imperial units.

.3 Obtain a copy of CSA Standard A23.1- and maintain on site.

1.2 DESCRIPTION

.1 **Related Specification Sections**

03 10 00: Concrete Formwork
03 30 00: Cast-In-Place Concrete

.2 **Co-operation with Contract Administrator**

.1 Before commencing Work, review with Contract Administrator, Work to be performed under this section.

.2 Schedule Work to allow sufficient time and access for Contract Administrator to carry out periodic field review.

1.3 QUALITY ASSURANCE

.1 **Reference Standards and Publications**

The following reference standards and publications shall govern Work of this section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following standards apply but are not necessarily repeated in following list.

.1 ACI SP-66(04), ACI Detailing Manual – 2004.

.2 ASTM A1064/A1064M-14, Standard Specification For Carbon-Steel Wire And Welded Wire Reinforcement, Plain And Deformed, For Concrete.

.3 ASTM D 3963/D3963M-01(2007), Specification for Epoxy-Coated Reinforcing Steel.

.4 CSA A23.1-09 (R2014), Concrete Materials and Methods of Concrete Construction.

.5 CSA A23.3-14, Design of Concrete Structures.

.6 CSA G30.18-09, Billet-Steel Bars for Concrete Reinforcement.

.7 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.8 RSIC Reinforcing Steel Manual of Standard Practice, third edition, 2004.

.2 **Qualifications**

.1 Welding: Undertake welding of reinforcement only by a fabricator or Subcontractor approved by Canadian Welding Bureau to requirements of CSA Standard W186.

.3 **Source Quality Control**

.1 Source Quality Control to be performed by an inspection and testing company retained by the Contractor.

.2 Review provided by inspection and testing company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of

inspection and testing company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.

.3 Identify and correlate reinforcing steel from Canadian mills with test reports for compliance with requirements specified.

.4 All Testing of identified/ unidentified reinforcing steel is at expense of the Contractor. Perform testing for each 1 tonne [1000 kg] or part thereof supplied for incorporation in Work.

1.4 SUBMITTALS

.1 Shop Drawings

.1 Submit Shop Drawings, including placing drawings and bar lists.

.2 Prepare placing drawings and bar lists in accordance with the American Concrete Institute (ACI) Detailing Manual, the Reinforcing Steel Institute of Canada (RSIC) Reinforcing Steel Manual of Standard Practice, and the typical details included with contract documents.

.3 Prepare placing drawings to minimum scale of 1:50.

.4 Submit placing drawings and bar lists sufficiently detailed and dimensioned to permit correct placement of reinforcement and accessories without reference to the Drawings.

.5 Show reinforcement, including dowels, in elevation on placing drawings for wall reinforcement.

.6 Show concrete cover to reinforcement.

.7 Show location of construction joints.

.8 Indicate type of chair where concrete is exposed to view, in accordance with this Specification.

.9 Prior to submission to Contract Administrator, Contractor shall review all Shop Drawings. By this review, Contractor represents to have determined and verified field measurements, site conditions, materials, catalogue number and similar data and to have checked and coordinated each Shop Drawing with the requirements of Work and of contract documents. Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a responsible person.

.10 At time of submission, Contractor shall notify Contract Administrator in writing of any deviations in Shop Drawings from requirements of contract documents.

.11 Contract Administrator will review and return Shop Drawings in accordance with an agreed schedule. Contract Administrator's review will be for conformity to design concept and for general arrangement and shall not relieve Contractor of responsibility for errors or omissions in Shop Drawings or of responsibility for meeting requirements of contract documents.

.12 Contractor shall make any changes in Shop Drawings which Contract Administrator may require consistent with contract documents and resubmit unless otherwise directed by Contract Administrator. When resubmitting, Contractor shall notify Contract Administrator in writing of any revisions other than those requested by Contract Administrator.

.13 Do not commence fabrication of reinforcement before drawings have been reviewed and Contract Administrator's comments incorporated on drawings issued to fabricating shop.

.14 Submit Shop Drawings for review to Contract Administrator before any Work commences, in pdf format.

.2 Inspection Reports

.1 Inspection and testing company shall submit reports of inspections and tests in pdf format to the Contract Administrator.

2 Products

2.1 MATERIALS

.1 **Generally**

.1 In accordance with the reference standards.

.2 **Bar Reinforcing Steel**

.1 Bars: to CSA Standard CAN/CSA-G30.18 Grade 400W (weldable grade)

.2 Bar areas are 100 mm², 200 mm², 300 mm², 500 mm², 700 mm², 1000 mm², 1500 mm², and 2500 mm² for bar designations 10, 15, 20, 25, 30, 35, 45, and 55 respectively. Be aware that some sources produce bars of same designation but with significantly smaller areas, and such bars shall not be used without written permission of Contract Administrator and appropriate adjustments in number of bars.

.3 **Chairs Where Exposed to View**

.1 Plastic, plastic-tipped, or precast concrete.

.4 **Welded Wire Fabric**

.1 to CSA Standard G30.5, and in flat sheets, not rolls.

.5 **Mechanical Connection Compression Splice Couplers**

.1 To develop 125 percent of yield strength of bar in compression and concentrically align bars.

- CADWELD C16 Series Compression Only Splices, by Erico Inc.
- Lenton Splice, including plastic internal coupler thread protector and plastic bar end thread protector, by Erico Inc.
- Approved equivalent.

.6 **End Bearing Splices**

.1 To concentrically align bars and meet requirements of CSA Standard A23.3 Clause 12.16.4 “End-bearing splices”.

- PRE-SET, by Stricon Products, distributed by Harris Rebar Inc.
- SPEED SLEEVE, by Erico Inc.
- Approved equivalent.

.7 **Mechanical Connection Tension Splice Couplers**

.1 To develop 125 percent of yield strength of bar in tension.

- PortaFORGE, by Stricon Products Ltd., distributed by Harris Rebar Inc.
- Lenton Splice, including plastic internal coupler thread protector and plastic bar end thread protector, by Erico Inc.
- Approved equivalent.

2.2 **FABRICATION**

.1 Fabricate reinforcing steel only in a permanent fabricating shop unless otherwise approved by Contract Administrator.

.2 Fabricate reinforcing steel in accordance with Shop Drawings.

.3 Tag reinforcing bars to indicate placement as designated on Shop Drawings.

.4 Provide padded contact surfaces for systems for handling epoxy-coated bars, to prevent damage to coating.

.5 **Splices**

.1 Provide splices only where specifically indicated on Drawings.
.2 Stagger alternate mechanical splices 750 mm apart.
.3 Stagger alternate end bearing splices 750 mm apart.
.4 Install on threaded splices, plastic internal coupler thread protector and plastic bar end thread protector.

3 Execution

3.1 **EXAMINATION**

.1 Examine formwork to verify that it has been completed and adequately braced in place before commencing to place reinforcement.

3.2 **PLACING REINFORCEMENT**

.1 Place reinforcement in accordance with requirements of CSA Standard A23.3, typical details, and as indicated on Drawings.

.2 Do not cut reinforcement to incorporate other Work.

.3 Relocate or rebend bars only on written instructions of Contract Administrator.

.4 Tie, do not weld, reinforcement in place.

.5 Install mechanical connection splices and end bearing splices in accordance with manufacturer's instructions.

.6 Provide additional cover of 6 mm unless otherwise indicated on Drawings, at concrete surfaces to receive bush-hammered finish.

.7 **Metal Filled Sleeve Splices**

.1 Remove dirt, loose mill scale and rust from end surfaces of sleeved bars.
.2 Secure bars in concentric alignment with ends separated by 3 mm to 6 mm.
.3 Install filler metal so that space between ends of bars and voids in sleeve are filled.
.4 Confirm that sound filler metal is present at both ends of sleeve and at entry port.

.8 **End-Bearing Splices**

.1 Remove dirt, loose mill scale and rust from bar surfaces to be enclosed by splice, at time of installation. Remove burrs that may separate bearing faces.

.2 Rotate upper bar to obtain most complete contact between bearing faces.

.3 Install a locking sleeve to hold spliced bars in secure alignment, and with an inspection hole opposite contact faces facing outwards.

.4 Face sleeved flanges or projections to inside of column.

.5 Provide reducer inserts when spliced bars differ by one bar size.

.6 Verify by physical measurement that bar ends terminate in flat surfaces within 1.5 degrees of a right angle to the axis of bar and are fitted within 3 degrees of full bearing.

.9 **Reinforcement for Separate Topping**

.1 Reinforce separate toppings 50 mm thick and over with flat sheets of welded steel wire fabric:

- 102 x 102 MW13.3 x MW13.3 for toppings 50 mm to 75 mm thick
: 102 x 102 MW18.7 x MW18.7 for toppings over 75 mm to 100 mm thick.

.2 Place wire fabric 40 mm below finished concrete surface.

.10 **Concrete Fireproofing**

.1 Encase structural steel members with concrete where indicated on Drawings or where noted "C.F." on Drawings.

.2 Completely wrap members with 102 x 102 MW9.2 x MW9.2 welded steel wire fabric. For interior beams less than 450 mm deep fabric may be wrapped around bottom flange only.

3.3 ADJUSTING AND CLEANING

.1 Adjust and secure reinforcement in correct position immediately before concrete is placed.

.2 Remove contaminants which lessen bond between concrete and reinforcement.

3.4 FIELD QUALITY CONTROL

.1 Provide competent supervisor, with at least three years' experience in reinforcement placement, to direct placement of reinforcement.

.2 Inspect placement of reinforcement for conformance with Drawings and Specifications, before each concrete placement, and correct as necessary.

.3 Be aware that Contract Administrator's periodic review of selected areas of reinforcement is for verification of conformity to design concept and general arrangement only and shall not relieve Contractor of responsibility for quality control, errors, or omissions, or conformance with requirements of contract documents.

3.5 DEFECTIVE WORK

.1 Incorrectly fabricated, misplaced, or omitted reinforcement, will be considered defective Work performed by this section.

.2 Replace or adjust defective reinforcement before concrete is placed, as directed by Contract Administrator.

.3 Replace or strengthen concrete Work which is deficient as a result of incorrectly fabricated, misplaced, or omitted reinforcement, which was not corrected before concrete was placed.

.4 Testing and replacement of non-compliant Work in place:

.1 When initial inspection and tests indicate non-compliance with the contract documents, subsequent re-inspection and re-testing shall be performed by the same inspection and testing company at the Contractor's expense.

.2 Contractor shall pay for redesign, corrective measures and related expenses if Work has proven to be deficient.

− End of Section −

1 General

1.1 **SUMMARY**

.1 General Conditions and division 1, General Requirements, shall govern Work of this Section.

.2 Contractor shall obtain a copy of CSA Standards A23.1, and A23.2, and maintain on site.

.3 This is a performance Specification in accordance with CSA A23.1 Table 5 Alternative (1). Nothing in this section shall be construed or interpreted as rendering the Specification to be Alternative (2) prescriptive.

1.2 **DESCRIPTION**

.1 Related Specification Sections:
03 10 00: Concrete Formwork
03 20 00: Concrete Reinforcement
05 12 00: Structural Steel
05 50 00: Metal Fabrication

.2 **Co-operation with Contract Administrator**

.1 Before commencing Work, review with Contract Administrator, Work performed under this section.

.2 Schedule Work to allow sufficient time and access for Contract Administrator to carry out periodic field review.

1.3 **QUALITY ASSURANCE**

.1 **Reference Standards**

The following reference standards shall govern Work of this section, except where they are in conflict with requirements imposed by this Specification in which case the latter shall govern. Standards referenced by following standards apply but are not necessarily repeated in following list.

.1 ACI 117-06, Standard Specifications for Tolerances for Concrete Construction and Materials and Commentary, American Concrete Institute.

.2 ASTM C127-12, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.

.3 ASTM C171-07, Standard Specification for Sheet Materials for Curing Concrete.

.4 ASTM C295-12, Standard Guide for Petrographic Examination of Aggregate for Concrete.

.5 ASTM C309-13, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.6 ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete.

.7 ASTM C900-13a, Standard Specification for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds.
.8 CGSB 19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing.
.9 CGSB 19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
.10 CGSB 37.2-M88, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
.11 CGSB 37.3-M89, Application of Emulsified Asphalts for Dampproofing or Waterproofing.
.12 CGSB 37.5-M89, Cutback Asphalt Plastic Cement.
.13 CGSB 37-GP-6Ma, Asphalt, Cutback, Unfilled, for Dampproofing.
.14 CGSB 37-GP-12Ma, Application of Unfilled Cutback Asphalt for Dampproofing.
.15 CGSB 51-34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
.16 CSA A23.1-09, Concrete Materials and Methods of Concrete Construction.
.17 CSA A23.2-09, Methods of Test for Concrete.
.18 CSA A3000-13, Cementitious Materials Compendium.

.2 **Certification of Concrete Plant**

.1 Concrete plants shall be certified by the Ready Mixed Concrete Association of Ontario.
.2 Submit a copy of “Certificate of Ready Mixed Concrete Production Facilities” for each plant that will supply concrete on this Project.

.3 **Tolerances**

.1 In accordance with ACI 117; definitions for tolerance terminology and tolerances for formed concrete surfaces are recapitulated in Specification section 03 10 00, Concrete Formwork.
.2 Difference between elevation of high point and low point in specified area not to exceed:
In any bay up to 100 m²: 12.5 mm
In any bay up to 400 m²: 25 mm
.3 **F-Number System (Vehicle Areas)**
Finish floor slabs to meet following tolerance classification in accordance with CSA Standard A23.1, Clause 7.5.1.5 “F-number method” and Table 22 “Slab and floor finish classifications”.
Vehicle Areas: Class C: $F_F = 35$, $F_L = 25$
Areas other than Vehicle Areas: Class A: $F_F = 20$, $F_L = 15$
.4 For slabs which are intentionally sloped for drainage purposes, only “Floor Flatness” ($F_{F)}$ measure applies.
.5 Measure F_L levelness tolerance at 72±12 hours after completion of floor finishing, on formed slabs before removal of shores and on slabs-on-grade.

.4 **Sample of Floor Finishing**

.1 Finish and cure an area of floor slab where directed by Contract Administrator to provide sample of finish and curing procedures for approval.

.2 Provide new sample area until finish is approved.

.3 If liquid membrane curing compound is to be used on Project, determine and apply correct quantity required to meet rate of coverage recommended by manufacturer for measured test area.

.4 Approved sample will be the standard by which subsequent finishing will be judged and will be incorporated into Work.

.5 **Source Quality Control**

.1 Both source quality control, and field quality control specified in article 3.11, may be performed by an inspection and testing company retained by the Contractor.

.2 Review provided by inspection and testing company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of inspection and testing company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.

.3 Inspection and testing company shall be certified under CSA Standard A283, Qualification Code for Concrete Testing Laboratories, for Category 1 Certification.

.4 Payment for any standard testing and all additional tests (including testing of structure and its performance, and load testing) required by changes of materials or concrete mix design requested by Contractor, and failure of completed Work to meet specified requirements, shall be made at Contractor's expense.

.5 Perform Work of source quality control in accordance with CSA Standard A23.2 and to include:

.1 Verification that ready-mix Supplier is qualified to supply concrete in accordance with Specification.

.2 Review of proposed concrete mix designs.

.3 Sampling, inspection, and testing of materials as may be required.

.6 **Corrosion Inhibitor Quality Control**

.1 Representative of manufacturer of corrosion inhibitor shall visit concrete batch plant once a day for the first 3 days that concrete is batched with corrosion inhibitor, and thereafter at least once a week, to confirm that equipment is in good working order and correct dosage of corrosion inhibitor is consistently being added to the concrete. Submit letter promptly after each visit stating findings and recommendations.

1.4 PROJECT RECORDS

.1 **Concrete Pour Records**

Record time, date, delivery ticket serial number, and location in building of each concrete pour, and identify related test cylinders. Keep these records on Site until Project is completed.

.2 **Delivery Records**

File duplicate copies of concrete delivery slips. The following information shall be printed on each ticket at the plant using an automated printing device in accordance with Ontario Provincial Standard Specification OPSS.PROV 1350:

.1 Name and location of plant.
.2 Date and serial number of the ticket.
.3 Name of Contractor.
.4 Project name.
.5 Specified Class of Exposure of the concrete, specified strength and ordered slump or slump flow.
.6 Volume of concrete in load.
.7 Truck number.
.8 Mix design number.
.9 Time of first mixing of aggregate, cementing materials and water. Where an electronic ticketing system is not used, time shall be stamped by time clock, within 5 minutes of batching.
.10 Information on the amount of any material added after batching.
.11 Time truck arrived on site and time when truck was finished discharging.
.12 Rejection of a load or part thereof, if applicable.

.3 **Record Drawings**

.1 Record on a set of Drawings:
    .1 Time and date of each pour.
    .2 High and low ambient air temperatures during each pour.
    .3 Date of removal of forms in each area.
    .4 Founding elevations of all footings.
    .5 Variations of foundation Work from that indicated on Drawings.
.2 Make record drawings available for Contract Administrator's inspection at all times.

1.5 **SUBMITTALS**

.1 **Certificate**

.1 Submit a copy of “Certificate of Ready Mixed Concrete Production Facilities” for each plant that will supply this Project.

.2 **Samples**

.1 Submit for inspection, material samples of specified mix designs.

.3 **Concrete Mix Designs**

.1 Submit concrete mix designs to Contract Administrator and inspection and testing company within two weeks of tender award, including verification that each concrete mix will meet the specified performance requirements.
.2 The verification shall consist of test results from trial batches in accordance with CSA Standard A23.1 Clause 8.5.4 “Trial mixes”.
.3 Test results from another project completed within the last 12 months are also acceptable.

.4 Include in the submitted verification:
- .1 For C-XL, C-1 and A-1 exposure classes: concrete strength, hardened air void structure and chloride permeability index (coulombs).
- .2 For F-1 exposure class: hardened air void structure.
- .3 For elements specified as requiring low shrinkage concrete: shrinkage testing as per ASTM C157.

.5 Do not place concrete until the specified performance testing verification has been submitted to and reviewed by the Contract Administrator.

.6 Include in submitted mix designs the quantities of constituent components of the mixes. Alternatively, where quantities are not disclosed, each mix design shall be signed by a professional engineer licensed to practice in Ontario and knowledgeable and experienced in concrete mix design. Where quantities of constituent components are to be disclosed, the Contract Administrator will sign a confidentiality agreement not to disclose the information without authorization.

.7 When optimum bulk density of aggregates is specified, submit supporting evidence of compliance with requirements.

.8 Review of mix design does not relieve Contractor from responsibility for compliance with contract documents.

.9 Submit evidence, and material samples if requested, acceptable to inspection and testing company to verify that proposed concrete mix design will produce specified quality of concrete.

.10 Batch records:
- .1 Submit batch records if requested by Contract Administrator when concrete test results indicate that concrete may not be in conformance with Specifications.
- .2 Submit once a week, batch records for concrete with specified corrosion inhibitor, unless other means are provided to prove that the specified dosage of corrosion inhibitor was included in the mix.

.4 **Inspection Reports**

Inspection and testing company shall:

.1 Provide concrete test reports electronically using Ready Mixed Concrete Association of Ontario “Concrete Materials Tests” (CMATS). Notify Contract Administrator that this is how results will be reported and provide assistance and instructions on how to access the test results.

.2 Submit inspection reports in pdf format to Contract Administrator.

.3 On concrete cylinder test reports, include:
: Specific location of concrete represented by sample.
: Design strength.
: Unit weight of sample.
: Class of exposure.
: Aggregate size.
: Date, hour and temperature at time sample taken.
: Percentage air content.
: Test strength of cylinder.
: Type of failure if test fails to meet specification.

.5 **Joint Location Drawings**
Submit drawings showing proposed location of control joints in slab-on-grade, where not shown on Drawings.

.6 **Corrosion Inhibitor**
Submit letter from representative of manufacturer promptly after each visit to concrete batch plant.

1.6 **JOB CONDITIONS**

.1 **Environmental Conditions**
.1 In addition to Cold Weather and Hot Weather Requirements of CSA Standard A23.1, the following shall apply to Work of this Section.

.2 **Plastic Shrinkage Drying**
.1 Be aware that conditions causing plastic shrinkage cracking can occur at any time of year.
.2 Obtain forecasts each day from Environment Canada, including long-range forecasts, of temperature, relative humidity and wind speed.
.3 Provide the protection and other measures specified in CSA Standard A23.1 Clause 7.4.2 “Curing”, whenever forecast conditions are such that plastic shrinkage cracking may occur.
.4 Provide protection, wind breaks, and other measures before concrete placement commences.
.5 Provide equipment to spray fine fog mist in air over concrete. Do not spray onto concrete surface.

.3 **Protection and Heat**
.1 Provide protection or heat, or both, so that temperature of concrete at surfaces is maintained at not less than
.1 21 deg. C for three days after placing;
.2 10 deg. C for the next two days;
.3 above freezing for the next two days.
.2 Do not permit alternate freezing and thawing for fourteen days after placing.
.3 Do not heat above 30 deg. C.
.4 Provide heat and insulated blankets to minimize thermal gradient and to maintain slabs at similar temperature to beams.
.5 Distribute heaters uniformly and provide standalone fans to distribute heat uniformly.
.6 Vent exhaust gases from combustion type heaters to atmosphere outside protection enclosures.

.4 **Insulating Blankets**
.1 Use thermal blankets with an R value of not less than 3.5 $ft.^2$ hr. º F/BTU (imperial units), or multiple layers to achieve this R value.

.2 Place insulating blanket to closely follow finishing of concrete. Place as soon as finishing of sufficient portion of pour is completed that it can be covered by blankets. Do not wait till end of day to start placing insulating blankets.

.3 Do not remove protection until concrete has cooled sufficiently that the temperature differential between the concrete surface and ambient air does not exceed 12 deg. C.

.5 **Curing**

.1 Provide protection to maintain concrete continuously moist during curing period.

.6 **Hot Weather Concreting**

.1 For hot weather concreting, including but not limited to when daytime temperatures are forecast to exceed 30 deg. C, implement all of the measures of CSA Standard A23.1 Clause 7.4.1.2 “Severe drying conditions”. Note that this includes concrete placement at night.

.7 **In-Situ Strength**

.1 Determine in-situ strength by one of the following two methods. Field cured cylinders placed on top of floor are not acceptable means of assessing the in-situ strength of the concrete.

.2 Inspection and testing company shall be experienced in carrying out these test procedures.

.1 **Method 1 - Pullout Tests**

.1 Perform these tests in accordance with ASTM C900.

.2 Use proprietary inserts (LOK tests).

.3 Calibrate inserts with standard cylinders for each mix design prior to construction.

.4 Install proprietary inserts (LOK tests) at 30 locations within each pour area, fastened to formwork, distributed over the floor, including near edges of floor and openings where floor is likely to be coldest.

.5 When time to test, apply load by hydraulic jack that has been calibrated within the previous six months.

.6 Apply load to 5 inserts and determine strength. If strength is below specification for stripping form, wait another day before pulling another 5. When strength appears satisfactory, pull the remaining inserts.

.7 Make good any spalls around inserts.

.2 **Method 2 – Cast-in-Place Cylinders**

.1 Install cast-in-place cylinders with outer sleeve and inner sleeve in accordance with ASTM C873 using purpose made cylinder molds.

.2 Install cylinders at locations distributed over the floor, including near edges of floor and openings where floor is likely to be

coldest. Obtain Contract Administrator's approval of number and locations before proceeding.

.3 Patch holes neatly using specified metallic grout in dry locations and non-metallic grout in wet locations and parking structures.

.8 **Rain**

Do not place concrete when it is raining. Should rain commence during placing, cover freshly placed concrete.

.9 **Bonded Toppings**

Do not place bonded toppings on rough slabs that are less than 15 deg. C surface temperature.

.10 **Grout**

Do not grout at ambient air temperatures or concrete surface temperatures less than 5 deg. C, or when temperature is forecast to fall to less than 5 deg. C within 24 hours of grouting.

.11 **Sealants**

Do not apply sealants at ambient air temperatures or concrete surface temperatures less than 10 deg. C.

1.7 **PROTECTION**

.1 Protect floor slabs and concrete surfaces exposed to view or on which finishes are to be applied, from grease, oil, and other soil which will affect appearance of concrete, or impair bond of toppings or finish materials.

2 Products

2.1 **MATERIALS**

.1 **Generally**

In accordance with reference standards.

.2 **Cementing Materials**

.1 Portland cement: to CSA Standard A3000 type GU or GUL unless otherwise indicated.

.2 Cementitious hydraulic slag and fly ash: to CSA Standard A3000.

.3 **Fine Aggregate**

For slabs-on-grade: fineness modulus of fine aggregate between 2.6 and 3.1.

.4 **Coarse Aggregates - General**

20 mm to 5 mm unless otherwise specified.

.5 **Coarse Aggregate for Slabs Over Open Web Steel Joists (OWSJ), Waffle Slabs and Bonded Toppings ≤ 50 mm Thick**
12 mm to 5 mm.

.6 **Coarse Aggregate for Columns ≤ 300 mm in Least Dimension**
10 mm to 5 mm (or 14 mm to 5 mm if 10 mm is not available).

.7 **Coarse Aggregate for Slabs-on-Grade**

.1 Abrasion loss not to exceed 35 percent.

.2 Petrographic number of aggregate not to exceed 125 when tested in accordance with ASTM C295.

.3 **Additional Requirement for Slabs-on-Grade ≥ 125 mm Thick**
40 mm to 5 mm; combine at least two of the single sizes specified in Table 11 Group II of CSA Standard A23.1, one of which is to be 40 mm, to obtain maximum bulk density (unit weight) and optimum grading, in accordance with an approved procedure.

.8 **Admixtures**

.1 Conform to reference standards for chemical and air-entraining admixtures.

.2 Calcium chloride: Do not use calcium chloride or admixtures containing chloride.

.3 Chemical admixture**:** Incorporate water-reducing admixture conforming to ASTM C494 type A, in all concrete.

.4 Conform to ASTM C494 for other admixtures such as retarders, non-chloride accelerators and high range water reducers.

.5 Air entraining admixture: Incorporate air-entraining admixture in addition to chemical admixture in concrete of relevant class of exposure, in accordance with CSA Standard A23.1, Table 4.

.9 **Corrosion Inhibitor**
Calcium nitrite, meeting the requirements of CSA Standard S413, Appendix C.
- DCI, by W.R. Grace & Co. of Canada Ltd, Ajax, ON.
- Eucon CIA, by Euclid Canada Inc., Toronto, ON.
- MasterLife CI 30 by BASF
- Sika CNI, by Sika Canada Inc., Cambridge, ON
- Approved equivalent.

.10 **Integral Crystalline (Chemical) Waterproofing Admixture**

.1 A non-corrosive integral crystalline waterproofing admixture for incorporation into the concrete, at the dosage recommended in the manufacturer's printed instructions, that generates a non-soluble crystalline formation throughout the pores and capillaries of the concrete.
- Eucon Vandex AM-10 by Euclid Canada Inc., Toronto, ON.
- Kryton Internal Membrane by Kryton Canada Corporation, Vancouver, B.C.
- MasterLife 300D, by BASF
- Penetron Admixture, by Penetron Specialty Products
- Approved equivalent.

.11 **Granular Underbed for Slabs-on-Grade**

20 mm clear limestone, proof rolled for compaction, compacted thickness150 mm under slabs 125 mm or less, 200 mm under thicker slabs (other than raft slab), unless greater thickness is indicated in geotechnical report.

.12 **Curing-Sealing Compound**

Membrane curing compounds, acrylic emulsion, to ASTM C309, type 1; select compound which will not discolour in sunlight for use in such areas.

.1 **Solvent Based**:

- Diamond Clear, by Euclid Canada Inc., Toronto, ON.
- Mapecure Uv, by Mapei Inc., Brampton, ON.
- MasterKure CC 250 SB by BASF
- Sealtight CS-309, by W.R. Meadows of Canada Limited, Milton, ON.
- Approved equivalent.

.2 **Water-Based**:

- Diamond Clear VOX, by Euclid Canada Inc., Toronto, ON.
- Florseal WB 18, by Sika Canada Inc., Mississauga, ON.
- MasterKure CC 200 WB by BASF
- Vocomp-20, by W.R. Meadows of Canada Limited (do not use on coloured concrete).
- Approved equivalent.

.13 **Floor Hardener**

.1 **Metallic Hardener**

Ferrous aggregate premixed with Portland cement and plasticizers.

- Euco-Plate HD, by Euclid Canada Inc., Toronto, ON.
- Masterplate F_F, by BASF
- Approved equivalent.

.2 **Non-Metallic Hardener**

Natural and synthetic materials with Mohs hardness 7 minimum, premixed with Portland cement.

- Surflex, by Euclid Canada Inc., Toronto, ON.
- Diamag 7, by Sika Canada Inc., Mississauga, ON.
- Mastercron F_F, by BASF
- Approved equivalent.

.14 **Sealant**

.1 **Hot-Poured Asphalt**

For use with bituminous type joint filler: rubberized asphalt compound, to OPSS 1212.

- Hi-Spec Hot-Applied Polymeric Pavement Joint Sealant, by W.R. Meadows of Canada Ltd., Milton, ON.
- Sealz No. 6165 Hot Poured Joint Sealant, by Hydrotech Membrane Corporation.
- Approved equivalent.

.2 **Cold Poured Liquid Neoprene**

For use with non-bituminous joint filler.

- Gardox, by W.R. Meadows of Canada Limited, Milton, ON.
- MasterSeal CR 100 by BASF
- Approved equivalent.

.3 **Elastomeric Sealant**

For use with non-bituminous type joint filler.

.1 Multi-component polyurethane, in colour selected by Contract Administrator, to CGSB Specification CGSB 19.24.

For horizontal joints:

- Eucolastic 2SL, by Euclid Canada Inc., Toronto, ON.
- Planiseal Rapid Joint 15, by Mapei Inc., Brampton, ON.
- Sikaflex 2C SL, by Sika Canada Inc., Mississauga, ON.
- Masterseal SL2, by BASF

THC 900, by Tremco Ltd.

-Approved equivalent.

For vertical joints:

- Eucolastic 2NS, by Euclid Canada Inc., Toronto, ON.
- Sikaflex 2C NS EZ Mix, by Sika Canada Inc., Mississauga, ON.
- Masterseal NP2, by BASF
- Dymeric, by Tremco Ltd.
- Approved equivalent.

.2 Or one part urethane, in colour selected by Contract Administrator, to CGSB 19.13.

- Eucolastic SL, by Euclid Canada Inc., Toronto, ON.
- Mapeflex P1, by Mapei Inc., Brampton, ON.
- Sikaflex 1A, by Sika Canada Inc., Mississauga, ON.
- Masterseal SL1, by BASF
- Approved equivalent.

.

.15 **Control Joint Filler**

.1 **Interior Floors**

For control joints in interior floors, approved semi-rigid joint filler, to protect against slab edge breakdown:

- QWIKjoint UVR, by Euclid Canada Inc., Toronto, ON.
- Loadflex, by Sika Canada Inc., Mississauga, ON.
- Planibond JF, by Mapei Inc., Brampton, ON.
- Approved equivalent.

.2 **Exterior Floors**

For control joints in exterior floors left exposed.

Elastomeric sealant as specified above.

.16 **Non-Slip Inserts**

Fine aluminum oxide, standard strips, 6 mm wide , 10 mm deep.

.17 **Penetrant Sealer**

.1 **Solvent Based**

- Baracade Silane 100, by Euclid Canada Inc., Toronto, ON.
- Sikagard SN100, by Sika Canada Inc., Mississauga, ON.
- Approved equivalent.

.2 **VOC Compliant (water based or low VOC)**

- Baracade WB 244, by Euclid Canada Inc., Toronto, ON.
- Planiseal WR40, by Mapei Inc, Brampton, ON.
- Sikagard 740W, by Sika Canada Inc., Mississauga, ON
- MasterProtect H 400 by BASF
- Approved equivalent.

.18 **Curing Blanket**

Micro-Perforated Concrete Curing Cover: to ASTM C171, Table 1.

- Hydrasorb, by Firstline Building Products, Valdosta, Georgia, USA.
- Approved equivalent.

.19 **Torque Controlled Expansion Anchors**

.1 **Expansion Anchor**: Provide expansion anchors of size shown on Drawings, including matching nuts and washers:

.1 For dry locations within the conditioned building envelope:
KWIK Bolt 3 carbon steel zinc plated, by Hilti (Canada) Corporation, Mississauga, ON or approved equivalent.

.2 For wet or high humidity locations or locations exterior to the conditioned building envelope, but not exposed to deicing salt:
KWIK Bolt 3 type 304 stainless steel, by Hilti (Canada) Corporation, Mississauga, ON or approved equivalent.

.3 For locations exposed to chlorides or other corrosive materials:
KWIK Bolt 3 type 316 stainless steel, by Hilti (Canada) Corporation, Mississauga, ON or approved equivalent.

.2 **Sleeve Anchor:** Provide sleeve anchors of size shown on drawings, including matching nuts and washers:

.1 For dry locations within the conditioned building envelope:
HSL3 carbon steel by Hilti (Canada) Corporation, Mississauga, ON or approved equivalent.

.2 For wet or high humidity locations or locations exterior to the conditioned building envelope:
HSL3 stainless steel by Hilti (Canada) Corporation, Mississauga, ON or approved equivalent.

.20 **Adhesive Anchors in Drilled Holes**

.1 Anchor rod: Provide anchor rods of size, type and embedment length shown on Drawings including matching nuts and matching washers.

.2 Reinforcing bar: Provide reinforcing bar as anchor rod where specified on Drawings.

.3 Corrosion protection: Provide corrosion protection specified on Drawings.

.4 Adhesive: Provide the adhesive specified on the Drawings.

2.2 CONCRETE MIXES

.1 **General Requirements**

.1 Ready mix, with 28-days compressive strength as indicated on Drawings and in Specifications.

.2 Normal Density Concrete:

.1 Air dry unit weight: minimum 2300 kg/m^3, reduced proportionally for maximum air content listed in CSA Standard A23.1, Table 4.

.3 Do not replace more than 10 percent of Portland cement with fly ash in concrete that is exposed to view in the finished structure, or in concrete that is of CSA Standard A23.1 Class of Exposure C-XL, C1, C2, C3, C4, F1 or F2.

.4 Design concrete mix in conformance with CSA Standard A23.1, Clause 4.1.2 "Alternatives for specifying concrete", Alternative 1 of Table 5 "Alternative methods for specifying concrete", Table 1 "Definitions of C, F, N, A and S classes of exposure", Table 2 "Requirements of C, F, N, A and S classes of exposure", Table 4 "Requirements for air content categories" and as follows. Provide concrete meeting water/cementing materials ratio and air content of Table 2 in accordance with Class of Exposure specified in following sub-paragraphs, and minimum strength specified on Drawings. Note that concrete designed in accordance with water/cementing materials ratio of Table 2 may yield strength exceeding minimum strength specified on Drawings.

.2 **Class of Exposure**

Provide concrete as follows unless otherwise indicated in Schedule of concrete mixes on Drawings:

.1 Class of Exposure C-1 for reinforced concrete subject to deicing chemical exposure, including but not limited to:
- parking garage structural floors and walls, balustrades and columns adjacent thereto
- footings within parking garages
- other areas subject to deicing chemical exposure.

.2 Class of Exposure C-2 (Suggestion: replace at least 25 percent of the Portland cement with cementitious hydraulic slag, except reduced to 15% replacement in cold weather; up to 40% replacement in hot weather) for unreinforced elements subject to chlorides, including but not limited to:
- pavements, sidewalks, curbs and gutters
- slab-on-grade without reinforcement.

.3 Class of Exposure F-2 (Suggestion: replace at least 25 percent of the Portland cement replaced with cementitious hydraulic slag, except reduced to 15% replacement in cold weather; up to 40% replacement in hot weather) for elements in unheated areas not subject to chlorides, including but not limited to:
- walls and slabs in unheated basements
- exposed exterior beams, columns, walls and slabs

.4 For other elements exposed to freezing and thawing or deicing chemicals, conform to CSA Standard A23.1 for class of exposure.

.5 Interior Concrete, other than specified above, and not exposed to freezing and thawing, deicing chemicals, fertilizers or other corrosive materials: Select water/cementing materials ratio and cementing materials content on basis of strength, workability and finishing requirements.

.3 **Slump**

.1 Slump before addition of high-range (super-plasticizer) or mid-range water reducer, shall be in accordance with the mix design slump.

.2 Slump at delivery on site after addition of water reducers, whether added at plant or on site, shall be in accordance with the specified slump.

.3 The measured slump shall be plus or minus the tolerance for an individual batch, but the average of the slumps for the batches shall be the mix design slump or the specified slump at delivery on site, as applicable, in accordance with CSA Standard A23.1.

.4 Add high-range or mid-range water-reducer, not water, to bring slump to level acceptable to floor finisher for placement.

.4 **Air Entrained Concrete**

.1 Spacing factor for air entrained concrete shall not exceed 230 microns, and no single test shall exceed 260 microns, based on tests on cores drilled from the structure, and on cylinders.

.2 The air content in the hardened concrete shall be at least 3.0 percent.

.5 **Corrosion Inhibitor**

Incorporate corrosion inhibitor specified above, in the reinforced concrete elements where CSA Standard Exposure Class C-XL, C1, C2, C3 or C4 is specified: Provide dosage of 15 litres per cubic metre unless otherwise shown in the schedule of concrete mixes on the Drawings.

.6 **Slabs-on-Grade**

.1 Use type MH (or MHL) cement or replace the type GU (or GUL) cement with a sufficient percentage of cementitious hydraulic slag to obtain equivalent performance to type MH (or MHL) cement. When mean daily temperature is less than 10 deg. C, reduce the Portland cement replacement to 10 percent to 15 percent range. Do not use type MH (or MHL) cement in cold weather if it would result in excessively delayed setting time. For highly polished floors (such as Retro-Plate) do not replace more than 15% of the Portland cement.

.2 Limit shrinkage to not more than 0.040 percent in accordance with CSA Standard A23.1 Clause 8.8.2 “Specifying low-shrinkage concrete”, except limit shrinkage to 0.030 percent for warehouse floors, industrial floors and other floors where 38 mm coarse aggregate is specified.

.3 Use aggregates specified above.

.4 Provide cementing materials content adequate to achieve specified performance requirements and to ensure that floor can be properly finished. Floors shall have an adequately hard surface for the intended use and shall not dust.

.5 Slump at delivery, before addition of super-plasticizer: to meet design mix requirements (suggested 50 mm); add super-plasticizer, not water, to bring slump to level acceptable to floor finisher for placement.

.7 **Insulated Concrete Form (ICF) Walls**

.1 Exposure class F-2 for walls on exterior of building. Refer to Drawings for concrete strength.

.2 150 mm plus or minus 30 mm slump at time of deposit, unless otherwise specified on Drawings.

.8 **Floor Hardeners**

Confirm that concrete mix contains only materials compatible with floor hardener.

.9 **Drilled Caissons**

Provide concrete with adequate slump to be placed in caisson without arching, voids or segregation, generally 150 mm slump.

.10 **Sulphate Exposure**

Provide concrete mix in accordance with Clause 4.1.1.6 “Sulphate attack”, Tables 1 to 3 of CSA Standard A23.1, for concrete subject to sulphate attack, including caissons, and other concrete in contact with soil.

.11 **Concrete Toppings**

Provide topping with minimum 28-days compressive strength of 30 MPa.

.12 **Dry Pack Grout Under Steel Plates and Where Grout Thickness < 75 mm**

Mix one part Portland cement to two parts concrete sand that conforms to CSA Standard A23.1, with only sufficient water that mix will retain its shape when made into ball by hand.

.13 **Dry Pack Grout for Underpinning and Where Grout Thickness ≥ 75 mm**

Mix one part Portland cement, one and one-half (1½) parts concrete sand and two parts of 10 mm pea gravel, with only sufficient water that mix will retain its shape when made into ball by hand.

.14 **Premixed Grout**

Mix with water in accordance with manufacturer's printed instructions.

.1 **Dry Pack Non-Shrink Non-Metallic**

- Dry Pack Grout, by Euclid Canada Inc., Toronto, ON.
- Masterflow 100, by BASF
- M-Bed Standard Premix, by Sika Canada Inc., Mississauga, ON.
- Planigrout 712, by Mapei Inc., Brampton, ON.
- V-3 10K Grout, by W.R. Meadows of Canada Limited, Milton, ON.
- Approved equivalent.

.2 **Flowable Grout**

Non-metallic shrinkage compensating:
- In-Pakt Pre-Mix, by C.C. Chemicals Limited.
- Masterflow 928, by BASF
- NS Grout, by Euclid Canada Inc., Toronto, ON.
- Planigrout 712, by Mapei Inc., Brampton, ON.
- Sika Grout 212HP, by Sika Canada Inc., Mississauga, ON.
- Approved equivalent.

.15 **Cisterns**, **Water Tanks: Walls & Floor**

.1 Limit shrinkage to not more than 0.040% in accordance with CSA Standard A23.1 Clause 8.8.2 “Specifying low-shrinkage concrete”.

.2 Incorporate into the concrete at batch plant, integral crystalline waterproofing admixture specified above.

2.3 EQUIPMENT

.1 **Early-Entry Saw**

High speed dry-cut saw with spring-loaded anti-raveling skid plate, diamond-impregnated blades, up-cutting rotation of the blade to cut aggregate that permits sawcutting within 2 hours of completion of surface finishing operation, without spalling, or raveling of the concrete.
- Soff-Cut, by Husqvarna Construction Products, USA.
- Approved equivalent

3 Execution

3.1 EXAMINATION

.1 Confirm that subgrade of compacted fill conforms to requirements specified for backfilling before placing slab underbed.

.2 Confirm that surfaces on which concrete is to be placed are free of frost and water before placing.

.3 Confirm that reinforcement, dowels, control joints, inserts and all other built-in Work are in place and secured before placing concrete.

3.2 PREPARATION FOR SLABS-ON-GRADE

.1 **Granular Underbed**

.1 Obtain Contract Administrator's written confirmation that prepared subgrade is acceptable for placement of granular underbed.

.2 Place granular underbed over entire area of building and proof roll.

.3 Obtain Contract Administrator's confirmation that thickness, elevation and proof rolling of granular underbed are acceptable.

.4 In small areas not accessible to proof roller, use controlled density fill in lieu of granular.

.2 **Vapour Barrier**

.1 Place polyethylene membrane specified above, on top of prepared granular underbed, lap sides and end joints 150 mm, and "shingle" laps in direction of concrete placing.

.2 Do not use polyethylene sheet under highly polished floor such as Retro-Plate.

.3 Remove foreign materials from underbed and forms before placing concrete.

3.3 PLACING CONCRETE

.1 **Notification**

Notify Contract Administrator at least 24 hours before commencing to place concrete, and 24 hours before wall forms are closed in. Regardless of any requirement of reference standards to inspect all of the Work prior to placing concrete, field review of construction will be in accordance with random sampling program.

.2 **Beams, Girders, Columns**

Place beams, girders, brackets, column capitals and haunches monolithically with floor slab.

.3 **Concrete Placed over Open Web Steel Joists**

Transport and spread concrete over joist construction in a manner to prevent lateral deflection and twisting of joists.

.4 **Concrete Fireproofing**

.1 Encase structural steel members with concrete, where indicated on Drawings or where noted "C.F." on Drawings.

.2 Provide concrete of same strength as adjacent concrete framing. Provide 50 mm minimum cover.

.5 **Future Extension**

Where pockets, chases, anchors, angle irons and other hardware are indicated on Drawings to allow for future lateral extension, grease exposed structural steel Work and fill pockets and chases with 15 MPa concrete.

.6 **Sloping Slabs and Other Sloping Surfaces**

Commence concrete placement at bottom of sloping surfaces.

.7 **Vibration of Concrete Reinforced with Epoxy-Coated Bars**

Use rubber headed vibrators.

.8 **Elephant Trunk Chutes**

Provide elephant trunk chutes for concrete placement heights exceeding 1.5 m.

.9 **Insulated Concrete Forms (ICF)**

.1 Place concrete by boom pump equipped with 102 mm maximum diameter reducer followed by double ninety-degree bend to reduce velocity of concrete entering wall and flap gate at end of the double ninety degrees to keep site clean.

.2 Do not place concrete at greater than 1200 mm of lift per hour.

.3 Terminate a pour at center of longest wall where possible. Do not complete a pour against a buck or corner.

.4 Consolidate concrete by means of hand tamping, rodding and vibrating.

3.4 FLOOR FINISHING

.1 **Floor, Roof, Stair Treads, and Other Slab Surfaces**

.1 Perform finishing operations on plastic concrete surfaces in accordance with CSA Standard A23.1, Clause 7.5 “Finishing and treatment of slab or floor surfaces”, and as specified herein.

.2 Be aware that finishing while bleed water is on surface, or adding water or cement to surface, are causes of scaling and dusting and are strictly forbidden.

.3 Be aware that concrete for this Project may contain supplementary cementing material which may delay concrete set and onset of bleeding.

.4 Refer to Drawings, Schedules, and other sections of Specification, for required finishes and concrete toppings.

.5 Verify with those responsible for Work of other sections, that proposed finish is satisfactory for application of their materials.

.6 Finish floors to match approved sample.

.7 Screed surface to an even, level, or sloped surface, to elevations indicated on Drawings or required for specified finishes and concrete toppings.

.2 **Exposed Floor Surfaces**

Provide hard, smooth, dense, steel troweled surface, free from blemishes, and of uniform appearance.

.3 **Non-Slip Floor Surfaces**

Provide swirl trowel finish, or light broom finish, of texture acceptable to Contract Administrator, unless otherwise specified on Drawings.

.4 **Hardened Floor Finish**

.1 Apply premixed material specified above, prepackaged hardener, to total of 5.0 kg/m² of floor surface.

.2 Apply in two shakes of half total specified amount in each shake; the second shake at right angles to the first.

.3 Finish as specified for "Exposed Floor Surfaces".

.4 Follow manufacturer's special finishing instructions if concrete is air entrained.

.5 **Insulation Board or Built-Up Roofing**

Hand or mechanical float surface to uniform texture, free from hollows, bumps and ridges. Finish to moderately flat classification.

.6 **Control Joints in Slabs-On-Grade**

.1 Use early-entry saw specified above.

.2 Provide sawcutting equipment that is adequate in the number of units and the power to complete sawing in the required time before concrete temperature begins to fall.

.3 Arrange for an ample supply of saw blades and anti-raveling skid plates to be on site before concrete placement begins.

.4 Maintain on site at least one standby unit in good working order.

.5 Replace early-entry saw blades and anti-raveling skid plate as required by manufacturer. Replace anti-raveling plate with every blade change.

.6 Commence sawcutting as soon as concrete can support weight of saw and operator without marring concrete surface and within 2 hours of completion of final finishing in warm weather. Do not wait till next day to commence sawcutting.

.7 Complete sawcutting before final set of concrete.

.8 Unless otherwise shown on Drawings, sawcut control joints along column grid lines and additionally so that spacing does not exceed the following, where “t” is the slab thickness:

.1 Exterior pavement and walks exposed to the atmosphere: 20 t but ≤ 4.6 m.

.2 Interior slabs of unheated buildings (parking garages): 24 t but ≤ 4.6 m.

.3 Interior slabs of heated buildings: 30 t but ≤ 4.6 m.

.9 For slabs placed in longitudinal strips, sawcut transversely in sequence at half, then quarter, then eighth points.

.10 Sawcut 6.4 mm wide to depth of 1/4 of slab thickness and not less than 25.4 mm deep. Sawcut to 1/3 of slab thickness if slab is reinforced with steel fibres.

.11 Use joint protector inserts to prevent corner spalling.

.12 Remove dry powder without disturbing finish.

.13 Avoid traffic across sawcut until concrete gains sufficient strength that joint edges will not be damaged.

.14 For slabs that will be covered with carpet or other materials where slab cracks will not telegraph through the finish, early-entry sawcutting is not required but sawcutting shall commence before concrete temperature starts to fall and within 18 hours of final finishing of floor surface.

.7 **Joint Filler in Slabs-on-Grade Control Joints**

.1 For floors which will be covered with finish materials which conceal joint: clean residue from floor and joint, fill with latex-sand-cement mortar worked into joint, or place fine silica sand in bottom of joint and fill top 12 mm of joint with specified control joint filler to flush top with surface; do not overfill.

.2 For permanently exposed floors: protect, prepare and fill joint in accordance with following sub-paragraphs.

.3 Keep off floor, construction traffic which may erode concrete at edges of sawcuts.

.4 Do not fill joints until as long as possible after placing slab, but in no case less than 90 days.

.5 Arrange for representative of joint filler manufacturer to be present for a period of time at commencement of Work to verify that proper procedures are being employed.

.6 Clean sawcut residue from floor.

.7 Clean residue from joint by power washing with 8 MPa water jet and let dry.

.8 Install joint filler to thoroughly dry surfaces only, at ambient air temperatures above 5 deg. C.

.9 For interior floors, fill joints full depth with semi-rigid epoxy joint filler specified in above; do not overfill.

.10 For floors exterior to building, install closed-cell polyethylene backer rod, of diameter 25 percent greater than joint width, flush with top of floor, to exclude dirt. Immediately prior to filling joint, depress backer rod to bottom of joint and fill with elastomeric sealant specified above; do not overfill.

.11 Cut off any over-pour of filler on adjacent slab surface after filler has hardened.

.12 Immediately prior to handover of building, re-examine joint for separation of filler from slab. Clean separations with compressed air and fill.

.8 **Stair Tread Non-Slip Inserts**

.1 Install non-slip inserts specified above, at each tread and landing; place 40 mm from edge of nosing and extend for full width of nosing except for 80 mm at each end. Refer to Drawings for number of inserts per tread.

.2 Set inserts in prepared grooves, secured with waterproof adhesive and with top set 1 mm above treads.

3.5 FORMED SURFACE FINISHING

.1 Treat formed surfaces in accordance with CSA Standard A23.1, Clauses 7.7.1 “General” and 7.7.2 “Formed surface finishes”, and as additionally specified herein.

.2 Provide "Smooth-Rubbed Finish" in accordance with CSA Standard A23.1, Clause 7.7.4.2 “Smooth rubbed finish”, for formed concrete surfaces which will be exposed to view in building and left unpainted.

.3 Finish vertical surfaces to receive waterproofing membrane smooth with no ridges or depressions.

.4 Finish formed surfaces to receive a hot-applied rubberized asphalt membrane smooth with no ridges or depressions, using "Sack-Rubbed Finish" in accordance with CSA Standard A23.1, Clause 7.7.4.4 “Sack rubbed finish”. Clean surfaces of dust, oil, grease, salt, and loose or spalled material. Repair any honeycombed areas. Remove projecting mortar or concrete fins.

.5 Obtain Contract Administrator's approval of exposed concrete. Regrind or otherwise correct surfaces Contract Administrator has not approved, and to Contract Administrator’s satisfaction.

.6 **Plugs at Recessed Ties**

.1 Clean tie holes to remove all foreign matter.

.2 Coat plugs by dipping in adhesive and insert in hole.

.3 Remove excess adhesive immediately with thinner which will not stain concrete, as recommended by manufacturer.

.7 **Curb Edging**

Finish external corners of curbs rounded and smooth.

.8 **General**

.1 Conform to CSA Standard A23.1, Clause 7.6 “Toppings”, and as additionally specified herein.

.2 Be aware that thickness of topping shown on Drawings is a minimum, and actual thickness will be greater to account for cambers or deflections of supporting floor.

.9 **Placing and Compaction of Topping**

.1 Place each section in one continuous operation.

.2 Take special precautions against plastic shrinkage cracking, whenever rapid drying of the topping may occur, in accordance with CSA Standard A23.1, Clause 7.4.1.2 “Severe drying conditions”.

.10 **Control Joints in Topping**

.1 Provide control joints for topping directly over construction joints in base slab.

.2 In all other respects, comply with sawcut control joint requirements for slabs-on-grade.

3.6 DRILLED-IN ANCHORS

.1 Installers shall be trained by the manufacturer and shall submit copy of manufacturer’s card documentation confirming the training.

.2 Arrange for manufacturer’s technical representative to be present during installation of first few anchors of each type. Submit site reports by manufacturer to Contract Administrator within one week of each visit. Indicate in reports anchor sizes and types installed, locations, and whether installation procedures were in accordance with manufacturer’s printed instructions.

.3 Install anchors in strict accordance with manufacturer’s printed instructions.

.4 Do not drill holes larger in diameter than indicated in manufacturer’s printed instructions.

.5 Provide manufacturer’s standard embedment length into solid concrete, unless otherwise noted on Drawings.

.6 Take special care to:

.1 Drill the specified depth of hole. Measure each and every hole depth drilled.

.2 Blow out dust with hose at bottom of hole, and then clean out hole by brush, repeating the blow out and brush cleaning multiple times in accordance with manufacturer’s instructions. Anchors installed in holes that are not thoroughly

cleaned in strict accordance with manufacturer's instructions will not develop the required strength and are not acceptable.

.3 Put sufficient adhesive in the hole so that it squeezes out all around the perimeter.

.7 Do not cut reinforcement to accommodate anchors.

.8 Relocate anchors, at no additional cost, when obstructions prevent drilling holes to required depth in locations indicated on Drawings.

.9 Obtain Contract Administrator's approval of new location before drilling hole. Fill abandoned holes with specified grout.

.10 Tighten expansion anchors using torque wrench unless finger-tight is indicated on Drawings.

3.7 CURING AND SEALING

.1 Cure concrete in accordance with CSA Standard A23.1, Clause 7.4 "Protection and curing" and as specified herein.

.2 Be aware that proper curing is essential, and failure to cure properly causes scaling, dusting and lack of durability.

.3 **Curing Compound Method**

.1 Use curing and sealing compound specified above except:

.1 On surfaces to receive epoxy or similar paint finish.

.2 On surfaces to which architectural finishes will be adhered, the adhesives for which are incompatible with the curing compound.

.3 Air-entrained concrete for exterior slabs and sidewalks placed between October 1 and April 1.

.4 Parking garage floors and roofs; exterior sidewalks, pavements and curbs; and other finished concrete surfaces that will be exposed to freezing and thawing or deicing chemicals.

.2 Select water-based compound except in colder weather when temperatures are such that manufacturer recommends solvent-based compound.

.3 Verify with manufacturer, compatibility of curing compound with exposure and end use conditions, including but not restricted to exterior exposure, moist environment, coloured concrete, surface hardeners and shakes, adhered finishes, paints and other coatings, texture and slip resistance, and the like.

.4 Apply curing and sealing compound in accordance with manufacturer's instructions, increasing application rate as necessary to cover surface completely.

.4 **Plastic Film Method**

Where curing compound method cannot be used, cure finished floor surfaces not exposed to freezing and thawing or deicing chemicals, as follows, except use "Curing Blanket Method" for parking garage floors and roofs:

.1 Cover with 0.102 mm [4 mil] thick polyethylene sheets, held securely in place.
.2 Lap edges 100 mm minimum and seal laps.
.3 Maintain in place in accordance with CSA Standard A23.1 Tables 2 and 20 for the exposure classification, except not less than 7 days at ≥ 10 deg. C for exposed warehouse and industrial floor surfaces.
(For exposure Class C-XL, C-1, C-2, F-1, S-1 and S-2: 7 days minimum at ≥ 10 deg. C and for the time necessary to attain 70% of the specified strength;
For exposure Class C-3, C-4, F-2 and N (except as noted above for warehouse and industrial floors): 3 days minimum at ≥ 10 deg. C or for the time necessary to attain 40% of the specified strength).

.5 **Curing Blanket Method**
For exterior sidewalks, pavements and curbs; and other finished concrete surfaces that will be exposed to freezing and thawing or deicing chemicals:
.1 Cover with curing blanket specified above and maintain in place in accordance with CSA Standard A23.1 Tables 2 and 20 (7 days minimum at ≥ 10 deg. C. and not less than time to attain 70% of the specified strength).
.2 Wet blanket regularly to maintain in moist condition. Do not allow to dry out.
.3 In warm weather, place soaker hoses on top of curing blanket and turn on periodically to keep curing blanket wet. Assign workers whose responsibility shall be to ensure that covering material used for wet curing does not dry out.
.4 In cold weather, place insulated blankets over curing blanket.

3.8 GROUTING FOR STEEL MEMBERS

.1 Provide and place grout under column base and beam bearing plates as follows:
.1 Co-operate with other trades that supply and set plates.
.2 Dampen concrete surfaces immediately before installing grout.
.3 Install grout in a manner to ensure positive bearing of full area of steel plate.
.4 Use non-shrink and shrinkage-compensating grouts only when grout will be contained against expansion and self- disintegration.

.2 Slope grout beyond edge of plate at 45 degrees.

.3 Provide same environmental protection and curing as specified for concrete.

.4 Do not use flowable grout at beam bearing plates unless otherwise indicated or approved by Contract Administrator.

3.9 CAULKING

.1 **Caulk**
.1 Joints exposed to view in walls and slabs with elastomeric sealant specified in above, in colour selected by Contract Administrator.
.2 Joints not exposed to view in walls with cold poured liquid neoprene sealant specified above.

.3 Joints not exposed to view in slabs with hot poured asphalt specified above, or cold poured liquid neoprene sealant specified in above.

.2 Apply sealant to thoroughly dry surfaces only, at ambient air temperatures above 5 deg. C.

.3 Confirm that preformed joint filler and backer rod are compatible with sealant.

.4 Caulk control joints in slab-on-grade.

.5 Caulk other joints in accordance with following:
- .1 Do not commence joint preparation until concrete is at least 28 days old.
- .2 Thoroughly clean sides of joints with mason's router, or power saw, equipped with double blade where necessary to suit joint width.
- .3 Blow clean with compressed air with oil trap on line, or vacuum clean.
- .4 Install backer rod of diameter 25 percent greater than joint width, and of type recommended by sealant manufacturer to be compatible with sealant. Locate backer rod to provide for sealant depth of one-half joint width, but not less than 12 mm.
- .5 Prime joint if required, as recommended by sealant manufacturer.

3.10 PENETRANT SEALER

.1 Apply penetrant silane sealer specified above, to vertical surfaces, to a height of 1 m above floor, and from top of footing, or bottom of grade beams, to 1 m above slab-on-grade.

.2 Lightly sandblast surfaces to receive penetrant sealer, within 72 hours before applying sealer.

.3 Verify surfaces are dry, and concrete is at least 28 days old, before applying sealer.

.4 Apply at manufacturer's recommended coverage rate.

3.11 FIELD QUALITY CONTROL

.1 Inspection and testing company, retained by the Contractor, shall perform sampling, inspection and testing of concrete Work at Site.

.2 Perform sampling, inspection and testing in accordance with CSA Standard A23.2, and to include:
- .1 Making of standard slump tests.
- .2 Obtaining of three standard specimens for strength tests from each 100 m^3 of concrete, or fraction thereof, of each mix design of concrete placed in any one day.
- .3 Verification that test specimens are stored within an enclosure, maintained at specified temperatures.

.4 Making compression tests of each set of three specimens, one at 7 days and two at 28 days.

.5 Verification of air content of air-entrained concrete.

.1 For CSA Standard A23.1 Class of Exposure C-XL, C-1, C-2 and F-1 test at frequency in accordance with CSA Standard A23.1 Clause 4.4.4.1.1 “Frequency and number of tests”.

.2 Make first test before placing any concrete.

.3 After stable air content has been established, frequency of tests will be determined by Contract Administrator.

.4 For other classes of exposure, test at time of obtaining strength test specimens.

.6 Verification of unit weight of semi-low density concrete by the volumetric method, making one test for each 100 m^3 or portion thereof placed in any one day.

.7 Verification that concrete contains corrosion inhibitor where specified. Periodic review of batch plant records for dosage.

.8 Testing of pullout inserts or cast-in molds specified above.

.9 For parking garages, determine:

.1 Chloride ion content in accordance with CSA Standard A23.2, Test Method 4B.

.2 Air void spacing factor.

.3 **Inspection for Tolerances**

.1 Confirm that concrete Work meets tolerance requirements specified above.

.2 Use the elevation survey records of elevations of soffit form surfaces and finished concrete surfaces specified in Specification section 03 10 00 and this section as basis for judging compliance.

.3 Use 3 m long aluminum straightedge with end sleeper pads to CSA Standard A23.1, to judge compliance with specified slab finish tolerances, except use dipstick equipment where F-number tolerance is specified.

.4 **Slabs-on-Grade**

.1 Monitor on a random basis acceptable to Contract Administrator, that slab is being sawcut before slab temperature starts to fall.

.2 Observe application of curing compound to sample slab, recording rate of application.

.5 **Drilled-in Anchors**

.1 Arrange for inspection and testing company to randomly select and pull test anchors as follows:

.2 5% of each type and size of anchor installed on a weekly basis, but not less than one anchor of each type and size.

.3 Pull test to twice the allowable design tension capacity of the anchor given by the manufacturer.

.4 Submit reports of pull tests to Contract Administrator on weekly basis. Indicate on report each anchor location, test load and mode of failure, if applicable. Notify Contract Administrator immediately if anchor fails pull test.

3.12 DEFECTIVE WORK

.1 Variations in excess of specified tolerances and marked and disfigured surfaces that cannot be repaired by approved methods will be considered defective Work performed under this Specification section.

.2 Replace or modify concrete that is out of place, or does not conform to lines, detail or grade as directed by Contract Administrator.

.3 Replace or repair defectively placed or finished concrete as directed by Contract Administrator.

.4 Testing and replacement of non-compliant concrete in place:

.1 When initial inspection and tests indicate non-compliance with the contract documents, subsequent re-inspection and re-testing shall be performed by the same inspection and testing company at the Contractor's expense.

.2 Contractor shall replace or strengthen deficient concrete Work as directed by Contract Administrator and pay for all testing and related expenses for replaced Work until approved by Contract Administrator.

3.13 CLEANING UP

.1 Remove from building site excess and waste materials, mock-up panels, test areas, and debris resulting from Work of this section. Leave premises in a condition acceptable to Contract Administrator before completion of Work.

− End of Section −

Part 1 General

1.1 RELATED SECTIONS

.1 01 33 00 Submittal Procedures

.2 03 20 00 Concrete Reinforcing

.3 03 30 00 Cast in Place Concrete

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA-A23.1- 94, Concrete Materials and Methods of Concrete Construction.

1.3 PERFORMANCE REQUIREMENTS

.1 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4 PRODUCT DATA

.1 Submit product data in accordance with Specification section 01 33 00 - Submittal Procedures.

.2 Include application instructions for concrete floor treatment.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Specification section 01 74 19 - Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away for children.

.4 Use chemical hardeners that are non-toxic, biodegradable and have zero or low VOC.

.5 Dispose of surplus chemical and finishing materials in accordance with federal, provincial and municipal regulations.

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

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Temporary lighting:

.1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.

.2 Electrical power:

.1 Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

.1 Make the work area watertight protected against rain and detrimental weather conditions.

.4 Temperature:

.1 Maintain ambient temperature of not less than [10] deg C from [7] days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture:

.1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.6 Safety:

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.7 Ventilation:

.1 Arrange for ventilation system to be operated during installation of concrete floor treatment materials. Ventilate area of work as directed by Contract Administrator by use of approved portable supply and exhaust fans.

.2 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 1 - solvent-based, Type 2 - water based, clear colour.

.2 Surface sealers may not be manufactured or formulated with aromatic solvents.

2.2 CURING COMPOUNDS

.1 Select low VOC, water-based, organic-solvent free curing compounds.

2.3 CONCRETE STAINS

.1 Select water-based concrete stains.

2.4 MIXES

.1 Mixing, ratios and application in accordance with manufacturer’s instructions.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that surfaces are ready to receive work and elevations are as indicated on Shop Drawings.

3.2 PREPARATION OF EXISTING SLAB

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges.

.2 Saw cut control joints to CSA-A23.1, 24 hours maximum after placing of concrete.

3.3 APPLICATION

.1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.

.2 Apply floor treatment in accordance with sealer manufacturer's written instructions.

.3 Clean overspray. Clean sealant from adjacent surfaces.

3.4 PROTECTION

.1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

1 GENERAL

1.1 General

.1 All conditions of the Construction Agreement and division 1, general requirements apply to this section.

.2 Execute work to the highest standards of workmanship in the industry by fully trained applicators in strict accordance with the written application instructions from the manufacturer.

1.2 Co-ordination

.1 Co-ordinate work under this section with work of related sections.

1.3 Related Work Specified Elsewhere

.1	Selective Demolition and Removal	Section 02 41 13
.2	Sealants	Section 07 92 00
.3	Overhead Sectional Doors	Section 08 36 00
.4	Painting	Section 09 91 00

1.4 Scope of Work

.1 Supply all labour, plant, tools, equipment and materials necessary to carry out all the local concrete repairs to the existing curbs located between overhead door, as specified and directed by the Contract Administrator.

1.4 Protection

.1 Protect surrounding areas and surfaces from damage during work of this section.

.2 Prevent precipitation and debris from entering openings during work.

1.5 Delivery and Storage

.1 Deliver and store materials to manufacturer's instructions.

.2 Store materials under cover on elevated platforms, protected from weather and construction activities. Do not store materials on roof.

.3 Protect materials from freezing. Materials suspected of having been subjected to freezing are not to be used unless the manufacturer verifies in writing the material has not been damaged.

.4 Deliver and store materials in original packages with labels intact.

.5 Remove and replace damaged, wet or broken materials.

.6 Store materials away from open flame or ignition sources.

1.6 Warranty

.1 The Contractor shall provide a written corporate warranty for a period of two (2) years from the date of substantial completion of the project as certified by the Contract Administrator.

.2 Defective concrete repairs covered under the warranty shall include but not be limited to, debonding of patches from substrate, and cracking. Replacement and repair of defective concrete repairs shall be in accordance with this section.

1.7 Submittals and Design Requirements

.1 The Contractor shall submit to the Contract Administrator, two copies of the CSA W186 certificate for each welder on site a minimum of 5 working days prior to welding.

.2 The Contractor shall submit to the Contract Administrator; three copies of the shoring and formwork design a minimum of 15 working days prior to removal of concrete.

.3 The prepackaged cementitious repair mortar, prepackaged concrete mix or ready mix concrete shall have a minimum compressive strength of 35 MPa.

.4 A minimum tensile bond strength of 1.4 MPa is required at the interface between the new repair materials and the existing concrete.

1.8 Related By-Laws and Standard Specifications

.1 Conform with the requirements of the Ontario Building Code (latest edition) and all amendments and all local, Municipal and Provincial building by-laws and ordinances.

.2 Standard specifications (refer to most recently published standards). Except where modified by this section or the Drawings, the specifications listed below shall govern:

Standard No.	**Title**
CSA - A23.1-14	Concrete Materials and Methods of Construction
CAN/CSA - A23.2-14	Methods of Test for Concrete

CSA - G30.18	Billet Steel Bars for Concrete Reinforcement
CSA - W 186	Welding of Reinforcing Bars in Reinforced Concrete Construction
CSA - A3000	Portland Cement

1.9 Site Review and Testing

.1 Concrete work will be reviewed by the inspection and testing company retained by the Contractor. The Contractor is also required to cooperate with, provide access and samples to the Contract Administrator. The Contractor shall give 24 hours advance notice for inspection and/or testing services. All costs of testing to be paid by the Contractor.

.2 Concrete will be tested in accordance with CSA-A23.1-14 to determine its compliance with the specification.

.3 In-place bond testing may be carried out to evaluate the bond between the existing and new concrete, if required by the Contract Administrator.

.4 Any work not accepted by the Contract Administrator shall be immediately corrected by the Contractor to the Contract Administrator's satisfaction.

.5 Welding inspection of the reinforcing steel will be performed by a certified welding inspector.

2 Products

2.1 Materials

.1 Ready mix concrete (full-depth Edge, through-slab and/or deep delamination repair):

.1 Materials and methods of construction shall be in accordance with CSA Standard CSA-A23.1-14.

.2 Concrete mix design for repairs shall meet the following requirements: (minimum repair depth: 80 mm)

Class of Concrete:	C-1
Water cement: ratio	Maximum 0.40
Aggregate Size:	20 mm
Air Content:	6.5 ± 1.5 percent
Strength:	Minimum of 35.0 MPa at 28 days
Chloride Ion Penetrability:	Maximum 1500 Coulombs @ 56 days

.4 Portland cement shall meet the requirement of CSA Standard A3000, Type GU.

.5 Air entraining admixture shall be Ministry of Transportation, Ontario approved.

.6 Calcium chloride or any admixture containing chloride shall not be used.

.7 Cementitious hydraulic slag shall not exceed 30% replacement by weight of total cementitious materials.

.2 Cement slurry

.1 Materials and methods of construction shall be in accordance with CSA Standard CSA-A23.1-14.

.2 Portland cement shall meet the requirements of CSA Standard A3000, Type GU.

.3 Cement slurry shall consist of Portland cement and water to form a heavy cream consistency.

.4 Calcium chloride or any admixture containing chloride shall not be used.

.3 Top surface and full depth pre-packaged repair material

.1 Top surface and through slab repair mortar shall meet the same requirements as ready mix concrete with the following exceptions:

Aggregate Size: 10 – 12 mm

Air Content: 6 – 9 %

.2 Approved materials are MS-S10 by KPM industries or approved equivalent.

.4 Underside and vertical repair mortar

.1 Underside repair mortar shall be Sikatop 123 Plus as manufactured by Sika Canada Inc., or approved equivalent.

.5 Reinforcing Steel

.1 Reinforcing steel shall be Grade 400W and conforming to the requirements of CSA Standard G30.12-M77 Grade 400W.

2.2 Equipment

.1 Concrete removal: Concrete removal shall be carried out using maximum 7 kg chipping hammers.

.2 Surface preparation

.1 Concrete surface preparation shall be carried by means of sandblasting.

.2 Reinforcing steel shall be sandblasted to SSPC-SP10 near white blast finish.

3 Execution

3.1 Examination

.1 Report to the Contract Administrator in writing any defects or discrepancies. Work shall not be started until unsatisfactory conditions are corrected. Commencement of work implies acceptance of existing conditions and assuming full responsibility for the finished condition of the work.

3.2 Delaminated and Unsound Concrete

.1 Identify all delaminated and/or unsound concrete to be repaired on the top surface, underside and through slab areas of the balconies by hammer-sounding and mark out area with paint or crayon.

.2 Repair type and extents will be confirmed by the Contract Administrator on Site.

3.3 Delamination Removal

.1 Remove all unsound and/or delaminated concrete using maximum 7 kg chipping hammers until sound concrete is reached.

.2 Removal shall extend along all reinforcing bars to the point where the exposed steel is essentially rust-free. Do not extend removal beyond the limits of the repair area except as authorized by the Contract Administrator.

.3 The concrete in the top surface repair areas shall be removed to a uniform depth of 25 mm below the bottom bar of the top layer of reinforcing steel. Concrete removal at the underside of the slab is to extend 25 mm above the top bar of the bottom layer of reinforcing steel. Concrete removal to the slab edge is to be carried out to the full thickness of the slab to a horizontal distance of 300 mm and/or 25 mm beyond the first horizontal reinforcing bar.

.4 The perimeter of the patches shall be sawcut 12 mm. Do not cut into or damage any reinforcing bars.

.5 When concrete removal is complete, all debris shall be removed from the repair areas by suitable means.

3.4 Surface Preparation

.1 The concrete substrate within the repair area shall be sandblasted. Any reinforcing steel that is uncovered shall be sandblasted to remove all loose and fractured concrete.

.2 The reinforcement shall be sandblasted to SSPC-SP10 near white blast finish.

.3 Replace and/or reinforce damaged or severely corroded reinforcement with new bars of the same diameter, length and type including welding as directed by the Contract Administrator.

.4 The repair area shall be patched within 72 hours after sandblasting the steel and repair area. Any mill rust which occurs on the steel during the 72 hour period shall be removed by wire brushing prior to application of the patching materials. Repair areas shall be protected from moisture accumulation which would accelerate corrosion of reinforcing steel.

3.5 Formwork

.1 Design, construct and install suitable formwork at all edge repair and vertical surface repair locations. The formwork for the vertical element repairs shall be 50 mm lower than the top of the repair area in order to allow concrete to be placed into repair area.

.2 Formwork installation shall be reviewed by the Contract Administrator prior to commencement of any concrete placement.

3.6 Concrete Placement

.1 Concrete shall be placed and consolidated in through-slab areas before proceeding with placement of the repair concrete in shallow repairs.

.2 The prepared vertical surfaces shall be thoroughly wetted down with potable water for not less than 1 hour prior to placement of concrete to achieve saturated surface dry (S.S.D.) condition.

.3 Cement slurry shall be brushed onto the S.S.D. existing concrete immediately prior to placement of concrete.

.4 Concrete shall be placed by an approved method and consolidated using pencil vibrators.

.5 No construction joints will be permitted in the concrete repair patches except as authorized by the Contract Administrator.

3.7 Repair Mortar Placement – Top Surface and Vertical Repairs

.1 Wet down thoroughly the prepared surfaces with potable water for a period of not less than one hour prior to placement of repair mortar. Puddles and/or free water shall be blown clear of the repair surface. Substrate shall be saturated dry or damp, prior to application of the repair mortar.

.2 Brush thoroughly some of the repair mortar onto the damp prepared surface to ensure satisfactory bond.

.3 Apply the repair mortar in accordance with manufacturer's instructions when the bond coat has reached initial set.

.4 Finish of repair mortar shall be by steel trowel.

.5 Carry out curing of repair mortar on underside or vertical surfaces using clear liquid curing compound as specified and in accordance with manufacturer's recommendations.

3.8 Concrete Curing

.1 Wet curing shall be carried out in accordance with CSA-A23.1-14, Section 8.8.6 "Curing Requirements"; but not less than 7 days unless approved by the Contract Administrator in writing.

3.9 Cleaning

.1 Remove all surplus materials and debris resulting from the foregoing work, daily as the work proceeds and on completion.

.2 Remove all stains or other adhesive and coatings from all affected surfaces.

END OF SECTION

1 GENERAL

1.1 General

.1 All conditions of the Construction Agreement and division 1, general requirements apply to this section.

.2 All work shall meet the requirements of the 2012 Ontario Building Code and the CAN3-A371 standard, including all amendments up to contract date.

1.2 Co-ordination

.1 Co-ordinate work under this section with work of related sections.

1.3 Related Work Specified Elsewhere

.1	Selective Demolition and Removal	Section 02 41 13
.2	Preformed Metal Cladding	Section 07 42 00
.3	Sheet Metal Roofing	Section 07 61 00
.4	Sheet Metal Flashing & Trim	Section 07 62 00
.5	Sealants	Section 07 92 00

1.4 Scope of Work

.1 Supply all labour, materials and equipment necessary to perform the masonry replacement and repair work specified in Specification section 01 11 00 - Summary of Work, to the full extent of the Drawings and Specifications.

1.5 Source Quality Control

.1 Brick units to meet SW Grade requirements in accordance with CAN/CSA-A82.1-M87 (Reaffirmed 1992) Canadian Standard for Burned Clay Brick.

1.6 Samples

.1 Submit samples in accordance with division 1 Specifications.

.2 Submit samples of the following materials to the Contract Administrator prior to commencing work and in accordance with the work schedule:

.1 Two brick masonry units.

.2 One of each type of masonry tie proposed for use.

.3 Samples shall fully represent the physical and chemical properties of materials and the full range of colour and texture to be supplied.

1.7 Product Delivery, Storage and Handling

.1 Deliver, store and handle materials following manufacturer's instructions.

.2 Deliver materials to job site in dry condition.

.3 Keep materials dry until use, except where wetting of bricks is specified.

.4 Store materials under waterproof covering on elevated platforms protected from construction activity.

.5 Isolate masonry units from contact with ground and other materials to prevent staining.

.6 Handle and store masonry units to prevent soiling and chipping.

.7 Remove and replace damaged or broken materials.

.8 Deliver and store materials in original packages with labels intact.

.9 Do not transport any materials through the building.

1.8 Protection

.1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

.2 Protect masonry and other work from being marked and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.3 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

1.9 Cold Weather Requirements

.1 Adhere the following cold weather requirements while work is in progress:

.1 Air temperature -4 to 4°C - Sand or mixing water shall be heated to a minimum of 20°C and a maximum of 70°C;

.2 Air Temperature -7 to -4°C - Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. Heat shall be provided on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 25 km/h; and

.3 Air Temperature -7°C and Below - Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. Enclosures and auxiliary heat shall be provided to maintain air temperature above 0°C. The temperature of the unit when laid shall be not less than -7°C.

.2 Mortar temperatures shall not exceed 50°C, to avoid flash set.

.3 Heat sand slowly and evenly. Do not use scorched sand, having a reddish cast, in mortar.

.4 After combining heated ingredients maintain temperature of mortar between 5°C and 50°C until used.

.5 Protect mortar from rain and snow.

.6 Maintain dry bed for masonry and use dry masonry units only. Do not wet masonry units in cold weather.

.7 Provide the following cold weather protection for completed work:

.1 Mean daily air temperature 0 to 4^{0}C - masonry shall be protected from rain and snow for 24 hours.

.2 Mean daily air temperature -4 to 0^{0}C - masonry shall be completely covered for 24 hours.

.3 Mean daily air temperature -7 to -4^{0}C - masonry shall be completely covered with insulating blankets for 24 hours.

.4 Mean daily air temperature -7^{0}C and below - masonry temperature shall be maintained above 0^{0}C for 24 hours by enclosure and supplementary heat.

1.10 Hot Weather Requirements

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

1.11 Safety Requirements

.1 Provide a respirator, which may include a single-use respirator, designed for protection against silica exposure. Ensure workers wear the respirator when grinding existing mortar joints.

1.12 Warranty

.1 Submit a written warranty for masonry restoration work specified in this section and as specified in the General Conditions of the Contract for a period of two (2) years from the date of the Certificate for Substantial Performance.

.2 The Contractor shall warrant that the masonry restoration will be free from defects related to workmanship or material deficiencies.

.3 Any repair required under the warranty will be carried out in accordance with the recommendations of the Contract Administrator.

.4 Inspect work of this section 30 days before expiry of warranty and correct defects within 15 days of inspection.

1.13 Reference Standards

.1 CSA Standard A179-M1976, "Mortar and Grout for Unit Masonry"

.2 CAN3-A371-M84, "Masonry Construction for Buildings"

.3 CAN/CSA-482.1 M87 (Reaffirmed 1992) “Burned Clay Brick”

1.14 Measurement for Payment

.1 Payments will be as per the items in Tender Price Form.

.2 Final measurements for payment of all repairs shall be measured and agreed upon by the Contract Administrator and the Contractor prior to commencing removal. The Contractor shall not perform repairs beyond the limits of the repair areas which were agreed upon without prior authorization by the Contract Administrator.

2 Products

2.1 Masonry Units

.1 Brick masonry units: Burned clay brick conforming to CAN3-A82.1-M87 (R2003), SW Grade. size, compressive strength, colour, finish, and texture to match existing.

2.2 Mortar

.1 Portland cement: Type 1, gray and white Portland cement conforming to CAN3-A179-M1976.

.2 Hydrated Lime: Type N, hydrated lime conforming to CAN3-A179-M1976, containing no air entrainment.

.3 Aggregate: Natural sand conforming to CAN3-A179-M1976, colour, size and texture to match existing.

.4 Water: Potable, free of deleterious materials.

.5 Colour pigments: pure, chemically inert, unfading, alkali-fast, inorganic, finely ground purpose made colour pigments for masonry mortars. Colour to match the existing.

.6 Admixtures for the purpose of acceleration, air entraining admixtures, cementitious materials containing air entraining admixtures, calcium chloride or admixtures containing calcium chloride shall not be used.

.7 Frozen materials or materials mixed or coated with ice or frost shall not be used.

2.3 Masonry Accessories

.1 Brick ties: Stainless steel wall tie, such as Helifix as supplied by Helifix North America Corporation, Helico Sprio-Ties as supplied by JV Building Products, or an approved equivalent. Diameter to be 8 mm. Length to suit application. Sample to be reviewed by Contract Administrator.

.2 Weep hole vents: purpose made plastic vent, designed to vent, and drain cavity to exterior such as DA1069 cell-vent as manufactured by Dur-O-Wal Limited or an approved equivalent.

.3 Mortar net: purpose made 10 mm wide to suite cavity thickness, 250 mm high density polyethylene or nylon mesh designed to allow moisture to flow downward to membrane flashing and weep holes, such as "The Mortar Net" as supplied by JV Building Products, or approved equivalent.

2.3 Through Wall Membrane Flashing

.1 Through Wall Membrane flashing: Composite self-adhering membrane comprised of rubberized or modified asphalt and polyethylene such as “Perm-A-Barrier Wall Flashing” as manufactured by W. R. Grace & Co. of Canada Ltd., “Blueskin TWF” as manufactured by The Henry Company, IKO AquaBarrier TWF Through Wall Flashing as manufactured by IKO or an approved equivalent.

.2 Membrane primer: as supplied or recommended by the membrane underlayment manufacturer.

.3 Membrane sealant: as supplied or recommended by the membrane underlayment manufacturer.

.4 Termination Bar: Hot dipped galvanized sheet steel, 3 mm core nominal thickness, Z275 coating designation to ASTM A525M-80, 25 mm wide.

2.4 Anchorage

.1 Fasteners for masonry and concrete substrates: "Tapcon" fasteners with "Climaseal" corrosion resistant finish, as manufactured by Buildex/Red Head, or approved equivalent. Length to suit material thickness.

3 Execution

3.1 Examination

.1 Examine the brick masonry walls to establish areas and quantities of re-pointing, crack repair, and individual brick replacement. Hammer tap the brick masonry units to identify spalled, or otherwise deteriorated brick masonry units.

.2 Agree with the Contract Administrator about those areas which are to be repaired/replaced and mark out the areas as directed by the Contract Administrator.

3.2 General Execution

.1 Carry out work in accordance with CSA standard CAN3-A371-M84.

.2 Inform and allow Contract Administrator to review any unusual or deteriorated construction revealed during work of this section.

3.3 Mortar

.1 Type N Mortar: Mortar proportions by volume to CAN3-A179-M1976.

.2 1 part Portland Cement, 1 part lime, 6 parts sand, colour pigment not to exceed 10 percent of the Portland cement by weight. Mortar to match the colour and texture of the existing mortar.

.3 Mix cementitious material and aggregate in a mechanical batch mixer for a minimum of 3 minutes with an optimum amount of water to produce a workable consistency.

.4 Use and place mortar within 2 hours of the initial mixing. Mortars that have stiffened due to evaporation of water may be tempered by adding water to restore the required consistency.

.5 Mix mortar for re-pointing in the following manner:

.1 Thoroughly mix all ingredients dry.

.2 Re-mix adding only enough water to make an unworkable mix. Mix should retain its form when formed into a ball.

.3 Keep mortar in this dampened condition for 1 hour at 21 degrees C., or 1 1/2 hours at 4 degrees C. and rising.

.4 Add sufficient water to bring mix to proper consistency.

3.4 Brick Masonry Units

.1 Remove only brick approved by the Contract Administrator by means that will not cause further deterioration. Remove to sound brick.

.2 Lay replacement brick masonry, including brick ties as specified.

.3 Build masonry plumb, level and true to line with vertical joints in alignment.

.4 Layout coursing, bond, and joint bricks to match existing. Layout coursing and bond to achieve correct coursing heights. Deviation in joint thickness shall not exceed +/-3 mm.

.5 Install each masonry unit with full mortar coverage on all adjoining ends, backs, and bearing surfaces, as required to provide completely solid bed joints and head joints. Mortar shall not be slushed into joints between units after laying.

.6 Fill collar joint between existing block and new brick with grout as specified in the Specification section.

.7 Except in cold weather, wet clay bricks having an initial rate of absorption exceeding 1 g/min./1000 m^2. Wet to a uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface is dry.

.8 Mix and blend units within each pallet and with other pallets to ensure a uniform blend of colour and texture.

.9 Install brick ties as new brick masonry is being laid between new face brick and existing back-up up wall, in accordance with the brick tie manufacturer' written instructions and as follows:

.1 Spacing of brick ties shall be a maximum of 400 mm vertically and 600 mm horizontally.

.2 Drill a small pilot hole into the back-up concrete block or cast-in-place concrete. Size and depth of pilot hole shall be determined by on site testing performed with the manufacturer's representative.

.3 Check the pull-out load obtained on a minimum of 10% of all masonry ties installed as directed by the Contract Administrator. Additional tests may be required if the required pull-out strengths are not obtained.

.4 "Wet-Set" brick tie in mortar prior to laying the next brick course.

3.5 Through Wall Membrane Flashings

.1 Install a continuous membrane flashing along the base of the masonry walls, and transition to roofing, as indicated on Drawings and in accordance with manufacturer's printed instructions.

.2 Provide prefinished sheet metal drip edge flashing in accordance with Specification section 07 62 00.

.3 Dam membrane flashing at all terminations to ensure masonry cavity drains to the exterior. Turn membrane up at ends a minimum of 150 mm.

.4 Ensure all surfaces are free from frost, dust, grease, oil, loose or spalled material.

.5 Apply primer as per manufacturer's printed instructions. Allow the primer to dry and install membrane flashings on the same day as priming.

.6 Proceed only when weather is favourable. Should installation be undertaken at temperatures below 4°C, consult manufacturer regarding special procedures.

.7 Maintain the recommended minimum sidelap and endlap following the manufacturer's printed instructions.

.8 Roll the membrane immediately after placement to ensure continuous adhesion. The roller to be of the type and size recommended by the manufacturer.

.9 Ensure the continuity of the membrane flashing is maintained at all penetrations and terminations. Apply membrane sealant as required to fill inaccessible gaps following the manufacturer's instructions.

.10 Membrane shall be continuous and shall be fully adhered to back-up wall. Secure top edge of membrane flashing as shown on Drawings.

.11 Provide continuous termination bar along top of membrane flashing where indicated on Drawings. Fasten termination bar to substrate at a minimum of 150 mm on centre.

.12 Apply membrane sealant along top of membrane flashings as indicated on Drawings and in accordance with Specification section 07 92 00.

.13 Protect the membrane from tears or punctures during all operations. Repair membrane as required in a manner approved by the manufacturer and Contract Administrator.

.14 Do not allow membrane flashing to be covered until reviewed and approved by Contract Administrator.

3.7 Re-pointing

.1 Re-point in the following manner the cracked, debonded, eroded or otherwise deteriorated mortar joints in the brick masonry where specified and approved by the Contract Administrator.

.2 Rake out existing mortar to a depth of 19 mm to 25 mm. Remove mortar by means that will not cause damage to adjacent masonry units and mortar joints.

.3 Remove all loosened or disintegrated materials beyond this point.

.4 Wash clean all joints.

.5 Remortar joint by tightly packing the specified mortar into the joints.

.6 Tool mortar to provide a concave joint.

3.9 Adjustment and Cleaning

.1 Daily as the work proceeds and on completion, remove all surplus materials and debris resulting from the foregoing work.

.2 Remove all mortar droppings, or stains from all affected surfaces.

.3 Wash down and brush masonry units to remove mortar and stains. Use only detergents, or proprietary masonry cleaners as recommended by brick manufacturer. Do not use wire brushes for cleaning.

.4 Should specified cleaning methods be insufficient, proceed with other methods only with the approval of the Contract Administrator.

.5 Protect adjacent materials, construction, and finished surfaces from damage while cleaning.

END OF SECTION

1 General

1.1 SUMMARY

.1 General Conditions of the Construction Agreement and division 1, General Requirements, shall govern Work of this section.

1.2 DESCRIPTION

.1 **Relevant Specification Sections**

03 10 00: Concrete Formwork
03 30 00: Cast-In-Place Concrete
05 31 00: Steel Roof Deck
05 50 00: Metal Fabrications

.2 **Co-operation with Work of Other Sections**

Check Drawings and Specifications for requirements of other Specification sections which will affect installation of Work of this section.

.3 **Co-operation with Contract Administrator**

Before commencing Work, review with Contract Administrator, Work performed under this section.

1.3 QUALITY ASSURANCE

.1 **Reference Standards**

The following reference standards shall govern Work of this section, except where they are in conflict with requirements imposed by this specification, in which case the later shall govern. Standards referenced by following standards apply but are not necessarily repeated in following list.

.1 ASTM A108-13, Specification for Steel Bar, Carbon and Alloy, Cold Finished.
.2 ASTM A123 / A123M -15 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
.3 ASTM A153 / A153M - 16 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
.4 ASTM A653/A653M-13, Specification for Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.5 ASTM A1011/A1011M-13, Specification for Steel, Sheet and Strip, Hot-Rolled, Structural Quality.
.6 Canadian Institute of Steel Construction (CISC), Code of Standard Practice, Seventh Edition
.7 CSA S16-09, Design of Steel Structures.
.8 CSA S136-12, Cold Formed Steel Structural Members.
.9 CSA W178.1-08(R2013), Certification of Welding Inspection Organizations.
.10 CSA W178.2-08(R2013), Certification of Welding Inspectors.
.11 SSPC-SP6/NACE No. 3, Structural Steel Painting Council, Commercial Blast Cleaning.

.2 **Qualifications**

.1 Undertake welding only by fabricators certified by Canadian Welding Bureau under CSA Standard W47.1, Division 1 or 2.1.

.2 Connections designed by the Consultant:
Submission of Shop Drawings for connections which have been detailed on Drawings by Consultant shall represent acceptance by Contractor that connection can be executed successfully.

.3 Other connections:

.1 Design of other connections which cannot be selected from standard designs tabulated in CISC Handbook of Steel Construction shall be by a Professional Engineer, licensed in the Province of Ontario, experienced in structural steel connection design.

.2 Consultant will review connection arrangement to verify general conformance with overall design concept of structure.

.3 Connection design engineer shall be insured against professional liability in accordance with Section 74 subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable.

.3 **Design**

.1 **Connections**

.1 Provide bolted or welded connections, unless shown otherwise on Drawings.

.2 Use high strength bolts, except that A307 bolts may be used for connections of roof purlins, bridging, girts and trimmer beams not connecting to columns, unless otherwise noted on Drawings.

.3 Use slip-resistant (friction-type) connections for bolted joints designed to resist reversible forces, except that bolt capacity need not be so limited under seismic force.

.4 Provide tension adjustment hardware at rod type bracing and at flat bar type bracing.

.5 Do not permit connections to encroach on clearance lines required for installation of Work of other Specification sections.

.2 **Beam Connections**

.1 Provide connections adequate to resist reaction of beam, when beam is loaded to maximum flexural capacity under uniformly distributed load, unless reaction or connection detail is shown on Drawings.

.2 Provide flexible beam connections for unrestrained members in accordance with CSA S16, unless shown otherwise on Drawings.

.3 Select connections, wherever possible, from standard designs tabulated in current edition of CISC Handbook of Steel Construction, except that length of beam web angles shall not be less than half the depth of beam, and single angles shall not be used for beams deeper than 600 mm.

.4 Provide direct connections to flanges of spandrel beams (exterior perimeter beams) to restrain twisting.

.5 Do not use fish plate, shear plate or tab connections.

.4 **Tolerances**

.1 Conform to tolerances specified in CSA S16.

.2 In addition to tolerances specified in CSA S16, erect shelf angles and members to which frames of windows, doors and louvres are connected directly and which are attached to steel frame, within a tolerance of plus or minus 3 mm, and with abutting ends of members at same level.

.5 **Random Splicing**

Obtain in writing from Contract Administrator, prior to commencement of Shop Drawings, special requirements that will be imposed as a necessary condition of acceptance of members with randomly located butt welded splices.

.6 **Source Quality Control**

.1 Inspection and testing of materials and shop fabrication of Work of this section, and field quality control specified elsewhere in this section, shall be performed by an independent inspection and testing company retained by the Contractor.

.2 Provide free access for inspectors to all places where Work is being done.

.3 Review provided by inspection and testing company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of inspection and testing company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the specification.

.4 Inspection and testing company shall be certified by Canadian Welding Bureau, in Category 1, Buildings, under CSA W178.1.

.5 Welding inspectors and supervisors shall be certified by Canadian Welding Bureau to CSA W178.2, to minimum level 2 certification.

.6 Inspection and testing company shall carry out shop inspection to verify:

.1 Structural materials and paint conform to the Specifications. Mill test reports, properly correlated to the materials, will be accepted in lieu of physical tests of structural materials.

.2 Fabrication and welding conform to Specifications and dimensioned Shop Drawings.

.3 Shop painting, and cleaning and preparation for same, conform to specified requirements.

.4 Surfaces inaccessible for cleaning and painting after assembly are treated before assembly.

.5 For surfaces painted with zinc-rich paint or zinc primer, specified surface preparation is followed, and specified paint thickness is applied.

.6 Non-destructive testing of welded connections:

Carry out non-destructive testing of welded connections chosen at random as follows:

- 10 percent of moment connections involving use of fillet welds, by magnetic particle inspection.
- All moment connections and all connections in direct tension involving use of full penetration groove welds, by ultrasonic testing.
- Where moments are transferred by either fillet welds or groove welds into end plates in "T" joint configurations, examine base metal for lamellar tearing or cracking, by ultrasonic testing.

1.4 **SUBMITTALS**

.1 **Professional Liability Insurance**

Submit proof of connection design engineer's professional liability insurance coverage specified in elsewhere in this Specification.

.2 **Calculations**

Submit design calculations if requested by Contract Administrator.

.3 **Shop Drawings**

.1 Submit for review typical details of connections and any special connections, before preparation of Shop Drawings.

.2 Professional Engineer responsible for connection design shall sign and seal each Shop Drawing submitted.

.3 Submit erection diagrams and shop details, fully detailed and dimensioned, with complete information necessary so that steel may be fabricated and erected without reference to Drawings.

.4 Do not use Drawings as erection drawings unless written permission is obtained from Contract Administrator.

.5 Include whether snug-tight or pre-tensioned high-strength bolts are to be used, and whether threads are to be excluded from shear plane.

.6 Show splice locations and details.

.7 Submit typical details of connections and any special connections for review before preparation of Shop Drawings.

.8 Prior to submission to Contract Administrator, Contractor shall review all Shop Drawings. By this review, Contractor represents to have determined and verified all field measurements, site conditions, materials, catalogue number and similar data, and to have checked and coordinated each Shop Drawing with the requirements of Work and of contract documents. Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a responsible person. Shop Drawings not reviewed by the Contractor will be rejected.

.9 At time of submission, Contractor shall notify Contract Administrator in writing of any deviations in Shop Drawings from requirements of contract documents.

.10 Contract Administrator will review and return Shop Drawings in accordance with an agreed schedule. Consultant's review will be for conformity to design concept and for general arrangement, and shall not relieve Contractor of responsibility for errors and omissions in Shop Drawings or of responsibility for meeting all requirements of contract documents.

.11 Contractor shall make changes in Shop Drawings which Consultant may require, consistent with contract documents, and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.

.12 Submit Shop Drawings to Contract Administrator for review before any Work commences, in pdf format.

.4 **Paint Performance**

If requested by Contract Administrator, submit paint manufacturer's certification that paint conforms to CISC/CPMA Standard specified.

.5 **Inspection Procedure and Reports**

Inspection and testing company shall:

.1 Submit Inspection Procedure:

Submit to Contract Administrator procedure which shall be followed to verify compliance with the Drawings and Specifications. Include details of any random sampling procedures, general instructions given to inspectors and special instructions pertaining to aspects peculiar to this Project. Submission of this procedure shall not relieve inspection and testing company of responsibility to confirm that completed structural steelwork complies with above requirements.

.2 Submit reports at least weekly when shop and sitework of this section is in progress.

.3 Submit inspection reports in pdf format to the Contract Administrator

.4 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.

.5 Include deficiency list of outstanding items from previous reports, and comment on status.

.6 **Erection Procedures**

.1 Submit to Contract Administrator or regulatory authorities for review, diagrams showing methods of erection proposed, if so directed by Contract Administrator or regulatory authorities.

1.5 **PRODUCT HANDLING**

.1 Deliver Products that are supplied only under Work of this section to trades responsible for their installation, to location they direct, and to meet construction schedule.

.2 Handle and store structural steel so that no damage or corrosion is caused to stored or erected Work, or to other property.

.3 Protect architecturally exposed steel during fabrication, handling, storage and erection to prevent marring of surfaces exposed to view, by marking, bending, denting, or coarse grinding.

2 Products

2.1 **MATERIALS**

.1 Structural steel shall meet LEED requirements and be:

.1 manufactured with a combined recycled content (pre-consumer plus post-consumer) of at least 90%, except for cold formed sections recycled content shall be at least 40%.

.2 manufactured, and its various components extracted, within 800 km of the site if shipped by truck or 2400 km if shipped by rail or boat.

.2 Provide new materials in accordance with Reference Standards, of strength and quality noted on Structural Drawings.

.1 **Cold Formed Channels**

- Fabricate from hot rolled sheet to ASTM A1011/A1011M, Grade 50.

- Fabricate from zinc-coated sheet to ASTM A653/A653M, Structural Quality Grade 50 (345 MPa) Class 1.

.2 **Anchor Bolts:** to ASTM F1554 Grade 36 unless otherwise specified on Drawings, and to typical details on Drawings.

.3 **Studs:** to ASTM A 108.

.3 **Galvanizing**

Hot-dip galvanizing to ASTM A123 and ASTM A153.

.4 **Paint**

.1 Comply with the VOC LEED requirements for paint applied onsite that will end up on the interior of the building weatherproofing system upon Project completion. If applied onsite and used within the weatherproofing system, the VOC limit is 250 g/L. None of the following products meet this requirement and shall not be applied on site if they will end up on the interior of the building weatherproofing system upon project completion. For such cases, submit proposed paint to Contract Administrator for review.

.2 Shop coat paint, for steel that will not receive finish coat: to CISC/CPMA Standard 1-73a, a quick-drying one-coat paint for use on structural steel.

.3 Prime paint: to meet requirements of CISC/CPMA 2-75, a quick-drying primer for use on structural steel.

.4 **Inorganic Zinc Primer**

- Carbo Zinc 11, by StonCor Group, Whitby, ON.
- Dimetcote 9, by Ameron Canada Inc., Oakville, ON.
- Catha-Coat 302HB, by International Devoe, Toronto, ON
- Approved equivalent.

.5 **Zinc-Filled Epoxy Polyamide Primer**

- Carbozinc 859, by StonCor Group, Whitby, ON
- Amercoat 68A, by Ameron Canada Inc., Oakville, ON.
- Catha-Coat 313, by International Devoe, Toronto, ON
- Approved equivalent

.6 **Zinc-Rich Paint - Organic, Ready Mixed**

- ZRC Cold Galvanizing Compound, by ZRC Worldwide, Marshfield, MA. (available in Ontario from Kerry Industries, Scarborough, ON).
- Zinc Clad 5, by Sherwin Williams, Markham, ON.
- Approved equivalent

2.2 FABRICATION

.1 Fabricate Work of this section in accordance with CSA S16, and as specified below.

.2 **Holes**

.1 Punch holes 11 mm to 28 mm diameter as required for attaching the Work of other sections to structural steel members. Locate holes so that no appreciable reduction of strength of members is caused.

.2 Provide holes for pipes and ducts, and reinforce openings as indicated on Drawings. Cutting of holes in structural members in field will not be permitted except with written approval of Contract Administrator.

.3 Provide effective drainage holes to prevent accumulation of water in tubular members.

.3 **Base Plates**

Provide single base plates. Do not use separate leveling plates for columns.

.4 **Welded Studs**

Install in accordance with CSA W59-03, Appendix H.

.5 **Architecturally Exposed Steelwork**

Fabricate and maintain straightness of structural steelwork which will be left exposed to view as finished surface, in accordance with Canadian Institute of Steel Construction (CISC), Code of Standard Practice, Appendix I, Architecturally Exposed Structural Steel, and as follows:

.1 Continuously seal weld connections exposed on exterior of building.

.2 Finish exposed welds smooth and flush with adjacent surfaces.

.3 Remove mill marks, identification, and surface imperfections smooth and flush with adjacent surfaces.

.4 Do not mar surface with grind marks that are clearly visible after painting.

.6 **Cleaning Steel**

.1 Clean steel, whether it is to be painted or not, to the degree required by CISC/CPMA 1-73a, except as specified below.

.2 Clean steel which is specified to be painted to CISC/CPMA 2-75 in accordance with that standard.

.3 Clean steel which is specified to receive an organic zinc-filled epoxy primer, or zinc-rich paint, or inorganic zinc primer, in accordance with SSPC-SP 6, Commercial Blast Cleaning.

.7 **Painting**

.1 Paint interior steel surfaces that are not specified to receive topcoat or zinc primer or zinc-rich paint, with one coat of paint to CISC/CPMA 1-73a.

.2 Prime interior steel surfaces that are specified in Specification section 09 91 00 to be finish painted, and are not specified to receive zinc primer, with one coat of prime paint to CISC/CPMA 2-75.

.3 Prime steel surfaces specified on Drawings to receive inorganic zinc primer or zinc-filled epoxy polyamide primer (products as specified above) with one coat to an average dry film thickness of 65 microns [2.6 mils] and a minimum dry film thickness of 50 microns [2 mils].

.4 Paint steel surfaces exterior to the building vapour barrier and not specified to be galvanized or painted with zinc primer, with two coats of zinc-rich paint specified above, applied to an average dry film thickness of 38 microns [1.50 mils] per coat, and a minimum dry film thickness of 23 microns [0.90 mils] per coat.

.5 Do not paint:

- Surfaces and edges within 50 mm [2"] of field welds.
- Surfaces encased in, or in contact with concrete, including the top flange of beams supporting cast-in-place slabs.
- Surfaces to be spray fireproofed.

.6 Apply paint in accordance with manufacturer's published directions.

.7 Paint steel in shop under cover and keep under cover until paint has dried.

.8 **Galvanizing**

Galvanize lintels, brick support angles, architectural block support angles, as well as other members indicated as galvanized on Drawings, after shop welding is complete.

3 Execution

3.1 EXAMINATION

.1 Verify, before delivery of structural steel, that Work of other Specification sections on which Work of this section is dependent is correctly installed and located.

3.2 PREPARATION

.1 Supply anchor bolts, base and bearing plates and other members to be built in under Work of other sections as Work progresses. Co-operate with installers of this Work and Provide instructions for its setting.

.2 Where new Work connects to existing construction, determine site conditions and dimensions accurately in field. Report any necessary adjustment to Contract Administrator.

3.3 ERECTION

.1 Comply with requirements of reference standards and requirements of regulatory authorities, in erection of Work of this section.

.2 Make adequate provision for horizontal and vertical erection loads and for sufficient temporary bracing, to keep structural frame plumb and in true alignment until completion of erection, and installation of masonry, concrete Work, and floor and roof decks which Provide stability to completed building.

.3 Provide temporary steel members as may be required for erection purposes and remove when no longer required.

.4 **Beam Bearing Plates and Column Base Plates**

.1 Set beam bearing plates and column base plates, at proper elevation, true and level, with steel shims, ready for grouting as specified under Work of other Specification sections.

.5 **Floor Grating**

Provide specified grating and weld at least two bearing bars of each grating panel to every supporting steel beam unless otherwise noted.

.6 Erect architecturally exposed steel in accordance with specified requirements of AISC Code of Standard Practice, Section 10, Architecturally Exposed Structural Steel.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing company, when appointed as specified in source quality control elsewhere in this section, shall perform:
- .1 Inspection of erection and fit-up, including placing, plumbing, leveling and temporary bracing and conformance with specified tolerances.
- .2 Inspection of bolted connections, including verification that A307, A325/A325M snug tight only bolts, and A325/A325M pretensioned bolts have been used appropriately, and that threads are excluded from shear plane where required.
- .3 Inspection of welded joints, including slag removal.
- .4 General inspection of field cutting and alterations; report immediately to Contract Administrator, alterations or cutting not shown on reviewed Shop Drawings.
- .5 General inspection of shop coating touch-up.
- .6 Inspection of zinc primer and zinc-rich paint, including surface preparation and coating thickness.

3.5 COATING TOUCH-UP

.1 Clean welds to remove all residue from electrodes.

.2 After erection is complete, give one coat of touch-up paint to field bolts, field connections, burnt areas, and abrasions or damage to prime coats.
- .1 Use a compatible primer to touch-up 1-73a or 2-75 shop applied primer.
- .2 Use a compatible organic zinc-filled epoxy primer (specified above) to touch-up inorganic or organic zinc primer.
- .3 Use a compatible zinc-rich paint (specified above) to touch-up shop or field applied zinc-rich paint.

.3 Give areas of bare metal on galvanized members two coats of zinc-rich paint.

3.6 DEFECTIVE WORK

.1 Variations in excess of specified tolerances, and failure of materials or workmanship to meet requirements of this Specification, and which cannot be repaired by approved methods, will be considered defective Work performed by this section.

.2 Replace defective Work, as directed by Contract Administrator.

.3 Testing and replacement of non-compliant Work in place:
- .1 When initial inspection and tests indicate non-compliance with the contract documents, subsequent re-inspection and re-testing shall be performed by the same inspection and testing company and any costs shall be borne by the Contractor.
- .2 Contractor shall pay for additional inspection and testing, redesign, corrective measures and related expenses if Work has proven to be deficient.

− End of Section −

1 General

1.1 SUMMARY

.1 General Conditions of the Construction Agreement and division 1, General Requirements, shall govern Work of this section.

1.2 DESCRIPTION

.1 **Related Specifications**

03 10 00: Concrete Formwork
03 30 00: Cast-in-Place Concrete
05 12 00: Structural Steel

.2 **Co-operation with Work of Other Sections**
Check Drawings and Specifications for requirements of other Specification sections which will affect installation of Work of this section.

.3 **Co-operation with Contract Administrator**
Before commencing Work, review with Contract Administrator, Work performed under this section.

1.3 QUALITY ASSURANCE

.1 **Reference Standards & Publications**
The following reference standards shall govern Work of this section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following standards apply but are not necessarily repeated in following list.

.1 CSA S136-12, Cold Formed Steel Structural Members.
.2 CSSBI 10M-13, Standard for Steel Roof Deck, published by Canadian Sheet Steel Building Institute.
.3 ASTM A653/A653M-13 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by Hot-Dip Process.
.4 CSA W178.1-08(R2013), Certification of Welding Inspection Organizations.
.5 CSA W178.2-08(R2013), Certification of Welding Inspectors.
.6 Ontario Building Code, 2012 Edition (OBC).
.7 User's Guide - NBC 2010 Structural Commentaries (Part 4 of Division B)

.2 **Qualifications**

.1 Design of steel roof deck shall be by a Professional Engineer licensed in the Province of Ontario, experienced in steel deck design.
.2 Contract Administrator will review general arrangement to verify general conformance with overall design concept of structure.
.3 Steel deck design engineer shall be insured against professional liability in accordance with Section 74 subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable.

.3 **Design Criteria**

.1 Design roof deck and fasteners in conformance with CSSBI 10M Article 8.6.

.2 Design deck to span continuously over at least 4 supports (3 spans) wherever possible. Avoid single span deck wherever possible.

.3 Design roof deck and fasteners to support the most critical of:

.1 Dead plus live or snow loads shown on Drawings and Specifications, but not less than uniform factored load 3.5 kPa for strength (as per CSSBI 10M Clause 8.6.5);

.2 Concentrated loads stipulated in Ontario Building Code Table 4.1.5.9;

.3 Maximum deflection of 1/240 of the span under uniform unfactored live or snow load shown on Drawings but not less than 1.9 kPa (as per CSSBI 10M Clause 8.6.5).

.4 Design roof deck and fastening, including side lap fastening, for diaphragm action and to resist diaphragm shears shown on Drawings.

.5 Provide fastenings to supports to resist the specified loadings, and at not greater than: 400 mm spacing or 2 flute spacings whichever is the lesser. Provide arc spot welds not less than 20 mm top diameter.

.4 **Suspended Loads**

Do not suspend ceilings, lights, ducts, piping, or any other item from steel roof deck.

.5 **Tolerances**

.1 Upon completion of fabrication, verify that depth of deck is not more than 1 mm under the design depth, and that the cover width of steel roof deck does not exceed design width by more than 10 mm per meter of width.

.2 Lay and position roof deck within a tolerance of plus or minus 12 mm with respect to edges of deck parallel to flutes and centrelines of columns and building exterior lines.

.6 **Source Quality Control**

.1 Inspection and testing of materials and fabrication of Work of this section, and field quality control specified elsewhere in this section, shall be performed by an independent inspection and testing company retained by the Contractor.

.2 Review provided by inspection and testing company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of inspection and testing company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.

.3 Inspection and testing company shall be certified by Canadian Welding Bureau, in Category 1, Buildings, under CSA W178.1.

.4 Welding inspectors and supervisors shall be certified by Canadian Welding Bureau to CSA W178.2.

1.4 **SUBMITTALS**

.1 **Professional Liability Insurance**

Submit proof of design engineer's professional liability insurance coverage specified elsewhere in this Specification.

.2 **Shop Drawings**

.1 Submit erection drawings in accordance with part 3 of Request For Tender, as per division 1 Specifications and as specified below.

.2 Copies of Drawings utilized as erection drawings are not permitted without written permission from the Contract Administrator.

.3 Each Shop Drawing submitted shall bear signature and seal of Professional Engineer responsible for deck design.

.4 Indicate: design loading; thicknesses and steel grade of material; zinc coating designations; layout of units; framing and supports; required minimum bearing; anchorages; size and spacing of fastening to meet uplift and diaphragm action; openings and their reinforcement; accessories; and details of construction, including warping of deck to provide slopes for drainage.

.5 Prior to submission to Contract Administrator, Contractor shall review all Shop Drawings. By this review, Contractor represents to have determined and verified all field measurements, site conditions, materials, catalogue number and similar data, and to have checked and coordinated each shop drawing with requirements of Work and of contract documents. Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a responsible person. Shop Drawings not reviewed by the Contractor will be rejected.

.6 At time of submission, Contractor shall notify Contract Administrator in writing of any deviations in Shop Drawings from requirements of contract documents.

.7 Consultant will review and return Shop Drawings in accordance with an agreed schedule. Consultant's review will be for conformity to design concept and for general arrangement, and shall not relieve Contractor of responsibility for errors or omissions in Shop Drawings or of responsibility for meeting all requirements of contract documents.

.8 Contractor shall make changes in Shop Drawings which Consultant may require, consistent with contract documents, and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.

.9 Show locations of sheet lengths, sheet quantities, thicknesses, metallic coating designations, and all fastening types, sizes and spacing.

.10 Submit Shop Drawings for review before any Work commences, in pdf format, to the Contract Administrator.

.3 **Mechanical Fasteners**

.1 Submit supporting evidence of mechanical fastener capacity to resist uplift, deck diaphragm action, and corrosion.

.2 Submit evidence of mechanical fasteners conformance to Factory Mutual recommendations.

.3 Submit samples of mechanical fasteners.

.4 **Inspection Reports**

Inspection and testing company shall:

.1 Submit reports at least weekly when shop and site Work of this section is in progress.

.2 Submit inspection reports in pdf format to the Contract Administrator

.3 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.

.4 Include deficiency list of outstanding items from previous reports, and comment on status.

1.5 **PRODUCT HANDLING**

.1 Deliver anchors supplied under Work of this section to those responsible for their installation, to place they direct and to meet construction schedule.

.2 Comply with requirements of CSSBI 10M, Clause 8.10. Where storage is necessary, tilt bundles for drainage, block bundles off ground for effective drainage and ventilation, block bundles to prevent sagging, and store away from chemically corrosive substances such as but not limited to salt, cement and fertilizer, away from contaminating materials such as diesel oil, paint and grease, and away from site traffic.

2 Products

2.1 **MATERIALS**

.1 **Sheet Steel**

To ASTM A653/A653M, Grade 230 MPa minimum.
Base steel nominal thickness 0.76 mm or greater, as required to support loads shown on Drawings.
Minimum zinc coating designation ZF75.

.2 Verify that finish or treatment of zinc coated steel coil provided by steel mill is not detrimental to adhesion of paint system specified for steel roof deck in division 9 Specifications.

.3 **Zinc-Rich Paint**

- ZRC Cold Galvanizing Compound, by ZRC Worldwide, Marshfield, MA. (available in Ontario from Kerry Industries, Scarborough, ON).
- Zinc Clad 5, by Sherwin Williams, Markham, ON.
- Approved equivalent.

.4 **Fasteners**

.1 Approved, corrosion resistant, of adequate capacity to resist uplift and diaphragm shear forces when test strengths are evaluated in accordance with procedures adopted by the Steel Deck Institute, St. Louis, Missouri.

2.2 **FABRICATION**

.1 Comply with requirements of CSSBI 10M, Clause 5.

.2 **Reinforcement for Openings**

Provide reinforcement for openings in accordance with CSSBI 10M, Clause 8.7, and as follows, unless heavier reinforcement is shown on the Drawings or specified:

.1 For openings up to 150 mm across the flutes, no reinforcement is necessary if not more than two vertical webs are removed.

.2 For openings exceeding 150 mm but less than 300 mm across the flutes: Provide not less than one 51 x 51 x 6.4 mm steel angle reinforcement to frame across each side of opening in a direction perpendicular to the flutes. Weld angle to at least two flutes on each side of opening. Alternatively, reinforcement shall be provided based on structural analysis of the loads involved.

.3 For openings exceeding 300 mm but less than 450 mm across the flutes: Provide suitable reinforcement based on structural analysis of the loads involved.

3 Execution

3.1 EXAMINATION

.1 Verify and approve alignment and levels of supporting members before laying roof deck. Do not proceed with erection until conditions are made satisfactory.

3.2 ERECTION

.1 Comply with requirements of CSSBI 10M, Clauses 7 and 8.7, and as specified herein.

.2 Fasten deck to supporting structural steel by mechanical fastening or arc spot welding.

.3 Erection Work, including field welding, shall be the responsibility of the steel deck fabricator and shall be carried out by fabricator's erection crews or fabricator's approved erector.

.4 When arc spot welding is used, erect deck only by erectors qualified in accordance with CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures. Perform welding only by welders qualified for deck welding by the Canadian Welding Bureau.

.5 Band and sling employing steel wire rope and choker type sling or multi-lift beams, steel deck being hoisted to the working level.

.6 Place bundles so as to avoid overloading the structure.

.7 Before leaving the site each day:

.1 Align and secure in place all deck sheets.

.2 Secure loose bundles of steel deck sheets.

.3 Lower to ground all loose sheets.

.8 **Cutting and Fitting**

.1 Cut and fit roof deck and accessories around projections through roof.

.2 Make cuts square with neatly trimmed edges.

.9 **Closures**

.1 Install sheet metal closures in flutes where indicated on Drawings and where required to close openings, as at junction of walls and partitions with deck.

.2 Install sheet metal cover plates at changes of deck direction, and at ridges and valleys.

.3 Secure closures and cover plates by either sheet metal screws or welding.

.10 **Side Lap Fastening**

.1 Fasten side laps as required to meet design requirements referenced in this Specification section. In no case shall spacing of side lap fastening exceed 900 mm.'

.11 **Laps and Fastening at Supports**

.1 Fasten deck to supports as required to meet design requirements referenced in this section.

.2 Provide not less than 50 mm end laps, and make end laps only over supports.

3.3 FIELD QUALITY CONTROL

.1 Inspection and testing company, when appointed as specified in source quality control elsewhere in this section, shall perform:

.1 Verification of material thickness, depth and dimensions of profile and zinc coating thickness.

.2 Verification that erection and fastening comply with contract documents.

.3 General inspection of coating touch-up.

.4 Pry tests of roof deck welds to supports.

3.4 COATING TOUCH-UP

.1 After erection, wire brush, clean and paint welded areas, rust spots, and scratched or otherwise damaged areas of zinc coating on deck and shop-applied prime paint on structural members.

.2 Apply two coats of zinc-rich paint to zinc coated areas specified above.

.3 Apply one coat of prime paint to prime painted areas specified above. Verify that touch-up paint is same type as shop coat.

3.5 DEFECTIVE WORK

.1 Variations in excess of specified tolerances and failure of materials or workmanship to meet requirements of this Specification, and which cannot be repaired by approved methods, will be considered defective Work performed by this section.

.2 Replace defective Work, as directed by Contract Administrator.

.3 Replace bent, warped, dented, punctured or weld-perforated deck where exposed to view.

.4 Testing and replacement of non-compliant Work in place:

.1 When initial inspection and tests indicate non-compliance with the contract documents, subsequent re-inspection and re-testing shall be performed by the same inspection and testing company at Contractor's expense.

.2 Contractor shall pay for additional inspection and testing, redesign, corrective measures and related expenses if Work has proven to be deficient.

− End of Section −

Part 1 GENERAL

1.1 General

.1 All conditions of the Construction Agreement and division 1, General Requirements apply to this section.

.2 All work shall meet the requirements of the 2012 Ontario Building Code (OBC), including all amendments.

1.2 Coordination

.1 Co-ordinate work under this section with work of related sections and with the Contract Administrator.

1.3 Related Sections

.1 02 41 13: Selective Site Demolition

.2 03 30 00: Cast-in-place Concrete

.3 07 42 00: Preformed Metal Cladding

1.4 Scope of Work

.1 Supply all labour, materials and equipment required to design, fabricate and install a new galvanized steel framed landing with stairs, guardrails and handrails to meet the requirements outlined in Specification section 01 11 00, Summary of Work.

1.5 Shop Drawings

.1 Prepare and submit Shop Drawings for review by the Contract Administrator.

.2 Amongst other items, show the following: Structural layout, member sizes, identification marks, method of anchorage, number of anchors, connection details, joints, splices, bearing details, holes, finishes, grades of steel, bolts electrodes, accessories, and all other pertinent data and information.

.3 Shop Drawings shall bear the signature and stamp of a qualified professional engineer registered to practice in the Province of Ontario.

.4 Design Requirements:

.1 System description: landing, treads, risers, handrails, guardrails, vertical posts, base plates and anchorage.

.2 Landing and stairs to be supported by the new concrete grade beam of the loading dock exterior wall and concrete piers.

.3 Guardrails and handrails shall have no connection to the exterior wall. Where possible the ends of the top rail are to be connected to a structural element of the building.

.4 Guard rail and handrail geometry to conform to OBC requirements. Handrails to Section 3.4.6.5; and guardrails to Section 3.4.6.6.

.5 Design loads - Guardrails

.1 All design loads for guardrails to conform to OBC 2012 , Section 4.1 “Structural Loads and Procedures”. Wind load is to be considered in combination with all other applicable loads on guards as per Table 4.1.3.2.

.2 Carry out testing on different components of new guardrail systems for static loads and deflection according to CAN3-S157-05.

.3 Load Criteria: The installed railing system shall withstand all loads conforming to OBC 2012, Section 4.1 including load conditions outlined in Table 4.1.3.2.

.6 Design loads - Handrails

.1 All design loads for handrails to conform to OBC 2012, Section 3.4.6.5 (12). Handrails and their supports shall be designed and constructed to withstand the loading values obtained from the non-concurrent application of the following:

.2 A concentrated load not less than 0.9 kN applied at any point and in any direction; and

.3 A uniform load not less than 0.7 kN/m applied in any direction.

.7 Design loads – Stairs and Landing:

.1 Live load of 4.8 kPa plus a snow load of 1.2 kPa, in accordance with the OBC.

1.6 General Requirements

.1 All materials shall be new and in perfect condition, free from defects that may impair strength, durability, performance, or appearance.

.2 Perform welding work in accordance with CSA Standard W59-M1989 unless otherwise specified.

.3 Carry out all welding work by a welder certified to CSA Standard W47.1-92, Certification of Companies for Fusion Welding of Steel Structures.

.4 All steel material to be hot dipped galvanized in accordance with CSA Standard G164-M92.

1.7 Submittals

.1 Submit all product data, technical data and installation instructions (latest edition) on all materials and components to the Contract Administrator for review.

1.8 Field Quality Control

.1 Provide Contract Administrator with date each phase of work will begin, 48 hours before commencing work.

1.9 Protection

.1 Protect the work of this section from damage. Damaged work which cannot be satisfactorily repaired, restored or cleaned, shall be replaced at no cost to the Owner.

.2 Protect surrounding areas and surfaces from damage during work of this section.

1.10 Delivery, Storage & Handling

.1 Deliver, store and handle products and materials following manufacturer's instructions in original packages with labels intact.

.2 Deliver products and materials to the job site in good condition and properly protected against damage to finished surfaces.

.3 Store products and materials in a location and manner to avoid damage. Stacking shall be done in a way that shall prevent bending.

.4 Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes.

.5 Remove and replace damaged or broken materials.

.6 Do not transport any materials through the building.

1.11 References

.1 ASTM A 53-82, Pipe Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.2 CAN/CSA-S16.1-94, Steel Structures for Buildings.

.3 CSA Standard G40.21-98, Structural Quality Steel.

.4 CAN/CGSB-1.40-M89, Primer, Structural Steel, Oil Alkyd Type.

.5 CSA Standard W59-M1989, Welded Steel Construction.

.6 CSA Standard G164-M92, Hot Dipped Galvanizing of Irregularly Shaped Articles

.7 ANSI/NAAMM HMMA MBG 531-17, Metal Bar Grating Manual, 8th Edition.

.8 NAAMM MBG 534-14, Metal Bar Grating Engineering Design Manual.

2 **PRODUCTS**

2.1 Materials

.1 Structural Steel: new stock, conforming to CAN/CSA-G40.21-M92, Grade 300W. All components to be hot dipped galvanized with 600 g/m2 zinc coating to CSA Standard G164-M92 after fabrication.

.2 Welding Materials: to CSA W59-1989.

.3 Fasteners:

.1 Exposed: to match metal anchored.

.2 Non-Exposed: Same as for exposed or may be galvanized steel.

.4 Anchor bolts: Anchor bolts to be stainless steel, HSL Heavy-Duty Anchor as manufactured by Hilti, or approved equivalent.

.5 Bolts, Washers, and Nuts: to ASTM A307-82a.

.6 Rust Inhibitive Primer: ZRC Cold Galvanizing Compound, zinc-rich coating as manufactured by ZRC Worldwide or approved equivalent.

.7 Stair treads, landing: Standard Duty (SD) grading, galvanized, serrated surface, as manufactured by Vulcraft Canada, or approved equivalent.

.1 Treads to have checkered plate nosing.

.2 Grating to be welded to supports.

2.2 Substitutions

.1 Proposals for substitutions of different steel members for those indicated on Drawings will be entertained by the Contract Administrator should availability, scheduling, or similar reasons merit their consideration.

.2 Submit proposals for substitutions to Contract Administrator with reasons for their proposal, and with all supporting design calculations required as evidence that the structure will not be compromised.

.3 Be responsible for all or any additional costs incurred due to substitutions including subsequent review and approval by Contract Administrator.

.4 Do not proceed with work incorporating substitutions without their approval by Contract Administrator.

3 **EXECUTION**

3.1 Examination

.1 Examine all areas before commencing to ensure that work done by other trades is complete and ready to receive work of this section. Report in writing to the Contract Administrator any conditions which adversely affect installation and performance.

.2 Do not commence work until adverse conditions are corrected. Commencement of work shall signify acceptance of existing conditions.

3.2 General Installation

.1 Perform work in accordance with the proposed design and reviewed Shop Drawings.

.2 Review with the Contract Administrator any situation which is ambiguous or unique.

.3 Erect work square, plumb, straight and true, accurately fitted, with tight joints and intersections, as indicated on Drawings and reviewed Shop Drawings.

.4 Weld or bolt field connections to CAN3-S16.2-M84.

.5 Anchor connections to concrete and masonry walls and concrete slabs with specified anchor bolt.

3.3 Steel Fabrication

.1 Build work square, plumb, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Fabricate items from steel unless otherwise noted.

.3 Weld connections where possible, otherwise use bolt connections. Cut-off bolts flush with nuts.

.4 Where possible, fit and shop assemble work, ready for erection.

.5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.6 Touch-up field welds, bolts, burnt or scratched surfaces after completion of erection with zinc rich primer.

3.4 Dissimilar Metals

.1 Apply isolation coating to metal surfaces to be embedded in concrete or mortar joints and in areas where dissimilar metals are in contact.

3.5 Existing Structure

.1 Visit the site and be thoroughly familiar with the structural system in the vicinity of the work. Take field dimensions as required for a proper fitting.

.2 Any damages to existing structural members to be rectified to the Contract Administrator's approval at no additional cost to the Owner.

3.6 Repair of Defective Work

.1 Remove permanently stained, marred, dented or otherwise defective work and replace with products and materials that meet specification requirements.

3.7 Cleaning

.1 Remove all surplus materials and debris resulting from the foregoing work daily as the work proceeds and on completion.

.2 Remove all dirt, stains or other contaminants from all affected surfaces.

END OF SECTION

.1 GENERAL

1.1 GENERAL

.1 All conditions of the Construction Agreement and division 1, General Requirements apply to this section.

.2 All work shall meet the requirements of the 2012 Ontario Building Code and the manufacturer's recommendations, including all amendments up to Project date.

1.2 CO-ORDINATION

.1 Co-ordinate work under this section with work of related sections.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1	Selective Site Demolition	Section 02 41 13
.2	Preformed Metal Cladding:	Section 07 42 00
.3	Sheet Metal Roofing:	Section 07 61 00

1.4 SCOPE OF WORK

.1 Supply all labour, materials and equipment required to provide thermal insulation specified in Specification section 01 11 00, Summary of Work, and to the full extent of the Drawings and Specifications.

1.5 PROTECTION

.1 Protect surrounding areas and surfaces from damage during the work of this section.

1.6 DELIVERY AND STORAGE

.1 Deliver and store materials to manufacturer’s instructions.

.2 Store materials under cover on elevated platforms, protected from weather and construction activities.

.3 Remove and replace wet or damaged materials.

1.7 REFERENCES

.1 CAN/CGSB-51.11-92; Mineral Fibre Thermal Insulation Blanket.

.2 CSA-A101-M1983; Thermal Insulation, Mineral Fibre for Buildings.

.3 CAN/CGSB-51.20-M87, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

2 PRODUCTS

2.1 MATERIALS

.1 Semi-rigid insulation: non-combustible, water repellent semi-rigid mineral wool insulation board such as “CavityRock” as manufactured by ROCKWOOL. or an approved equivalent conforming to CAN/CGSB-51.11-92 and CSA-A101-M1983. Thickness as indicated on Drawings.

.2 Insulation fasteners: Impaling type, perforated 50 mm x 50 mm plate, adhesive backed; spindle length to suit insulation thickness; 25 mm diameter self-locking washer.

.3 Spray applied polyurethane (SPF) insulation: One component low pressure flexible polyurethane spray foam insulating sealant, such as “GREAT STUFF PRO™ Window & Door Insulating Foam Sealant” as manufactured by Dow Chemical Company or an approved equivalent.

3 EXECUTION

3.1 EXAMINATION

.1 Examine site conditions and surfaces to ensure that they are in satisfactory condition for the commencement of the work of this section.

.2 Examine work of other trades for defects and discrepancies and report them in writing. Do not proceed with work until surfaces are satisfactory.

3.2 SEMI - RIGID INSULATION

.1 Install semi-rigid insulation where indicated on Drawings.

.2 Install semi-rigid insulation boards with fasteners at a rate of five fasteners per 600 mm x 1200 mm board. Two fasteners minimum per partial board.

.3 Crush insulation with fastener 10 percent to ensure full contact of insulation board against substrate.

.4 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.5 Fit wall insulation closely around all protrusions or penetrations.

.6 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use largest possible dimensions to reduce number of joints and to reduce the possibility of displacement.

.7 Do not enclose insulation until it has been reviewed and approved by the Contract Administrator.

3.3 Spray Applied Polyurethane (SPF) Insulation

.1 Install the specified spray applied polyurethane (SPF) insulation as per manufacturer's written instructions and indicated on Drawings.

.2 Prepare surfaces as required by foam manufacturer's recommendations.

.3 Trim the foam to provide a neat flush joint.

3.4 CLEANING

.1 Daily as the work proceeds and on completion, remove all surplus materials and debris resulting from the foregoing work.

END OF SECTION

1 **GENERAL**

1.1 General

.1 All conditions of the Construction Agreement and division 1, General Requirements apply to this section.

.2 All work shall meet the requirements of the 2012 Ontario Building Code, the Canadian Sheet Steel Building Institute (CSSBI) Guidelines and the manufacturer's recommendations, including all amendments up to project date.

1.2 Co-ordination

.1 Co-ordinate work under this section with work of related sections.

1.3 Related Sections

.1	Selective Site Demolition:	Section 02 41 13
.2	Masonry Repairs:	Section 04 90 00
.3	Thermal Insulation:	Section 07 21 00
.4	Sheet Metal Roofing:	Section 07 61 00
.5	Sheet Metal Flashing:	Section 07 62 00
.6	Sealants:	Section 07 92 00

1.4 Scope of Work

.1 Supply all materials, labour and equipment required to fabricate and install preformed metal cladding specified in Specification section 01 11 00 and to the full intent of Drawings and Specifications.

1.5 Submittals

.1 Shop Drawings

.1 Submit Shop Drawings to the Contract Administrator showing all components of the metal cladding system and on as large a scale as practical. Shop Drawings shall indicate method of construction, fastening, sealing, anchorage as well as material type, thickness, and finishes.

.2 Show details of connecting work of this section with the existing building and related sections.

.3 Shop Drawings shall bear the signature and stamp of qualified professional engineer registered in Province of Ontario.

.2 Samples

.1 Submit samples to the Contract Administrator of all materials, with their respective finishes, upon award of the contract. Samples shall fully represent the physical and chemical properties of the materials to be supplied.

.2 Submit metal materials 450 mm square for sheet and 450 mm long for rolled materials, indicating colours in range to be furnished.

.3 Manufacturer's Technical Data

.1 Submit all technical data to the Contract Administrator from the manufacturer and have the manufacturer confirm the compatibility of all materials to be used prior to commencing installation.

1.6 Protection

.1 Protect surrounding areas and surfaces from damage during the work of this section.

.2 Prevent precipitation and debris from entering openings during work.

1.7 Delivery and Storage

.1 Deliver and store materials to manufacturer's instructions and CSSBI guidelines.

.2 Protect metal and metal finishes to prevent damage during fabrication, storage, shipping, handling, and installation.

.3 Stack units in manner to prevent racking. Do not remove from crates or other protective covering until ready for installation.

.4 Store materials under cover on elevated platforms, protected from weather and construction activities.

.5 Provide method of lifting or hoisting units into place without causing damage to unit or surrounding surfaces.

.6 Remove and replace damaged units.

1.8 Quality Assurance

.1 Work of this section shall be fabricated by a member of the CSSBI. Furnish evidence of membership upon request.

.2 Work of this section shall be erected by an experienced fabricator or forces approved by the fabricator. Furnish evidence of approval upon request.

.3 Comply with CSSBI Technical Bulletins Volume 7, Nos. 5, 7, 9 and 10, except as specified otherwise.

1.9 Warranty

.1 Provide a written warranty stating that the preformed metal siding will remain free from material or workmanship defects for a period of two (2) years from date of Certificate for Substantial Performance. The warranty shall include all required materials and their application, at no additional cost to the Owner.

.2 Inspect the preformed metal siding 30 days before expiry of warranty and correct defects within 15 days of inspection. This inspection shall be performed at no additional cost to the Owner.

.3 Agree to make good any defects and replace defective units. Replacement to include removal of defective units and installation of replacement units, including removal and replacement of adjacent materials as required to allow for replacement of defective unit.

.4 Carry out repair work required under the warranty in accordance with the recommendation of the Contract Administrator.

1.10 References Standards

.1 ASTM A 525- 91be1 , Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

.2 ASTM A 446 (Latest Edition), "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) By The Hot-Dip Process, Structural (Physical) Quality".

.3 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint

.4 CGSB-93.3: M91, Prefinished Galvanized and Aluminum Zinc Alloy Steel Sheet for Residential Use

2 **PRODUCTS**

2.1 Materials

.1 Preformed metal cladding: Pre-painted galvanized sheet steel to ASTM A525-M80, base metal 0.76 mm (24 gauge) core nominal thickness, hot-dipped galvanized to Z275 Zinc coating designation. Profile to be CL725 as manufactured by Vicwest Inc., or an approved equivalent. Finish to be Stelco's 8,000 series or an approved equivalent. Colour to be approved by the Contract Administrator and/or Owner from manufacturer's standard colour chart.

.2 Steel framing: Z-bars, subgirts, spacers, clips, closures, brackets, and supports to ASTM A446 (latest Edition), Grade A, base metal 1.22 mm core nominal thickness (18 gauge), hot-dipped galvanized to Z275 zinc coating designation. Sizes as indicated on reviewed Shop Drawings.

.3 Zinc rich primer: ZRC Cold Galvanizing Compound, by ZRC Worldwide or an approved equivalent.

.4 Isolation coating: alkali resistant bituminous paint to CAN/CGSB-1.108-M89-Type 2.

.5 Metal Liner: Pre-painted galvanized sheet steel to ASTM A525-M80, base metal 0.76 mm core nominal thickness, hot-dipped galvanized to Z275 Zinc coating designation. Profile to be L-800R Liner by Vicwest Inc., or approved equivalent. Finish to be Stelco's 8,000 series or an approved equivalent. Colour to be approved by the Contract Administrator and/or Owner from manufacturer's standard colour chart.

2.2 Fasteners

.1 Fasteners for masonry and concrete: Tapcon fasteners with "Climaseal" corrosion resistant finish, or an approved equivalent, of sufficient length to provide a minimum 38 mm penetration into substrate.

.2 Fastener for metal siding to supports: "PRISMA Nylon Head Fasteners" as manufactured by Construction Fasteners, Inc., or an approved equivalent. Galvanized or equivalent corrosion resistant finish. Colour of screw head to match metal siding. Size and type to suit application. Contract Administrator to approve sample.

2.3 Fabrication

.1 Design and fabricate steel subgirt anchor framing system to provide support for the metal siding assembly as specified and indicated on Drawings. Avoid dissimilar metal contact wherever possible. Comply with requirements of CAN3-S136-M84 and CAN3-S16.1-M84.

3 **EXECUTION**

3.1 Examination

.1 Examine site conditions and surfaces to ensure that they are in satisfactory condition for the commencement of the work of this section.

.2 Examine the work of other trades for defects and discrepancies and report them in writing. Do not proceed with work until the surfaces are satisfactory.

3.2 General Installation

.1 Perform work in accordance with the Specifications, Drawings, and manufacturer's printed instructions.

.2 Review with the Contract Administrator and/or the manufacturers' technical representative any situation which is ambiguous or unique instructions will be confirmed in writing by the Contract Administrator.

3.3 Erection

.1 Ensure air barrier and insulation have been installed and reviewed by the Contract Administrator prior to enclosing with cladding.

.2 Install supports and preformed metal cladding in accordance with the manufacturer's directions and reviewed Shop Drawings. Profile to be installed in vertical orientation.

.3 Securely install components so that they line up square, in true straight flat or flush planes, plumb and level, free from distortion within reason and to the satisfaction of the Contract Administrator.

.4 Make joints neat and fine as practicable.

.5 Shim framing components as required to compensate for unevenness of existing substrate. Provide additional framing at terminations, openings and penetrations.

.6 Fasten galvanized steel supports with specified fastener to existing concrete block masonry. Fasteners to be installed at a maximum spacing of 450 mm on centre.

.7 Fasten metal siding to the Z-bar supports with the specified fastener(s). Fasteners to be installed at a maximum spacing of 450 mm on centre.

.8 Allow for expansion control in system to compensate for expansion and contraction of building components. Allow for climatic conditions during construction.

.9 Ensure exposed surfaces are free of distortion, twist, waves, and buckles.

.10 Pre-finish all face fasteners, where accepted by the Contract Administrator, to match the colour of the metal cladding or flashings.

3.4 Cleaning

.1 Daily as the work proceeds and on completion, remove all surplus materials and debris resulting from the foregoing work.

.2 Remove all stains and/or droppings of asphalt, caulking or other adhesive from the work of other trades.

END OF SECTION

1 **GENERAL**

1.1 General

.1 All conditions of the Construction Agreement and division 1, General Requirement apply to this section.

.2 All work shall meet the requirements of the 2012 Ontario Building Code, the Canadian Roofing Contractors Association (C.R.C.A.) and the Canadian Sheet Steel Building Institute (CSSBI) Bulletin B9-83, including all amendments up to Project date.

1.2 Coordination

.1 Co-ordinate work under this section with work of related sections.

1.3 Related Sections

.1	Thermal Insulation	Section 07 21 00
.2	Preformed Metal Cladding	Section 07 42 00
.3	Sheet Metal Flashings	Section 07 62 00
.4	Sealants	Section 07 92 00

1.4 Scope of Work

.1 Supply all materials, labour and equipment required to fabricate and install sheet metal roofing system specified in Specification section 01 11 00 and to the full intent of Drawings and Specifications.

1.5 Submittals

.1 Shop Drawings

.1 Submit Shop Drawings to the Contract Administrator showing all components of the metal roofing system and in as large a scale as practical. Shop Drawings shall indicate method of construction, fastening, sealing, anchorage as well as material type, thickness, and finishes.

.2 Show details of connecting the work of this section with the existing building and related sections.

.3 Shop Drawings shall bear the signature and stamp of a qualified professional engineer registered in Province of Ontario.

.4 Test reports for wind uplift requirements for the roofing membrane and/or assembly.

.2 Samples

.1 Submit samples to the Contract Administrator of all materials, with their respective finishes, upon award of the contract. Samples shall fully represent the physical and chemical properties of the materials to be supplied.

.2 Submit metal materials 450 mm square for sheet and 450 mm long for rolled materials, indicating colours in range to be furnished.

.3 Manufacturer's Technical Data

.1 Submit all technical data to the Contract Administrator from the manufacturer and have the manufacturer confirm the compatibility of all materials to be used prior to commencing installation.

1.6 Mock-Up

.1 Construct full size mock-ups of the prefinished sheet metal roofing complete with all flashings for typical condition. Mock-ups to include all typical components, and specified colour.

.2 Locate mock-ups at specific areas designated by the Contract Administrator.

.3 Mock-up will serve for initial review purposes by the Contract Administrator and, when accepted, shall represent the minimum standard for work.

.4 All materials used for mock-up must be in complete accordance with this Specification.

1.7 Protection

.1 Protect the work of this section from damage. Damaged work which cannot be satisfactorily repaired, restored or cleaned, shall be replaced at no additional cost to the Owner.

.2 Protect roof areas or access to work areas with minimum 12.5 mm plywood extending 900 mm beyond area where work is being conducted.

.3 All damage to the roofing system shall be repaired with compatible materials at no additional cost to the Owner.

.4 Carry out work on metal roofing only after completion of membrane underlayment has been reviewed by Contract Administrator.

1.8 Delivery and Storage

.1 Deliver and store materials to manufacturer's instructions and CSSBI guidelines.

.2 Do not store material on roof.

.3 Store materials under cover on elevated platforms, protected from weather and construction activities.

.4 Remove and replaced damaged material.

1.9 Warranty

.1 Provide a written warranty stating that the preformed metal siding will remain free from material or workmanship defects for a period of two (2) years from date of Certificate for Substantial Performance. The warranty shall include all required materials and their application, at no additional cost to the Owner.

.2 Provide all applicable material and material / labour warranties offered by the material manufacturers.

.3 Repair leaks in roofing and flashing within 48 hours of notification.

.4 Defective sheet metal roofing installation covered under the warranty shall include but not be limited to, loss of securement, corrosion, fading of finish, change of colour and staining of adjoining or adjacent materials or surfaces.

.5 Carry out all replacement and repair work during the warranty period as directed by the Contract Administrator and at no additional cost to the Owner.

.6 Inspect the sheet metal roofing installation 30 days before expiry of warranty and correct defects within 15 days of inspection. This inspection and defect rectification shall be performed at no additional cost to the Owner.

1.10 Reference Standards

.1 ASTM A 525M-80, Standard Specification for Sheet Steel, Zinc Coated (Galvanized) by the Hot Dipped Process, General Requirements.

.2 CSSBI Bulletin No. 9, Core and Maintenance of Pre-finished Sheet Steel Building Products, August, 1983.

.3 CSA A123.21, Standard test method for the dynamic wind uplift resistance of membrane-roofing systems.

2 **PRODUCTS**

2.1 Materials

.1 Sheet metal roofing system: Provide materials that are tested to and passed CSA A123.21 criteria. Install in accordance with CSA123.21. Use Tradition 100 Metal Roofing System as manufactured by VicWest Steel Inc. or an approved equivalent. Prepainted galvanized sheet steel to ASTM A525-M80, base metal 0.76 mm core nominal thickness (24 gauge), hot-dipped galvanized to Z275 Zinc coating designation. Finish to be Stelco's 10,000 series or an approved equivalent. Colour to be approved by Contract Administrator and Owner.

.2 Roofing facias and other exposed flashings: as per Section 07 62 00, same material type, colour and gauge as metal roofing panels.

.3 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

.4 Starter strips: Galvanized steel, 0.87 mm (22 ga) core nominal thickness, Z275 zinc coating to ASTM A525M-80. Finish and colour to match prefinished sheet metal where exposed. Starter strips to be continuous.

.5 Isolation coating: alkali resistant bituminous paint.

.6 Fasteners: of same material as sheet metal, of length and diameter suitable for sheet metal roofing application as recommended by membrane material manufacturer.

.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.8 Fasteners for masonry and concrete: Tapcon fasteners with "Climaseal" corrosion resistant finish, or an approved equivalent, of sufficient length to provide a minimum 38 mm penetration into substrate.

.9 Touch-up paint: as recommended by the prefinished sheet metal manufacturer.

2.2 Membrane Underlayment

.1 Self adhering membrane underlayment: Composite self-adh`ering membrane comprised of rubberized or modified asphalt and polyethylene to ASTM D1970 or CSA A123.22 as follows:

.1 Perm-A-Barrier as manufactured by W. R. Grace & Co. of Canada Ltd.,

.2 Blueskin SA as manufactured by the Henry Co.

.3 AquaBarrier AVB as manufactured by IKO Industries.

.4 Sopraseal Stick 1100 T as manufactured by Soprema.

.5 Approved equivalent.

.2 Membrane underlayment primer: as supplied or recommended by the membrane underlayment manufacturer.

.3 Membrane underlayment sealant: as supplied or recommended by the membrane underlayment manufacturer.

2.3 Sheathing

.1 Coverboard: “DensDeck Roof Guard” as manufactured by Georgia Pacific or an approved equivalent. Size to be 1220 mm x 2440 mm. Thickness to be 12.5 mm.

.2 Fasteners: FM Class 1 approved screw and plate type fastener, which is supplied or approved by coverboard manufacturer. Fasteners to be of sufficient length to penetrate steel deck 20 mm +/- 5 mm.

2.4 Fabrication

.1 Break form prefinished sheet metal to form fascia/copings shown on Drawings. End joints where adjacent lengths of metal flashing meet shall be made in accordance with jointing method specified hereinafter.

.2 Use competent mechanics and work accurately on details indicated and as specified herein. Mechanics shall be approved by the metal system supplier.

.3 Hem all exposed edges at least 12 mm for appearance and stiffness. Mitre and form standing seams at the corners.

.4 End joints where adjacent lengths of metal flashing meet shall be made using an "S-lock" joint. This shall be executed by inserting the end of one coping length in a 25 mm deep "S" lock formed in the end of the adjacent length, in a full bed of caulking compound. Concealed portion of the "S" lock shall extend 25 mm outwards and nailed to substrate. Face nailing of joints will not be permitted.

3 **EXECUTION**

3.1 Examination

.1 Examine site conditions and surfaces to ensure that they are in satisfactory condition for the commencement of the work of this section.

.2 Examine work of other trades for defects and discrepancies and report them in writing. Do not proceed with work until surfaces are satisfactory.

3.2 Coverboard

.1 Install coverboard over new metal roof deck as indicated on Drawings.

.2 Locate board edge joints parallel to and on top of deck flutes. Stagger end joints of adjacent lengths of board. Align coverboard edges and ends over gypsum board sheathing at roof edge.

.3 Mechanically fasten the gypsum board sheathing in accordance with Factory Mutual 1-60 wind uplift requirements at a minimum rate of one fastener per 0.4 m^2. Ensure the fastener layout pattern is in accordance with Factory Mutual and Manufacturer's requirements.

.4 Install mechanical fasteners in accordance with manufacturer's printed instructions. Drive fasteners firmly against and flush with surface of coverboard. Locate fasteners no closer than 150 mm from coverboard edges and ends.

3.3 Membrane Underlayment

.1 Install membrane underlayment onto sheathing as indicated on Drawings and as per manufacturer's printed instructions.

.2 Ensure all surface areas are free from frost, dust, grease, oil, loose or spalled material.

.3 Apply primer as per manufacturer's printed instructions. Allow the primer to dry and install membrane on the same day as priming.

.4 Proceed only when weather is favourable. Should installation be undertaken at temperature below 4^{O}C, consult manufacturer regarding special procedures.

.5 Maintain the recommended minimum sidelap and endlap as per the manufacturer's printed instructions.

.6 Roll the membrane immediately after placement to ensure continuous adhesion. The roller to be of the type and size recommended by the manufacturer.

.7 Ensure the continuity of the membrane is maintained at all penetrations and terminations. Apply membrane sealant as required to fill inaccessible gaps following the manufacturer's instructions.

.8 Do not cover the membrane until it is reviewed and approved by the Contract Administrator.

.9 Install in accordance with CSA123.21 for wind uplift requirements.

3.4 Insulation

.1 Install insulation over membrane underlayment as indicated on Drawings and as per Specification section 07 21 00.

3.5 Sheet Metal Roofing Installation

.1 Use concealed fastenings except where approved by Contract Administrator before installation.

.2 Provide underlay where dissimilar metals meet. Secure in place and lap joints a minimum of 100 mm.

.3 Install sheet metal roof panels using cleats spaced as recommended by manufacturer.

.4 Secure cleats with two fasteners each and cover with cleat tabs.

.5 Align transverse seams in adjacent panels.

.6 Flash roof penetrations with material matching roof panels and make watertight.

.7 Form seams in direction of water-flow and make watertight.

.8 Erect panels plumb and true.

.9 Upon completion of installation all panels shall be left free of dirt, grime and scratches.

3.6 Cleaning

.1 Daily as the work proceeds and on completion, remove all surplus materials and debris resulting from the foregoing work.

.2 Remove all stains, caulking or other adhesive from all affected surfaces.

END OF SECTION

1 **GENERAL**

1.1 General

.1 All conditions of the contract and division 1, General Requirement apply to this section.

.2 All work shall meet the requirements of the 2012 Ontario Building Code, CGSB 93.3-M91 Standard, and the Canadian Sheet Steel Building Institute (CSSBI) Bulletin B9-83, including all amendments up to project date, and good building practice.

.3 Execute work to the highest standards of workmanship in the industry, by fully trained sheet metal mechanics.

.4 All materials shall be new and in perfect condition, free from defects which may impair strength, durability, performance, or appearance.

1.2 Coordination

.1 Co-ordinate work under this section with work of related sections.

1.3 Related Work Specified Elsewhere

.1	Selective Site Demolition:	Section 02 41 13
.2	Thermal Insulation:	Section 07 21 00
.3	Preformed Metal Cladding:	Section 07 42 00
.4	Sheet Metal Roofing:	Section 07 61 00
.5	Sealants:	Section 07 92 00

1.4 Scope of Work

.1 Supply all materials, labour and equipment required to fabricate and install sheet metal flashings and membrane underlayment specified in Specification section 01 11 00, Summary of Work, and to the full intent of Drawings and Specifications.

1.5 Protection

.1 Protect the work of this section from damage. Damaged work which cannot be satisfactorily repaired, restored or cleaned, shall be replaced at no additional cost to the Owner.

1.6 Mock-Up

.1 Prior to commencement of work provide a mock-up of roof edge flashing, counter flashing, base drip flashing and corner flashing. Mock-ups to include all typical components, and specified colour.

.2 Locate mock-ups at specific areas designated by the Contract Administrator.

.3 All materials used for mock-up must be in complete accordance with this Specification.

.4 Mock-ups will serve for initial review and testing purposes by the Contract Administrator. The mock-ups shall represent the minimum standard for work when accepted by the Contract Administrator. Mock-up may remain as part of the Work if accepted. All damage to mock-up during the Work, including damage caused by testing shall be repaired to meet the Specifications and as directed by the Contract Administrator.

1.7 Delivery and Storage

.1 Deliver and store materials to manufacturer's instructions and CSSBI guidelines.

.2 Do not store material on roof.

.3 Store materials under cover on elevated platforms, protected from weather and construction activities.

.4 Remove and replaced damaged material.

1.8 Warranty

.1 Provide a written warranty stating that the prefinished sheet metal flashings and trim will remain free from material or workmanship defects for a period of Two (2) years from date of Substantial Performance as certified by the Contract Administrator. The warranty shall include all required materials and their installation.

.2 Provide all applicable material and material / labour warranties offered by the material manufacturers.

.3 Defective sheet metal installation covered under the warranty shall include but not be limited to, loss of securement, corrosion, fading of finish, change of colour and staining of adjoining or adjacent materials or surfaces.

.4 Carry out all replacement and repair work during the warranty period as directed by the Contract Administrator and at no additional cost to the Owner.

.5 Inspect the sheet metal flashing installation 30 days before expiry of warranty and correct defects within 15 days of inspection. This inspection and defects rectification shall be performed at no additional cost to the Owner.

.6 The cost of all warranties are deemed to be included in the contract price.

1.9 References

.1 A653/A653M-20, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian Sheet Steel Building Institute (CSSBI) Bulletin No. 9, Core and Maintenance of Pre-finished Sheet Steel Building Products, August, 1983.

2 PRODUCTS

2.1 Materials

.1 Prefinished sheet metal: Galvanized steel, 0.71 mm (24 ga) core nominal thickness, Z275 zinc coating to ASTM A525M-80. Finish to be factory applied silicone modified polyester to meet the following:

.1 Class F1S.

.2 Colour to match existing and to be selected by Contract Administrator and Owner from manufacturer's standard range.

.3 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.

.4 Coating thickness: not less than 20 micrometres.

.5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5units or less and erosion rate less than 20 % to ASTM D822 as follows:

.1 Outdoor exposure period 1,000 hours.

.2 Humidity resistance exposure period 1,000 hours.

.3 Continuous cleat: Galvanized steel, 0.87 mm (22 ga) core nominal thickness, Z275 zinc coating to ASTM A525M-80. Finish and colour to match prefinished sheet metal where exposed. Cleats to be continuous.

.4 Banding strip / termination bar: hot dipped galvanized sheet steel, 3 mm core nominal thickness, Z275 coating designation to ASTM A525M-80, 25 mm wide.

.5 Isolation coating: alkali resistant bituminous paint.

.6 Touch-up paint: as recommended by the prefinished sheet metal manufacturer.

.7 Nails: to CSA B111-1974, hot dipped galvanized steel flat head roofing nails of length and thickness to suit application.

.8 Fasteners for masonry and concrete: Screw type fastener with corrosion resistant finish, diameter to suit application and of sufficient length to provide a minimum 38 mm penetration into substrate. Acceptable products are: Tapcon fasteners by Buildex, Kwik-Con by Hilti, Cobratap Concrete Screws by Cobra, or an approved equivalent.

.9 Fasteners: Galvanized steel, Purpose made screw type fastener of galvanized steel, stainless steel, or copper, same material and finish as flashing metal. Provide integral colour matched screw head for exposed fasteners. Size and type to suit application. Contract Administrator to approve sample.

2.2 Membrane Underlayment

.1 Self adhering membrane underlayment: Composite self-adhering membrane comprised of rubberized or modified asphalt and polyethylene to ASTM D1970 or CSA A123.22 as follows:

.1 Perm-A-Barrier as manufactured by W. R. Grace & Co. of Canada Ltd.,

.2 Blueskin SA as manufactured by the Henry Co.

.3 AquaBarrier AVB as manufactured by IKO Industries.

.4 Sopraseal Stick 1100 T as manufactured by Soprema.

.5 Approved equivalent.

.2 Membrane underlayment primer: as supplied or recommended by the membrane underlayment manufacturer.

.3 Membrane underlayment sealant: as supplied or recommended by the membrane underlayment manufacturer.

2.3 Expansion Joint

.1 Flexible membrane expansion joint: RedLINE 40 by Situra Inc. or an approved equivalent.

2.4 Fabrication - General

.1 Confirm all site measurements prior to fabrication.

.2 Fabricate flashings as indicated on Drawings and to suit site conditions. Mock-up to be utilized to verify components.

.3 Fabricate cap flashings, starter strips, and base counter flashings less than 300 mm in height in 2400 mm maximum lengths. Form counter flashings between 300 mm and 600 mm in height in 1200 mm maximum lengths.

.4 Use competent workers and work accurately to details indicated and as herein specified.

.5 Provide an "S-Lock" joint at all end joints, unless otherwise specified. Mitre and form standing seams at all corners. Make allowance for movement at joints. Hem all exposed edges at least 12 mm for appearance and stiffness.

.6 Form sections square, true, and accurate to size, free from distortion, oil canning and other defects detrimental to appearance or performance.

.7 Apply isolation coating to metal surfaces to be embedded in concrete or mortar joints.

3 **EXECUTION**

3.1 Site Examination

.1 Examine site conditions and surfaces to ensure that they are in satisfactory condition for the commencement of the work of this section.

.2 Examine work of other trades for defects and discrepancies and report them in writing. Do not proceed with work until unsatisfactory conditions are corrected by the Contractor and receipt of written approval to proceed from Contract Administrator. Commencement of work implies acceptance of existing conditions and assuming full responsibility for the finished condition of the work as specified herein.

3.2 Installation

.1 Install flashings and other miscellaneous sheet metal work as detailed on Drawings.

.2 Do not use exposed fasteners unless approved before installation or where shown on Drawings.

.3 Provide self-adhering membrane underlayment beneath sheet metal flashings where indicated on Drawings. Install self-adhering membrane in accordance with this section.

.4 Provide continuous starter strips where indicated or required to present a true, non-waving, leading edge. Fasten starter strips to substrate at a minimum of 300 mm on centre.

.5 Face nailing of joints will not be permitted.

.6 Install the membrane expansion joint as per the manufacturer’s instructions.

3.3 Membrane Underlayment

.1 Install membrane underlayment under sheet metal flashings as indicated on Drawings and as per manufacturer's printed instructions.

.2 Ensure all surface areas are free from frost, dust, grease, oil, loose or spalled material.

.3 Apply primer as per manufacturer's printed instructions. Allow the primer to dry and install air barrier membrane on the same day as priming.

.4 Proceed only when weather is favourable. Should installation be undertaken at temperature below 4°C, consult manufacturer regarding special procedures.

.5 Maintain the recommended minimum sidelap and endlap as per the manufacturer's printed instructions.

.6 Roll the membrane underlayment immediately after placement to ensure continuous adhesion. The roller to be of the type and size recommended by the manufacturer.

.7 Ensure the continuity of the membrane underlayment is maintained at all penetrations and terminations. Apply membrane sealant as required to fill inaccessible gaps following the manufacturer's instructions.

.8 Do not cover the membrane underlayment until it is reviewed and approved by the Contract Administrator.

3.4 Flexible Membrane Expansion Joint

.1 Install flexible membrane expansion joint under at expansion joint locations as indicated on Drawings and as per manufacturer's printed instructions.

.2 Ensure all surface areas are free from frost, dust, grease, oil, loose or spalled material.

.3 Secure both sides of the expansion joint with a termination bar fastened with screw fasteners at 200 mm on centre.

3.5 Cleaning

.1 Daily as the work proceeds and on completion, remove all surplus materials and debris resulting from the foregoing work.

.2 Remove all stains, caulking or other adhesive from all affected surfaces.

END OF SECTION

1 **GENERAL**

1.1 GENERAL

.1 All conditions of the Construction Agreement and division 1, General Requirements apply to this section.

.2 All work shall meet the requirements of the 2012 Ontario Building Code, and the manufacturer's recommendations, including all amendments up to Project date, and good building practice.

.3 Execute work to the highest standards of workmanship in the industry, by fully trained applicators in strict accordance with the printed directions of the manufacturer of sealant to be used.

.4 All materials shall be new and in perfect condition, free from defects which may impair strength, durability, performance, or appearance.

1.2 COORDINATION

.1 Coordinate work under this section with work of related sections.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1	Masonry Repairs	Section 04 90 00
.2	Preformed Metal Cladding	Section 07 42 00
.3	Sheet Metal Roofing	Section 07 61 00
.4	Sheet Metal Flashing	Section 07 62 00
.5	Overhead Sectional Doors	Section 08 36 00

1.4 SCOPE OF WORK

.1 Supply all labour, materials, plant and equipment necessary for the application of sealants specified in Specification section 01 11 00, Summary of Work and to the full extent of the Drawings and Specifications.

1.5 JOB CONDITIONS

.1 Before commencing work each day, ensure that all surfaces to receive primer or sealant are clean and dry.

.2 Apply sealants at air and substrate temperatures not less than the minimum recommended by the material manufacturer. Work shall not be carried out during inclement weather conditions.

1.6 PROTECTION

.1 Protect surrounding areas and surfaces from damage during work of this section.

.2 Prevent precipitation and debris from entering openings during work.

1.7 DELIVERY AND STORAGE

.1 Deliver and store materials to manufacturer's instructions.

.2 Store materials under cover on elevated platforms, protected from weather and construction activities. Do not store materials on roof.

.3 Protect materials from freezing. Materials suspected of having been subjected to freezing are not to be used unless the manufacturer verifies in writing the material has not been damaged.

.4 Deliver and store materials in original packages with labels intact.

.5 Remove and replace damaged, wet or broken materials.

.6 Store materials away from open flame or ignition sources.

1.8 WARRANTY

.1 Submit a written warranty for sealant installations specified in this section covering a period of two (2) years from date of Substantial Performance as certified by the Contract Administrator, including materials and application.

.2 Inspect the sealants 30 days before expiry of warranty and correct defects within 15 days of inspection. This inspection shall be performed at no additional cost to the Owner.

.3 Defective joint sealant installation covered under the warranty shall include but not be limited to, joint leakage, hardening, cracking, crumbling, melting, bubbling, shrinkage, running, sagging, change of colour, loss of adhesion, loss of cohesion and staining of

adjoining or adjacent materials on surfaces. Replacement and repair of defective sealants shall be in accordance with this section.

.4 Repair leaks into building or wall assembly within 24 hours of notification. Repair any damage to the building / wall assemblies resulting from the leakage at no additional cost to the Owner.

.5 The cost of all warranties are deemed to be included in the contract price.

1.9 SUBMITTALS

.1 Submit manufacturer's specification data sheet for all products to be used.

.2 Submit manufacturer's standard colour chart for sealants.

1.10 CLOSEOUT SUBMITTALS

.1 Record documentation: In accordance with Specification section 01 78 00 - Closeout Submittals.

.1 List materials used in the sealant work.

.2 Warranty: Submit warranty documents specified.

1.11 REFERENCES

.1 CAN/CGSB 19.13-M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing;

.2 ASTM C920, Standard Specification for Elastomeric Joint Sealants.

1.12 QUALITY ASSURANCE

.1 Contractor qualifications: Seal joints specified in this section by a Contractor/Subcontractor approved by the manufacturer of sealants incorporated; who has adequate equipment for the Project, and skilled tradesmen to perform it expeditiously; and is known to have been responsible for satisfactory installations similar to that specified during the period of at least the immediate past five years.

2 PRODUCTS

2.1 MATERIALS

.1 Compatibility: All materials in a sealant system shall be compatible with each other and with the substrate.

.2 Sealant: Neutral cure silicone-based sealant to CAN/CGSB 19.13-M87 and ASTM C920 Type S, Grade Ns, Class 50. Colour to match adjacent cladding, roofing or sheet metal flashing, as per manufacturer recommendations, and to be approved by the Contract Administrator and Owner. Acceptable products:

.1 "Dowsil 795" as manufactured by Dow;

.2 "SilPruf NB SCS9000 Non-Staining Silicone Weatherproofing Sealant" as manufactured by Momentive Performance Materials;

.3 "Spectrum 2" as manufactured by Tremco Ltd.;

.4 or approved equivalent.

.3 Metal Liner – Concealed joints:

.1 Butyl sealant: a blend of butyl rubber and polyisobutylene. Conforming to ASTM C1311 and CAN/CGSB 19-GP-14M. Acceptable products:

.1 "Butyl Sealant" as manufactured by Tremco Ltd.;

.2 or approved equivalent.

.4 Primer: As recommended by the sealant manufacturer to assure adhesion of compound and to prevent staining of substrate materials.

.5 Joint backing: Polyethylene, urethane, neoprene or vinyl, extruded foam recommended by the sealant manufacturer. Circular shape with diameter 25 percent greater than joint width before installation.

.6 Bond Breaker Tape: 3M 226, 3M 481, 3M 710 as manufactured by 3M Corp., or an approved equivalent supplied or recommended by the sealant manufacturer.

.7 Solvent cleaner: Xylol or an approved equivalent recommended by sealant manufacturer.

.8 Isopropyl alcohol solution: 50% isopropyl alcohol and 50% potable water.

3 EXECUTION

3.1 SITE EXAMINATION

.1 Examine site conditions and surfaces to ensure that they are in satisfactory condition for the commencement of the work of this section. Examine sealant substrates for:

.1 Defects of coatings on the substrate that will adversely affect the execution and quality of work.

.2 Deviations beyond allowable tolerances for installation of sealants.

.2 Examine work of other trades for defects and discrepancies and report them in writing. Do not proceed with work until unsatisfactory conditions are corrected by the Contractor and receipt of written approval to proceed from Contract Administrator. Commencement of work implies acceptance of existing conditions and assuming full responsibility for the finished condition of the work as specified herein.

.3 Verify, before commencing work, that the joint size, depth and substrate will not adversely affect execution, performance or quality of completed work; and that the joints can be sealed in an acceptable condition by means of preparation specified in this section.

.4 Verify site conditions and methods of surface preparation, backing, priming and sealant application together with sealant manufacturer's representative and the Contract Administrator.

.5 Perform field adhesion test for sealant application in the presence of the sealant manufacturer’s representative and the Contract Administrator.

.6 Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.

3.2 GENERAL APPLICATION

.1 Perform work as specified and in accordance the manufacturers' printed instructions.

.2 Where manufacturers' printed instructions are not available, or a situation is ambiguous or unique, consult the manufacturer's technical representative and the Contract Administrator to review the situation and make clarifications. Instructions will be confirmed in writing by the Contract Administrator.

3.3 SURFACE PREPARATION

.1 Perform surface preparation work as per the following specification requirements and in accordance with the manufacturer's latest instructions. Use method of surface preparation suitable for substrate, as recommended by sealant manufacturer, and which does not damage the joint substrate or adjacent surfaces.

.2 Remove all accumulated dirt and debris by brushing, scrubbing, scraping, and / or grinding. Remove loose dirt and debris with industrial vacuum or compressed air.

.3 Masonry or other porous joint surfaces:

.1 Abrade joint substrate by grinding, mechanical abrading, brushing or a combination of these methods.

.2 Remove remaining dust or loose particles with a stiff brush, vacuuming or blowing with oil-free compressed air.

.3 Clean dirty surfaces with the “two cloth” cleaning method. Apply solvent cleaner to clean, soft, absorbent and lint free cloth and wipe surface to remove dirt. Rotate cloth to rewipe surface until no additional dirt is picked up. Immediately wipe surface with second clean, soft, absorbent and lint free cloth. Allow solvent to evaporate dry prior to installing primer, backer rod or sealant.

.4 Ensure joint interfaces are free of form release agents or retarders, or test substrates on the job for compatibility.

.4 Mask all surfaces adjacent to joints with masking tape or other suitable material approved by the Contract Administrator to avoid excess primer or sealant on surfaces.

.5 Prime surfaces to receive sealants to provide a positive and permanent adhesion and to prevent staining. Prime surfaces prior to installing backing material or bond breaking tape. Apply primers per manufacturer's written instructions and test substrates for adhesion in the presence of the Contract Administrator and manufacturer’s representative.

.6 Do not apply sealants until joint substrates follow the sealant manufacturer written instructions, and as otherwise specified.

3.4 JOINT BACKING

.1 Install backing material in all joints after applying sealant primer and prior to applying sealants. Install backing material to provide a sealant joint which meets the depth requirements recommended by the sealant manufacturer.

.2 Select the diameter of the backing material to allow for 25% compression of the backing material when inserted into the joint.

.3 Apply bond breaker tape, prior to applying sealant, where joints are of insufficient size to install backing material or where recommended by the sealant manufacturer or Contract Administrator. The use of bond breaker tape is required to prevent three (3) sided adhesion. Ensure bond surface area meets the minimum required size recommended by the sealant manufacturer.

3.5 SEALANT APPLICATION

.1 Apply sealants where specified, indicated on Drawings and as required to create air tight and water tight assemblies. Apply sealant in compliance with sealant manufacturer's latest instructions. Provide these instructions to the Contract Administrator prior to commencement of work.

.2 Apply sealant with a sealant gun with proper sized nozzles.

.3 Fill joints completely with sealant to required depths. Use sufficient pressure to fill all voids and joints. Sealant shall bond to both sides of the joints but not to backing material. Where required on aggregate surface precast, apply an initial bead of sealant to fill space between aggregate.

.4 Ensure surface of sealant is smooth and free from ridges, wrinkles, air pockets and embedded impurities.

.5 Tool joints to a slightly concave surface. Tool joints in 2 directions to eliminate air pockets or voids and to provide a smooth, neat-appearing finish with intimate contact to joint substrates.

.6 Remove masking and sealant smears and droppings resulting from work of this section as the work progresses and before it has set. Use sealant manufacturer's recommended cleaners as required.

3.6 CLEANING

.1 Remove all surplus materials and debris resulting from the foregoing work, daily as the work proceeds and on completion.

.2 Remove all stains, sealants or other adhesive and coatings from all affected surfaces.

END OF SECTION

1 GENERAL

1.1 General

.1 All conditions of the Contract and Division 1, General Requirements Apply to this section.

1.2 Co-ordination

.1 Co-ordinate Work under this section with Work of related sections.

1.3 Related Sections

.1	Summary of Work	Section 01 11 00
.2	Preformed Metal Cladding	Section 07 42 00
.3	Sealants	Section 07 92 00
.4	Painting	Section 09 91 00

1.4 Scope of Work

.1 Supply all materials, labour and equipment required to provide hollow metal doors, frames and hardware specified in Specification section 01 11 00, Summary of Work, and to the full extent of Drawings and Specifications. Paint the interior and exterior of the doors and exposed frame surfaces as per the colour approved by the Contract Administrator and Owner.

1.5 References

.1 Canadian Standards Association (CSA).

.1 CAN/ULC-S702-14, Standard for Mineral Fibre Thermal Insulation for Buildings, Third Edition.

.2 CSA-G40.21-13,. General requirements for rolled or welded structural quality steel / Structural quality steel.

.3 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 American Society for Testing and Materials (ASTM).

.1 ASTM A653/A653M, Specification for General Requirements for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process [Metric].

.2 ASTM A924/A924M, Standard Specification for General Requirements for Steel, Sheet, Metallic-Coated by the Hot-Dip Process.

.3 ASTM B 29-14, Specification for Refined Lead.

.4 ASTM B 749-14, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.5 ASTM E2074-00, Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

.4 Canadian Steel Door Manufacturers' Association, (CSDMA).

.1 CSDMA, Specifications for Commercial Steel Doors and Frames, 2009.

.2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 2009.

.5 National Fire Protection Association (NFPA)

.1 NFPA 80, Standard for Fire Doors and Fire Windows.

.2 NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN4-S104M, Fire Tests of Door Assemblies.

.2 CAN4-S105M, Fire Door Frames Meeting the Performance Required by CAN4-S104.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings.

1.6 Design Requirements

.1 Design exterior frame assembly to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 45°C.

1.7 Shop Drawings

.1 Submit Shop Drawings (electronically in PDF format) to the Contract Administrator for review. Shop Drawings are to be stamped by a Professional Engineer licenced to practice in Ontario.

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, arrangement of hardware and finishes.

.3 Indicate each type of frame material, core thickness, reinforcements, location of anchors and exposed fastenings and reinforcing and finishes.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on Drawings and/or door schedule.

2 PRODUCTS

2.1 Design Requirements

.1 ASTM A653/A653M, Specification for General Requirements for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process [Metric], minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.2 Reinforcement channel: to CAN/CSA-G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

2.2 Primers

.1 Touch-up primer to CAN/CGSB-1.181.

2.3 Hardware and Accessories

.1 General: Stainless steel with satin finish, aluminum with satin finish (except for wearing surfaces). Standard hardware for swing-door unit, (including wind restraint chain), except as noted below. Samples to be submitted for approval.

.2 Hinges: as recommended by manufacturer.

.3 Closer: LCN Super Smoothee or an approved equivalent.

.4 All door closers shall include a holder – model number: LCN 4114h. 4040XP

.5 Panic device set: Install panic bar with Allen key dog-down capability – model number: Sargent #8888.

.6 Dead bolt: Door bolt (Thrown / retracted by Key on interior and exterior as manufactured by Yale or an approved equivalent.

.7 Keying

.1 Doors to be individually keyed plus open with the master key.

.2 Provide keys in duplicate for every lock in this contract.

.3 Stamp keying code numbers on keys and cylinders.

.8 Door threshold: CT-658LP by KN Crowder to meet barrier-free height, or approved equivalent.

.9 Exterior top and bottom caps: steel.

.10 Metallic paste filler: to manufacturer's standard.

.11 Install weather stripping for the top and side of the exterior doorframe– model number: 18100CNB -Aluminum - Frame mounted bulb seal NEOPRENE.

.12 Install door sweep – manufacturer number: 306AV3685TKSP Brush Type

.13 Door handles: recessed finger pull; model number: GSH 961 Flush Pull (cast stainless steel).

.14 Provide additional Allen keys.

2.4 Frames Fabrication General

.1 Fabricate frames in accordance with CSDFMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Exterior frames: 1.6 mm welded type construction.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Protect mortised cutouts with steel guard boxes.

.6 Conceal fastenings except where exposed fastenings are indicated.

.7 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.5 Frame Anchorage

.1 Provide appropriate anchorage to wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.6 Frames: Welded Type

.1 Welding in accordance with CSA W59-13.

.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sane to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.7 Door Fabrication General

.1 Exterior doors: hollow steel construction, swing type, flush, with provision for glass openings as indicated.

.2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

.3 Blank, reinforce, drill doors, and tap for mortised, templated hardware.

.4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors.

.6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

2.8 Hollow Steel Construction

.1 Hollow metal doors to be H series heavy duty doors as manufactured by Fleming Door Products or equivalent from: Metal Door Limited, or Trillium Steel. Door to have continuous interlocking steel rib stiffeners and continuously welded seams.

.2 Form each face sheet for exterior doors from 1.6 mm sheet steel. Reinforce doors with vertical stiffeners, securely welded to each face sheet at 150 mm on centre maximum.

.3 Fill voids between stiffeners of exterior doors with fiberglass or mineral wool insulation.

3 EXECUTION

3.1 Installation General

.1 Install doors and frames to CSDFMA Installation Guide.

3.2 Frame Installation

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

3.3 Door Installation

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latch side and head: 1.5 mm.

.3 Finished floor and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

3.4 Finish

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

1 GENERAL

1.1 General

.1 All conditions of the Construction Agreement and division 1, General Requirements, apply to this section.

.2 All Work shall meet the requirements of the 2012 Ontario Building Code, including all amendments up to contract date.

1.2 Section Includes

.1 Labour, products, equipment and services necessary for the complete design, fabrication and installation of overhead doors in accordance with the Contract Documents.

1.3 Coordination

.1 Co-ordinate Work under this section with Work of related sections.

1.4 Related Work Specified Elsewhere

.1	Sealants:	Section 07 92 00
.2	Concrete Repairs:	Section 03 90 20
.3	Painting:	Section 09 91 00
.4	Electrical	Refer to Electrical Drawings

1.5 References

.1 Canadian Standards Association (CSA)

.1 CSA G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.105-M91 Quick-Drying Primer.

.2 CGSB 1-GP-121: 1993 Vinyl Pretreatment Coating for Metal (Vinyl Wash Primer)

.3 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc Rich Coating

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A366/A366M-97e1, Standard Specification for Commercial Steel (CS) Sheet, Carbon (0.15 Maximum Percent) Cold-Rolled (Withdrawn 2000)

.2 ASTM A653/A653M-22, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.3 ASTM D523-14(2018) Test Method for Specular Gloss

.4 ASTM D822/D822M-13(2018)Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings

.4 The Aluminum Association Inc. (AA)

.1 Aluminum Association Designation System for Aluminum Finishes.

1.6 Design Requirements

.1 Design exterior door assembly to withstand windload of 1 kPa with a maximum horizontal deflection of 1/240 of opening width.

.2 Design door panel assemblies with thermal insulation factor R16.

.3 Design door assembly to withstand minimum 100,000 cycles per annum, and 10 year total life cycle.

1.7 Shop Drawings

.1 Submit shop drawings in accordance with Specification section 01 33 00.

.2 Indicate sizes, service rating, types, materials, operating mechanisms, framng and supports, glazing locations and details, hardware and accessories, required clearances and electrical connections.

.3 Shop Drawings shall bear the signature and stamp of qualified professional engineer registered in Province of Ontario.

1.8 Closeout Submittals

.1 Submit printed operation instructions and maintenance data for doors, including the followng:

.1 As-built straight line wiring diagrams showing electrical connections and control circuitry.

.2 Instructions explaining operation.

.3 Lubrication chart, indicating lubrication points and type of lubricant recommended for equipment.

1.9 Delivery and Storage

.1 Handle products with care. Package, crate and brace products to protect against distortion, dirt, damage and weather during shipping, storage and handling.

.2 Deliver materials in the original containers, dry, undamaged with the seals and labels intact.

.3 Deliver materials in sequence to meet the installation schedule and arrange ahead for off the ground and under cover storage lcoations. Store products in strict accordance with the manufacturer's recommendations.

1.10 Warranty

.1 Provide a written warranty for the work of this section for a period of two (2) years from the date of substantial performance of the Project as certified by the Contract Administrator.

2 PRODUCTS

2.1 Manufacturer

.1 Overhead door and all components to be as manufactured and/or supplied by Dock Products Canada Inc. or an approved equivalent.

2.2 Doors

.1 Overhead door: Model G5000 – Garaga, insulated, with powered door operators, with windows to match existing. Baked enamel finish in white colour, as approved by the Contractor Administrator.

.2 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self tapping screws to manufacturer's recommendations.

.3 Fabricate doors from 26 gauge prepainted galvanized steel stock.

2.3 Hardware

.1 Track: vertical lift hardware with 75 mm deep, 2.66 mm core thickness galvanized steel track.

.2 Track Supports: 2.3 mm core thickness continuous galvanized steel angle track supports.

.3 Spring counter balance: heavy duty high cycle oil tempered torsion spring (100,000 cycle rated) with manufacturers standard brackets.

.4 Top roller carrier: galvanized Steel 3.04 mm thick.

.5 Rollers: full floating grease packed hardened steel, ball bearing 75 mm diameter solid steel tire.

.6 Roller brackets: adjustable, minimum 2.5 mm galvanized steel.

.7 Hinges: heavy duty, minimum 3.04 mm thick galvanized as recommended by manufacturer.

.8 Cable: 6 mm diameter galvanized steel aircraft cable.

.9 Provide safety bottom bracket.

2.4 Accessories

.1 Weather stripping: sill, jamb and head to manufacturer's standard.

.2 Finish ferrous hardware items with minimum zinc coating of 300 g/m to CSA G164.

3 EXECUTION

3.1 Installation

.1 Install doors and hardware in accordance with manufacturer's instructions.

.2 Rigidly support rail and operator and secure to supporting structure.

.3 Touch-up steel doors with primer where galvanized finish damaged during fabrication.

.4 Install operator including electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.

.5 Lubricate and adjust door operating components to ensure smooth opening and closing of doors.

.6 Adjust weatherstripping to form a weathertight seal.

END OF SECTION

1 GENERAL

1.1 GENERAL

.1 All conditions of the Construction Agreement and division 1, General Requirement, apply to this section.

.2 All work shall be performed in accordance with manufacturer's recommendations and good building practice.

1.2 COORDINATION

.1 Coordinate work under this section with work of related sections.

1.3 RELATED SECTIONS

.1	Masonry Repairs:	Section 04 90 00
.2	Overhead Doors:	Section 08 36 00

1.4 SCOPE OF WORK

.1 Supply all materials, labour and equipment required to prepare surfaces and apply primer and paint as specified in Specification section 01 11 00, Summary of Work, to the full extent of Drawings and Specifications.

1.5 CONTRACTOR QUALIFICATIONS

.1 Execute the work of this section by a Contractor / Subcontractor with equipment adequate for the Project and skilled trades people to perform the work expeditiously, known to have been responsible for satisfactory installations similar to those specified during a period of at least the past 3 years.

1.6 LIST OF PROPOSED MATERIALS

.1 Verify in writing your intention to apply the proprietary products specified or submit for approval a list of comparable materials of another manufacturer within two (2) weeks of the award of contract.

.2 This submittal shall include product name, number and catalogue data sheets. A letter is also required from the new supplier confirming that the quality and performance characteristics as well as colour of the proposed products meet or exceed those specified. Products named in this Specification need no further approval.

1.7 DELIVERY AND STORAGE

.1 Deliver materials in the original containers with the seals unbroken and labels intact and with the manufacturer's instructions printed thereon.

.2 Materials tools and equipment are not to be stored on Site.

1.8 JOB CONDITIONS

.1 Apply paint at air and substrate temperatures not less than the minimum recommended by the manufacturer.

.2 Do not apply paint finishes in areas where dust is being generated.

2 **PRODUCTS**

2.1 MATERIALS

.1 All primer and paint materials to be from one manufacturer.

.2 Concrete curbs adjacent to overhead doors:

.1 Paint: Traffic Striping Paint Professional, as manufactured by Rust-oleum Canada or approved equivalent. Dry film thickness to be as recommended by manufacturer. Provide two coats. Colour(s) to be yellow to match existing.

.2 Primer / Sealer: as recommended by manufacturer.

.3 Steel lintels and perimeter steel framing at the overhead doors:

.1 Primer: Glid-Guard Alkyd Metal Primer (4570). One coat at a dry film thickness of 50 microns (2 mils) per coat. Colour: to be tinted to a lighter shade of the paint colour.

.2 Paint: ICI Dulux Weatherguard 1540 Exterior Acrylic Latex Satin or ICI Dulux Weatherguard 1570 Exterior Acrylic Latex Satin – Low Temp as manufactured by ICI Canada Inc. or an approved equivalent. Two coats at a dry film thickness of 38 microns (1.5 mils) per coat. Colour: to be selected by the Contract Administrator and / or Owner.

2.2 APPLICATION EQUIPMENT

.1 Application equipment is not required to be new but shall be adequate for the work and workmanship herein specified.

2.3 ACCESSORY MATERIALS

.1 This work shall include all required ladders, drop cloths, masking, scrapers, tools, dusters, cleaning solvents to perform the work and achieve the results herein specified.

3 **EXECUTION**

3.1 EXAMINATION

.1 Examine surfaces to receive paint finishes and report to the Contract Administrator in writing all defects which cannot be corrected by the procedures specified elsewhere in this section, before starting any work.

.2 Examine work of other trades for defects and discrepancies and report them to the Contract Administrator in writing.

.3 Do not proceed with work until surfaces are satisfactory.

.4 Commencement of work in a specific area shall be construed as acceptance of the surfaces, and therefore the Contractor shall be fully responsible for satisfactory work as specified herein.

3.2 PROTECTION

.1 Protect work at all times and protect all adjacent work and materials by suitable covering or other method during progress of work.

.2 Protect adjacent resident's furnishings and belongings.

.3 Remove and protect factory finished work or similar items or provide adequate in place protection as directed by the Contract Administrator. Upon completion of each space, carefully replace removed items.

3.3 WORKMANSHIP GENERAL

.1 Apply by brush, roller or spray, upon approval from the Contract Administrator.

.2 Apply materials under adequate illumination, evenly spread and flowed-on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

.3 Ensure complete coverage and hide. When colour, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is uniform in colour, finish, and coverage at no additional cost to the Owner.

3.4 SURFACE PREPARATION

.1 Surfaces shall be clean, dry and adequately protected from dampness.

.2 Surfaces shall be free of any foreign materials which adversely affect adhesion or appearance of applied coating. Clean off all dust, dirt, wax, grease and other contaminants before painting.

.3 Prepare all other previously painted surfaces as follows:

.1 Remove all loose, peeling and cracked paint by scraping or sanding, or with approved chemical.

.2 Remove all rust and scale with power sanders and power wire brushes in accordance with Society for Protective Coatings (SSPC)-SP3, Power Tool Cleaning.

.3 Remove all oil and grease with solvents such as turpentine, mineral spirits or xylene in accordance with SSPC-SP1-82, Solvent Cleaning.

.4 Feather edges of remaining sound paint by sanding.

.5 Apply one coat of primer in accordance with the manufacturer's instructions on all exposed areas of substrate. Type of primer as specified .

3.5 PRIMER AND PAINT APPLICATION

.1 Apply the specified primer and paint in accordance with the manufacturer's instructions.

.2 Allow coats to dry following manufacturer's recommendations before applying succeeding coats.

.3 Sand and dust between each coat to remove defects visible from a distance of 1.5 metres.

.4 Ensure dry paint film thickness are maintained per coat. Provide two coats minimum.

.5 Post signage “WET PAINT” to warn public of recently completed primer and paint application. Remove signage when requested by the Contract Administrator.

3.6 CLEANING

.1 Daily as the work proceeds and on completion, remove all surplus materials and debris resulting from the foregoing work.

.2 Remove all paint from adjacent surfaces, upon completion of the work and leave the area in neat and tidy condition.

END OF SECTION

Part 1 General

1.1 Summary

.1 General Conditions and division 1, General Requirements, shall govern Work of this section.

.2 Quantities and dimensions enclosed by brackets apply for Project for which the Drawings are in imperial units.

.3 Contractor shall obtain a copy of CSA Standards A23.1, and A23.2, and maintain it on site.

.4 This is a performance specification in accordance with CSA A23.1 Table 5 Alternative (1). Nothing in this Section shall be construed or interpreted as rendering the specification to be Alternative (2) Prescriptive.

1.2 Related Sections

.1 Related Work Specified in Other Sections
03 10 00: Concrete Formwork
03 20 00: Concrete Reinforcement
03 30 00: Cast-in-Place Concrete
03 90 20: Concrete Repairs

.2 Co-operation with Contract Administrator
.1 Before commencing Work, review with Contract Administrator, Work performed under this section.

.2 Schedule Work to allow sufficient time and access for Contract Administrator to carry out periodic field review.

1.3 Quality Assurance

.1 **Reference Standards**
The following Reference Standards shall govern Work of this section, except where they conflict with requirements imposed by this Specification section in which case the latter shall govern. Standards referenced by the following Reference Standards apply but are not necessarily repeated in the following list.

.1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft;) (600kN-m/m;).

.2 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2,700 kN m/m3)
.3 CSA A23.1-09, Concrete Materials and Methods of Concrete Construction.
.4 CSA A23.2-09, Methods of Test for Concrete.
.5 CSA A3000-13, Cementitious Materials Compendium.
.6 TS 2.10, Construction Specification for General Excavation.
.7 TS 501, Amendment to OPSS.MUNI 501, Construction Specification for Compaction.
.8 TS 1010, Amendment to OPSS.MUNI 1010, Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material.

.2 **Administrative Requirements**
.1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of the work.
.2 Pay costs of relocating services.

1.4 SUBMITTALS

.1 **Samples**
.1 Submit for inspection by designated inspection and testing company, material samples of backfill for fill, and backfill for sub-base material proposed for use, no later than 1 week before backfilling or filling work.

Part 2 Products

2.1 Materials

.1 In accordance with Reference Standards.

.2 Aggregates
.1 Granular A, B Type I, B Type II, and select subgrade to OPSS 1010.
.2 Recycled concrete materials, 19 mm and 50 mm nominal diameter, to TS 1010.
.3 Unshrinkable fill: proportioned and mixed to provide:
.1 Maximum compressive strength of 0.4 MPa at 28 days.
.2 Maximum Portland cement content of 25 kg/m^3.
.3 Minimum strength of 0.04 MPa at 24 hours.
.4 Concrete aggregates: to CSA A23.1/A23.2.
.5 Cement: to CSA A3000-18, Type GU. (Type 1)
.6 Slump: 160 to 200 mm.

.3 Fill
.1 Select excavated materials from Site deemed appropriate for re-use on site either under landscaped or hardscaped areas.

.2 If sufficient volume of select site excavated materials are not available to complete backfilling works for area grading, import materials meeting OPSS 1010 select subgrade or materials meeting the geotechnical requirements.

.4 Bedding and embedment materials

.1 Bedding and embedment materials shall be one of the following, or as specified in the contract documents:

.1 Granular A.
.2 Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.
.3 Unshrinkable fill.
.4 Sand fill

.5 Cover Materials

.1 Cover materials shall be one of the following, or as specified in the contract documents:

.1 Granular A.
.2 Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.
.3 Unshrinkable fill.
.4 Sand fill

Part 3 Execution

3.1 Examination

.1 Examine Geotechnical Report included as an attachment to the tender documents.
.2 Before commencing work, verify and establish locations of buried services on and adjacent to site.

3.2 Preparation

.1 Protection of in-place conditions:

.1 Protect excavations from freezing.
.2 Keep excavations clean, free of standing water, and loose soil.
.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Contract Administrator's approval.
.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
.5 Protect buried services that are required to remain undisturbed.

.2 Buried services:

.1 Before commencing work, establish the location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
.5 Prior to beginning excavation Work, notify Contract Administrator and authorities having jurisdiction, establish location and state of use of buried utilities and structures. Contractor shall be responsible to clearly mark such locations to prevent disturbance during Work.
.6 Confirm locations of buried utilities by careful soil hydrovac methods.
.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
.8 Where utility lines or structures exist around excavation, obtain direction of the Contract Administrator and authorities having jurisdiction before removing.
.9 Record location of maintained, rerouted, and abandoned underground lines.
.10 Confirm locations of recent excavations adjacent to area of excavation.

3.3 Excavation

.1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Local regulations whichever is more stringent.
.2 Blasting shall not be permitted for excavation or rock removals.
.3 Excavate as required to carry out work.
.4 Do not disturb soil or rock below bearing surfaces.
.5 Notify Contract Administrator when excavations are complete.
.6 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
.7 Excavation taken below depths shown without Contract Administrator’s written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
.8 Excavate for slabs and paving to subgrade levels.
.9 In addition, remove all topsoil, organic matter, debris, and other loose and harmful matter encountered at subgrade level.
.10 Excavate for unsuitable soils as identified in the contract documents and Geotechnical report.
.11 Stockpile unsuitable materials separated from all native or import soils which have been designated to be removed or to remain on-site.
.12 Promptly remove from site materials deemed unsuitable for use in backfilling or grading activities.

3.4 Rock Removal

.1 Remove rock to alignments, profiles, and cross sections as indicated.
.2 Explosive blasting is not permitted on this Project.
.3 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak and avoid damage to adjacent structures.
.4 Excavate rock to lines and levels as required to achieve Finish Grading designs as indicated in the contract documents.
.5 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.
.6 Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.
.7 Cut trenches to widths as indicated.
.8 Use pre-shearing, cushion blasting or other smooth wall drilling and blasting techniques unless specified otherwise.
.9 Remove boulders and fragments which may slide or roll into excavated areas.
.10 Correct unauthorized rock removal at no extra cost.

3.5 Cofferdams, Shoring, Bracing and Underpinning

.1 Protection systems shall be according to OPSS 539. Protection systems shall be installed:
  .1 Where the stability, safety, or function of an existing structure, roadway, railway, or other facility can be impaired by an excavation or temporary slope.
.2 To permit excavation where there is a necessity to retain the sidewalls of an excavation and to permit dewatering by restricting water flow and facilitating safe execution of the work.
.3 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with recommended practices provided in Geotechnical report.
.4 Obtain permit from authority having jurisdiction for temporary diversion of water course as required.
.5 Construct temporary works to depths, heights and locations as indicated.
.6 During backfill operation:
  .1 Unless otherwise indicated or directed, remove sheeting and shoring from excavations.
  .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above the toe of sheeting.
.7 When sheeting is required to remain in place, cut off tops at elevations as indicated.
.8 Upon completion of substructure construction:
  .1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore watercourses as indicated.

3.6 Dewatering and Heave Prevention

.1 Keep excavations free of water while Work is in progress.
.2 Provide details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
.4 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
.5 Protect open excavations against flooding and damage due to surface run-off.
.6 Design dewatering systems to provide filters to treat TSS, Total Iron, and Total Manganese to permit discharge to municipal sanitary sewer system.
.7 Dispose of water in accordance with Permit to Take Water, if applicable, to approved collection or runoff areas and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
.8 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
.9 Provide silt sack TSS capture system at discharge piping to drainage ditches or to surface collection systems including catchbasins.
.10 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas as required by the Permit to Take Water.

3.7 Field Quality Control

.1 Testing of materials and compaction of backfill and fill will be carried out by inspection and testing company retained by the Contractor.
.2 Do not begin backfilling or filling operations until the material has been approved for use by the Contract Administrator.
.3 Not later than 48 hours before backfilling or filling with approved material, arrange for the designated inspection and testing agency, to perform for compaction testing.

3.8 Backfilling

.1 The compaction equipment and compaction method for the construction of shale embankments shall be according to OPSS 206.
.2 Remove snow, ice, construction debris, organic soil, and standing water from spaces to be filled.
.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade: compact existing subgrade under walkways, paving, and slabs on grade, to same compaction as fill.

.1 Fill excavated areas with gravel and sand compacted as specified for fill.

.5 Placing:

.1 The fill material should be placed in thin layers not exceeding the following thickness before the compaction:

.1 Approved earth borrow: 300 mm.

.2 Granular "A": 200 mm

.3 Granular "B": 200 mm

.4 Sand fill: 200 mm.

.2 Each fill layer should be uniformly compacted with heavy compactors, suitable for the type of fill used. The granular base and granular sub-base courses should be compacted to 98% of the material's SPMDD.

.3 Against structures, backfill around or above cast-in-place concrete shall not be started until 24 hours after placing concrete.

.4 Place backfill simultaneously on both sides of installed work to equalize loading. Difference in backfill elevations shall not vary more than 0.5 metres between sides of structure.

.5 Where temporarily unbalanced earth pressures are liable to develop on walls or other structures. Concrete shall be permitted to cure for a minimum of 14 days or until it has sufficient strength to withstand fill, compaction pressure and approval is obtained from geotechnical engineer or if approved by geotechnical engineer, erect bracing or shoring to counteract imbalance, and leave in place until removal is approved by geotechnical engineer.

.6 Compaction: compact each layer of material to following densities for material to ASTM D1557:

.1 To the underside of base courses: 95%.

.2 Base courses: 98%.

.3 Elsewhere: 95%.

.7 Granular fill under concrete slabs

.1 Immediately after foundation walls are completed to floor level and backfill over mechanical and electrical services is completed, place and compact fill as required to bring level up to elevation of underside of granular underbed provided under Specification section 03 30 00, Cast-In-Place Concrete.

.2 Inspect moisture content of fill prior to placing. Limited addition of water only to extent required to provide optimum moisture content for compaction. Puddling or flooding with water to compact fill is not permitted.

.3 Place fill in layers so equipment being used for compacting can produce specified density. If lumps are present in material each layer shall be continuously disked to ensure proper compaction.

.4 During and immediately after leveling and disking, compact each layer of fill using approved mechanical equipment until required

compaction and level is reached. Carry out compaction within 1 m of walls, where grade difference is 0.5 m or more on other side of wall by hand tamping.

.5 Make good any subsequent settlement.

.8 Fill under paving:

.1 Use select subgrade materials as approved by the Contract Administrator up to bottom of granular base courses.

.2 Use Granular 'A' or material as specified in the contract documents.

.9 Backfill and fill under areas to receive floor slabs: Granular A, Type 1 material meeting OPSS 1010 requirements to underside of porous base fill. Refer to Specification section 03 30 00 (Cast-In-Place Concrete) for requirements for granular underbed below slab-on-grade.

.10 Backfill adjacent to exterior foundations: Granular B, Type 1 materials meeting OPSS 1010 requirements for minimum of 600 mm against wall, balance to be native soil. Granular B materials to be capped with relatively impervious clay.

.11 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

.12 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.

.13 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

3.9 Grading

.1 Grade so that water will drain away from buildings, walls, and paved areas, to catch basins and other disposal areas approved by the Contract Administrator.

.1 Grade to be gradual between finished spot elevations shown on Drawings.

3.10 Cleaning

.1 Rock disposal:

.1 Dispose of surplus removed rock off site.

.2 Do not dispose removed rock into landfill. Send material to appropriate quarry as approved by the Contract Administrator.

.2 Progress cleaning:

.1 Leave Work area clean at end of each day.

.2 Dispose of cleared and grubbed material off site daily.

.3 Final cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.

.4 Waste management: separate waste materials for reuse and disposal in accordance with CWMP (refer to division 1 Specifications).

END OF SECTION

1 GENERAL

1.1 SUMMARY

1.1.1 General Conditions in the Construction Agreement and division 1, General Requirements, shall govern Work of this section.

1.1.2 Maintain on Site a copy of latest edition of CSA Standards S16.

1.1.3 Maintain on-site a copy of geotechnical investigation and design report (prepared by EXP, BRM-22028009-A0, February 27, 2023), all latest Drawings pertaining to the foundations; Specifications; contract documents; any documents regarding special foundation design features and assumptions such as design briefs, hammer data sheets. Be familiar with their provisions.

1.2 DESCRIPTION

1.2.1 **Related Work Specified in Other Sections**

03 10 00: Concrete Formwork
03 20 00: Concrete Reinforcement
03 30 00: Cast-in-Place Concrete
05 12 00: Structural Steel
31 24 13: Excavation, Trenching and Backfill

1.2.2 **Co-operation with Work of Other Sections**

Check Drawings and Specifications for requirements of other Specification sections which will affect installation of Work of this section.

1.2.3 **Co-operation with Contract Administrator**

.1 Before commencing Work, review with Contract Administrator, Work performed under this section.

.2 Schedule Work to allow sufficient time and access for Contract Administrator to carry out periodic field review.

1.2.4 **Work Included**

Provide all labour, materials, methods, equipment, and accessories necessary to supply and install the steel H piles shown on Drawings, specified herein, and as required for the complete and proper Work of this section, including, but not limited to, the following:

.1 Steel H piles including corrosion protection coating.

.2 Pile Static Load Test including all apparatus, equipment and temporary structures required.

.3 Pile Dynamic Analyzer Tests.

.4 Pile driving templates, shoes, cap and tip reinforcement.

.5 Pile splices.

.6 Geotechnical supervision.

.7 Inspection and testing services by an independent company.

1.3 QUALITY ASSURANCE

1.3.1 Reference Standards

All referenced standards listed below shall be the edition referenced by the Ontarion Building Code in force on the contract date, where Ontario Building Code does not reference the listed standards, the current published edition shall be followed.

The following reference standards govern Work of this section, except where they are in conflict with requirements imposed by this Specification, in which case the latter govern. Standards referenced by following standards apply but are not necessarily repeated in following list:

.1 Ontario Building Code, (OBC).

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM A106/A106M, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
- .2 ASTM A252, Standard Specification for Welded and Seamless Steel Pipe Piles.
- .3 ASTM D1143/D1143M, Standard Tests Method for Deep Foundations Under Static Axial Compressive Load.
- .4 ASTM D3689, Standard Test Methods for Deep Foundation Under Static Axial Tensile Load.
- .5 ASTM D3966, Standard Test Methods for Deep Foundations Under Lateral Load.
- .6 ASTM D4945, Standard Test Method for High-Strain Dynamic Testing of Piles.
- .7 ASTM D5882, Standard Test Method for Low Strain Impact Integrity Testing of Deep Foundations.

.3 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.171, Inorganic Zinc Coating.
- .2 CAN/CGSB-1.184, Coal Tar-Epoxy Coating.

.4 Canadian Standards Association International (CSA)

- .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
- .3 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
- .4 CAN/CSA-S16, Limit States Design of Steel Structures.
- .5 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
- .6 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .7 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .8 CSA W178.1, Certification of Welding Inspection Organizations.
- .9 CSA W178.2, Certification of Welding Inspectors.
- .10 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3.2 Reference Publications

.1 Canadian Foundation Engineering Manual, latest published edition.

1.3.3 Qualifications

.1 Design of pile splices, driving shoes, pile toe reinforcement, templates and other accessories shall be by a Professional Engineer, experienced in pile design and knowledgeable about pile driving operations and licensed in the Province of Ontario. Design Engineer must be insured against professional liability.

.2 Undertake Work of this section by Contractor/Subcontractor with adequate equipment, skilled tradespeople, and demonstrated experience in the installation of steel H piles.

.3 Undertake welding only by fabricators certified by Canadian Welding Bureau under of CSA W47.1 for fusion welding of steel structures and CSA W55.3 for resistance welding of structural components.

.4 Undertake welding only by welders with appropriate CSA W59 qualification within previous 6 months for each welding procedure undertaken by the welder.

1.3.4 **Independent Inspection and Testing**

.1 Both source quality verification and field quality verification, inspection and testing will be performed by an inspection and testing company and geotechnical engineer retained by the Contractor.

.2 The Contractor retains sole responsibility for quality control of Work and that performance or non-performance of inspection and testing company does not limit, reduce, or relieve Contractor's responsibilities for complying with requirements of contract documents.

.3 Inspection and testing company shall be certified by Canadian Welding Bureau, in Category 1, Buildings, under CSA Standard W178.1.

.4 Welding inspectors and supervisors shall be certified by Canadian Welding Bureau to CSA W178.2 to minimum Level 2 certification.

.5 The costs of 'dynamic pile analyzer tests' for all piles installed and for one 'static pile load test', and any others tests performed by inspection and testing company, are all to be paid by the Contractor.

.6 The Contractor is responsible to pay for additional inspection and testing, including load testing, required by Contractor requested changes of procedures or materials, or failure of completed Work to meet requirements of contract documents or to rectify the deficient Works.

1.3.5 **Source Quality Verification**

.1 Inspection and testing company shall:

.1 Confirm that materials conform to specified requirements. Mill test reports, correlated to materials, will be accepted in lieu of physical tests.

.2 Verify fabricated tolerance of piles and accessories.

.2 Geotechnical engineer shall:

.1 Review pile installation procedures proposed by the Contractor for piles to ensure both compatibility with geotechnical recommendations, and acceptable pile capacity results.

1.3.6 **Field Quality Verification:**

.1 Provide competent supervisors experienced in the installation of steel H piles to direct Work of this section.

.2 Schedule Work to allow sufficient time and provide free access for Contract Administrator to conduct periodic field review of Work of this section.

.3 Notwithstanding any requirement of reference standards, Contract Administrator's field review of Work of this section will be periodic, based on a rational sampling program.

.4 Be aware that any periodic review of Work of this section by Contract Administrator is for conformity to the design concept and general arrangement only and that Contractor retains responsibility for quality control, errors or omissions, and conformance with requirements of contract documents.

.5 Schedule and provide time and means to allow inspection and testing company and geotechnical engineer to inspect each installed pile, including taking samples and performing tests.

.6 Cooperate with inspection and testing company and geotechnical engineer to monitor pile driving and pile capacity testing with Dynamic Pile Analyzer and static load test.

.7 Inspection and testing company shall:

.1 Perform visual examination of 100% and non-destructive testing of 25% of complete penetration weld splices of steel H pile sections using Ultrasonic, Radiographic or other test methods acceptable to the Contract Administrator.

.8 Geotechnical engineer shall:

.1 Perform sampling, and detailed inspection of pile driving operations on a full-time basis during pile driving operation.

.1 Verify pile toe and head protections are adequate.
.2 Monitor and record pile driving procedures.
.3 Record installed pile lengths noting elevation of toe and cut-off.
.4 Confirm installed pile tolerances meet specified requirements.
.5 Verify pile head is perpendicular to longitudinal axis of the pile.
.6 Monitor and analyze results of dynamic pile analyzer tests.
.7 Monitor and analyze results of static load tests.
.8 Visually inspect surface of ground and exterior of buildings adjacent to pile driving Work at each site visit for indications of movement or distress.
.9 Verify that recording of Work and As-Built Drawings have been completed.
.10 Review and certify quantities submitted by Contractor for extra costs above contract.
.11 Provide verbal reports to Contract Administrator, confirmed by written reports, whenever site conditions warrant immediate response.
.12 Report immediately conditions which are inconsistent with contract documents.
.13 Keep accurate records of the installation of each pile and submit detailed report to Contract Administrator at the completion of the piling operation.

.9 Dynamic pile analyzer inspector shall:

.1 Review Contractor’s driving criteria and report on pile driving equipment in relation of pile and required load.

.1 On first day of driving, monitor pile driving in accordance with ASTM D4945. Select piles in three or four areas of the site to explore variable soils conditions by means of Dynamic Pile Analyzer. Based on test results, select pile for static load test.
.2 After static load test, correlate Dynamic Pile Analyzer results with information obtained from static load test; if load test is unsuccessful advise on anticipated resistance.
.3 Should static load test be unsuccessful, monitor pile driving under new driving criteria.
.4 After successful load Test, monitor piles re-struck in one day.

.10 Static load test:

.1 Select a pile to be statically load tested as specified elsewhere in this Specification section.

.1 Carry out testing in accordance with ASTM D1143, Clause 5.1 “Standard Loading Procedure” and Clause 5.1.1 “Direct Loading Method”.
.2 Evaluate test results in accordance with the Davisson’s “Offset Limit Load”, as given in Clause 20.5.1.1 of Canadian Foundation Engineering Manual.
.3 Evaluate test results in accordance with “Brinch-Hansen Failure Criterion”, as given in Clause 20.5.1.2 of Canadian Foundation Engineering Manual.

.4 Evaluate test results in accordance with “Chin Failure Criterion”, as given in Clause 20.5.1.3 of Canadian Foundation Engineering Manual.

.5 If load tested pile is unacceptable, revise driving criteria, re-drive test pile to the new criteria only if test pile was not loaded to failure; otherwise select another pile and repeat load test until load tested pile is deemed acceptable by Contract Administrator and geotechnical engineer. All costs for testing and re-testing are Contractor’s responsibility.

1.4 SUBMITTALS

1.4.1 Professional Liability Insurance

Submit proof of Connection Design Engineer’s professional liability insurance coverage specified elsewhere in this Specification section.

1.4.2 General:

.1 Provide submittals in accordance with Specification section 01 33 00 - Submittal Procedures.

.2 Product data: submit manufacturer’s printed product literature, specifications and datasheet.

.3 Notification: notify Contract Administrator in writing at time of submissions of any proposed deviations from requirements of contract documents.

1.4.3 Installation Procedure:

.1 Submit in accordance with Specifications section 01 33 00 - Submittal Procedures, for review by the Contract Administrator, and before commencing Work, a written description of complete installation procedure, including proposed sequence of driving, description of equipment, driving procedures and final set criteria.

.2 Be aware that review by the Contract Administrator of procedure will be for conformity to design concept only and that Contractor retains responsibility for errors and omissions and for meeting all requirements of contract documents, and further that the Contract Administrator’s review does not indicate approval of installation procedure, responsibility for which remains with the Contractor.

1.4.4 Shop Drawings:

.1 Submit Shop Drawings to the Contract Administrator in accordance with Specification section 01 33 00 - Submittal Procedures, and proceed with site Work only after approval of Shop Drawings by the Contract Administrator.

.2 Indicate on Shop Drawings details for:

.1 Location, size and number of each pile,

.2 Pile shoes, splices, pile cap and toe reinforcement,

.3 Grade of steel, protective coatings if specified,

.4 Expected Pile tip elevation and length,

.5 Expected Pile cut-off elevation.

.3 Each Shop Drawing submitted shall bear the stamp and signature of the Professional Engineer responsible for the design and shop drawings, or the responsible Professional Engineer shall submit a sealed and signed letter at commencement of Shop Drawing preparation confirming assumption of responsibility for design of splices, shoes, templates and other accessories, and compliance with the requirements of the contract documents.

.4 Review all Shop Drawings prior to submission to Contract Administrator. By this review, Contractor represents to have determined and verified all field measurements, site conditions, materials, products or accessories, and to have checked and coordinated

each Shop Drawing with requirements of Work and contract documents. Confirm Contractor's review of each Shop Drawing by stamp, date and signature of a responsible person.

.5 Notify Contract Administrator in writing at time of submission of any deviations in Shop Drawings from requirements of contract documents.

.6 Be aware that Contract Administrator's review of Shop Drawings is for conformity to design concept and for general arrangement, and that Design Engineer retains responsibility as Engineer of Record and that Contractor retains responsibility for errors and omissions in Shop Drawings and responsibility for meeting all requirements of contract documents.

.7 Make changes to Shop Drawings which Contract Administrator may require consistent with contract documents and resubmit unless otherwise directed by Contract Administrator. When resubmitting, notify Contract Administrator in writing of revisions other than those requested by Contract Administrator.

.8 Submit Shop Drawings in pdf format to the Contract Administrator.

1.4.5 **Mill Test Reports:**

.1 Submit Mill test reports for piles and identify source of material, prior to delivery of material to site.

.2 Submit three (3) copies of mill test reports indicating yield and chemical analysis of steel piles if requested by Contract Administrator.

1.4.6 **Static Load Test:**

.1 Submit proposed apparatus and structure for static load test to the Contract Administrator for review.

1.4.7 **Welder's Certificates:**

.1 Submit certificates from an independent laboratory acceptable to Contract Administrator, certifying appropriate CSA W59 qualification within the previous 6 months for each welding procedure performed by each welder employed in Work.

1.4.8 **Field Measurement:**

Maintain accurate records of driving for each pile, including:

.1 Pile number.

.2 Pile size and length, location of pile in pile group, location or designation of pile group.

.3 Type and make of hammer, stroke or related energy.

.4 Other driving equipment including water jet, driving cap, cushion.

.5 Sequence of driving piles in group.

.6 Number of blows per metre for entire length of pile and number of blows per 10 mm for last 50 mm.

.7 Final pile toe and cut-off elevations.

.8 Deviations from design location.

.9 Unusual pile behaviour or circumstances experienced during driving such as redriving, heaving, weaving, obstructions, and jetting.

.10 Other pertinent information such as interruption of continuous driving, pile damage.

.11 Record elevation taken on adjacent piles before, during and after driving of each pile.

.12 All measurements, observations and calculations associated with pile driving analyzer and wave equation analysis.

.13 Records must be certified by the geotechnical engineer retained by the Contractor.

.14 Provide a copy of all records to the Contract Administrator.

1.4.9 **Geotechnical Reports:**

Geotechnical engineer shall:

.1 Submit inspection reports at least weekly while site Work for this section is in progress.

.2 Submit inspection reports in pdf format to the Contract Administrator.

.3 Include in each report a plan locating each pile driven and identifying each pile which fails to satisfy specified tolerances.

.4 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.

.5 Include deficiency list of outstanding items from previous reports, and comment on status.

1.4.10 **Inspection Reports:**

Inspection and testing company shall:

.1 Submit inspection reports at least weekly when shop and site Work for this Section is in progress.

.2 Submit inspection reports in pdf format to the Contract Administrator.

.3 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.

.4 Include deficiency list of outstanding items from previous reports, and comment on status.

1.5 DELIVERY, STORAGE AND HANDLING

1.5.1 Deliver, store and handle in accordance with this section.

.1 Deliver new, undamaged materials to Site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on piling.

.2 Store piling to facilitate required inspection activities and prevent corrosion and damage to coatings prior to installation.

.3 Protect piles from deformation and damage during delivery, storage and handling.

.4 Replace damaged piles to satisfaction of Contract Administrator.

1.6 ENVIRONMENTAL CONDITIONS

Comply with environmental conditions specified in Section 03 30 00, Cast-in-Place Concrete, for all concrete Work.

1.7 GEOTECHNICAL INVESTIGATION

Geotechnical investigation has been carried out by EXP Services Inc (report is included in the attachments to the tender package).

1.8 SITE INVESTIGATION

1.8.1 Thoroughly review above noted geotechnical report. Note that boreholes are widely spaced and site stratigraphy is variable.

1.8.2 Conduct detailed site inspection and determine nature and extent of material through which piles will be driven, other pertinent site conditions and relationship of buildings, services or other improvements on Site and adjacent properties which may impact Work of this section.

1.8.3 Be aware that any services shown on Drawings are for general information purposes only and that Contractor is responsible for, and obliged to, locate and protect all municipal and other services.

1.8.4 Be aware that no additional costs will be entertained by Owner for difficulties encountered or expenses incurred as a result of any Site condition visible or which could be reasonably known to exist when bid is submitted.

1.9 REQIREMENTS OF REGULATORY AGENCIES

1.9.1 Conform to local and provincial regulations, including construction safety regulations.

1.9.2 Cooperate with the Contract Administrator and Owner to obtain necessary approvals from regulatory agencies.

2 PRODUCTS

2.1 PRICES

2.1.1 Prices requested as part of Tender shall include piles installed in place, driving plates, shoes, splices, point (or pile toe) reinforcement, pile cap, and preparation and submittal of Shop Drawings.

2.1.2 Piling costs may be adjusted by the provisional unit price indicated in the Tender, by measuring total actual installed length of piles. Total installed pile length means the summation of all the individual pile lengths, incorporated into the Works. The difference between the total actual installed pile length and the total pile length specified in Drawings shall be the basis for using unit price adjustment (and this would be applicable to both cases – greater or lesser installed pile lengths).

2.1.3 Base pricing is on number of piles and lengths indicated on Drawings.

2.1.4 Number and lengths of piles installed will be established by the Contract Administrator from the verified piling records.

2.1.5 Pile lengths extending above the cut-off elevation indicated on Drawings shall be considered as normal waste and not included in measured installed length.

2.1.6 Piles abandoned on written instructions from the Contract Administrator because of boulders or other obstructions encountered before reaching required bearing capacity will be paid in proportion to length driven.

2.1.7 Piles not meeting requirements of contract documents will not be included in measured installed length.

2.2 MATERIALS

2.2.1 **Generally:** in accordance with Reference Standards.

.1 Steel H piles: to CAN/CSA-G40.20/G40.21, Type and Grade 350W. Size and weight as indicated.

.2 Welding materials: to CSA W48.

.3 Steel plates and pile driving templates: to CAN/CSA-G40.20/G40.21, Grade 300W.

.4 Pile driving shoes: to CAN/CSA-G40.20/G40.21, Grade 300W - Titus or Hardbite.

.5 Splices: To develop ultimate capacity of sections spliced.

3 EXECUTION

3.1 EXAMINATION

3.1.1 Confirm and correlate dimensions at Project Site and obtain information that pertains to fabrication or to techniques of construction and installation.

3.2 PREPARATION

3.2.1 Before commencing Work, review with the Contract Administrator the Work of this section.

3.2.2 Check contract documents for requirements of other sections which will affect Work of this section.

3.2.3 Before delivery of structural steel (H-piles), confirm that Work of other sections on which Work of this section is dependent is properly installed in the correct location.

3.2.4 Comply with manufacturer's written recommendations or specification, including product technical bulletins, handling, storage and installation instruction, and datasheets.

3.2.5 Set out lines and levels and be responsible for correct location of piles.

3.2.6 Locate all underground services before commencing pile installation.

3.2.7 Confirm that ground conditions at pile locations are adequate to support pile installation operation and load testing operation. Make provision for access and support of piling equipment during performance of Work.

3.3 FABRICATION

3.3.1 Fabricate steel H piles and pile driving templates in accordance with requirements of reviewed Shop Drawings, reference standards and contract documents.

3.3.2 **Fabrication Tolerances:**

.1 Provide H pile sections to meet fabrication tolerances of CAN/CSA-G40.20/G40.21 and ASTM A6.

.2 Pile to be checked for deviations before leaving mill.

.3 Pile length: $\pm$ 1 m

3.3.3 Install pile toe reinforcement, splices, driving shoes and accessories as indicated.

3.3.4 Repair defective welds as approved by Contract Administrator.

3.3.5 Repairs: to CSA W59.

3.3.6 Unauthorized weld repairs may be rejected.

3.3.7 Repair damaged exterior protective coating of piles.

3.3.8 If piles are specified to be painted with protective coating, line inside surfaces of sleeves and pile guides with 25 mm timber strips or nylon roping to protect coating during driving operation.

3.4 PAINTING AND COATING

3.4.1 Painting requirements include surface preparation of outer surfaces of piling including bearing plate and pile cap by grit blasting, application of inorganic zinc coating and coal tar epoxy coatings and touch-up after delivery.

3.4.2 **Surface Preparation:**

.1 Sand or grit blast in accordance with SSPC-SP 2, SP3, SSPC-SP 5/NACE No.1, SSPC-SP 6/Nace No.3, SSPC-SP 7/NACE No.4, SSPC-SP 8 and SSPC-SP 10/NACE No.2., as appropriate.

.2 When blasting is completed remove dust by brush or vacuum prior to painting.

3.4.3 Apply first coating of paint same day as sand or grit blasting is completed.

3.4.4 Remove oil, grease and organic matter, with solvents or detergents prior to painting, in accordance with paint manufacturer's recommendations.

3.4.5 Paint piles as indicated.

3.4.6 Paint full length

3.4.7 Paint full length of pile with inorganic zinc primer and from 600 mm below finished ground elevation to 1000 mm below low water level with coal tar epoxy.

3.4.8 Do not paint portions in pile which are to be encased in concrete.

3.4.9 **Application:**

.1 Apply three coatings, each in accordance with manufacturer's recommendations.

.2 First coat, inorganic zinc: apply to average 75 micrometres [3.0 mil] dry-film thickness and minimum 65 micrometres [2.6 mil] thickness.

.3 Second and third coats, coal tar epoxy: apply to average single coat dry-film thickness of 180 micrometres [7.1 mil].

.4 Painted surfaces to be free from sags and runs.

3.5 EQUIPMENT

3.5.1 Provide equipment of sufficient capacity to handle maximum length of piles with minimum number of splices, and to drive pile to required resistance.

3.5.2 Prior to commencement of pile installation, submit to Contract Administrator for review, details of equipment for installation of piles.

3.5.3 **Hammer Selection:**

.1 Hammer to be selected on basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.

.2 The driveability analysis shall include, but not be limited to, the following: hammer, cushion, and capblock details; static soil parameters; quake and damping factors, total energy resistance, blow count, pile stresses and energy throughout at representative penetrations.

.3 Driveability analysis to be submitted to geotechnical engineer (retained by the Contractor) for review of hammers.

.4 When required criteria cannot be achieved with proposed hammer, use larger hammer

and take other measures as required.

3.5.4 Construct pile driver leads to provide free movement of hammer. Hold leads in position at top and bottom, with guys, stiff braces or other means. Except for piles being driven through water, provide length of leads so that use of a follower is unnecessary.

3.6 PROTECTION

3.6.1 Protect public and construction personnel, adjacent structures and services and Work of other sections from effects of pile driving operations.

3.6.2 Remedy or replace as required at own expense any adjacent existing services or structures, or Work of other sections damaged by pile driving operations to restore to original or better condition, at Contractor's expense.

3.7 INSTALLATION

3.7.1 Install piling in accordance with requirements of reviewed Shop Drawings, reference standards and contract documents.

3.7.2 Cooperate with inspection and testing company and geotechnical engineer to monitor pile driving and pile capacity with Dynamic Pile Analyzer.

3.7.3 Install all piling in presence of inspection and testing company and geotechnical engineer.

3.7.4 Install piles to provide capacities specified on Drawings.

3.7.5 **Splice Pile Extensions:**

.1 As indicated or as required per clauses above.
.2 Align extension with driven pile when splicing.
.3 Provide full bearing of spliced parts.
.4 Provide welded field splices to develop ultimate strength of the pipe, and which are truly aligned.

3.7.6 Hold piles securely and accurately in position while driving.

3.7.7 Position and hold pile driving template in location to ensure that driven piles will be within tolerances specified.

3.7.8 Secure templates to vertical piles in accordance with Shop Drawing details before inclined piles are installed.

3.7.9 Use driving caps to protect piles. Provide anvils or cushion blocks between hammer and pile head.

3.7.10 Reinforce pile heads if necessary.

3.7.11 Deliver hammer blows in direct axis of pile.

3.7.12 Drive pile continuously to final resistance.

3.7.13 Do not drive piles within 3 m of concrete which has been in place less than 3 days.

3.7.14 Drive individual piles in pile group from centre outwards to minimize the generation of increased driving resistance due to compaction and displacement of soil.

3.7.15 Check piles in group or nearby groups for heaving, by elevation survey after driving adjacent piles.

3.7.16 Exercise care when driving inclined piles adjacent to existing structures so that no contact takes place between pile and structure.

3.7.17 Do not drive inclined piles until vertical piles within 10 m have been fully driven.

3.7.18 After initial pile refusal (penetration resistance/termination criteria) to driving is achieved, re-drive (restrike) all piles to final resistance after 24 hours to confirm permanent refusal.

3.7.19 **Installation Tolerances:**

.1 Plan location at cut-off: ±75 mm.
.2 Vertical alignment: Plumb within 2% of total length.
.3 Cut-off elevation of pile head: ± 25 mm.
.4 Centre to centre of piles in pile group: ± 75 mm.

3.7.20 Cut off piles squarely at elevations indicated, to tolerances specified in previous paragraph.

3.7.21 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.

3.7.22 Install tendons, reinforcement or other anchorage which is specified on Drawings to support pile caps or connect pile caps to piles.

3.7.23 Leave rejected piles in place, cut off at elevation directed and install adjacent pile or piles as directed by Contract Administrator.

3.7.24 Touch-up scratched or uncoated surfaces with three applications of inorganic zinc coating and coal tar epoxy, as required.

3.7.25 Unless templates are specified to remain as part of the permanent structure, remove from Site when no longer required.

3.7.26 **Welding Reinforcing Bars to Pile if Specified:**

.1 Weld to CSA W59.
.2 Welding certification of companies: to CSA W47.1 and CSA W55.3, as appropriate.
.3 Welding certification of companies welding steel reinforcing bars placed in reinforced concrete: in accordance with CSA W186.

3.8 BRACING FOR STEEL PILE BENTS

3.8.1 Connect structural steel sway bracing as indicated before placing caps.

3.8.2 Provide fills and shims between bracing and pile as directed by Contract Administrator.

3.9 PILE DRIVING ANALYZER TESTING

3.9.1 Inspection and testing agency appointed by the Contractor will use Pile Driving Analyzer and Wave Equation Analysis to confirm driving criteria such as, hammer size and variation in impact, suitability of driving cap and cushions and penetration resistance relative to set for driving and re-striking.

3.9.2 Prepare piles to be instrumented by drilling and tapping holes for installation of strain transducers and accelerometers, as directed by inspection and testing agency.

3.9.3 Provide assistance, as required, in instrumentation process during initial set-up and during tests. Such assistance will include, but is not limited to:

.1 Attaching of test equipment leads to transducers and accelerometers when pile is positioned in leads prior to driving;

.2 Replacing of transducers and accelerometers, if required, during driving.

3.9.4 Make allowance for probable interruption in driving, such as:

.1 For changing or modifying hammer, cap, cushions, or other equipment;

.2 For replacing or adjusting of transducers and accelerometers;

.3 For assessing of monitored results.

3.9.5 Replace or adjust hammer and modify cap, cushions, and other equipment, as directed by the geotechnical engineer and inspection and testing company.

3.9.6 Confirm that final set (penetration resistance/termination criteria) has been achieved, by redriving (restriking) instrumented piles in accordance with this section.

3.10 CLEANING UP

Remove excess waste materials, cut-off pile sections and debris resulting from Work of this section from Site. Leave premises in a condition acceptable to the Contract Administrator.

3.11 DEFECTIVE WORK

3.11.1 Failure of materials or workmanship to meet requirements of contract documents, including variations in excess of specified tolerances or failure of piles to meet required load capacity, will be considered defective Work performed by this section.

3.11.2 The Contractor is also responsible to pay for all additional inspection and testing, redesign, corrective measures, and related expenses required to correct defective Work.

3.11.3 Repair or replace defective Work as directed by the Contract Administrator, at no cost to Owner. Be aware that one defective pile may require two or more replacement piles to balance loading.

3.11.4 Be aware that the Contractor shall be responsible for all costs involved in removing and replacing Work of other sections made necessary due to rejection of defective piles.

END OF SECTION