

Part 1 General

1.1 WORK OF THE CONTRACT

- .1 Refer to Part D – Supplemental Conditions: D3 – Scope of Work.

1.2 DIVISION OF WORK

- .1 Division of the *Work* among *Subcontractors* and *Suppliers* is solely *Contractor's* responsibility. *Contract Administrator* and the City of Winnipeg assume no responsibility to act as an arbiter to establish subcontract limits between *Sections* or Divisions of the *Work*.

1.3 SPECIFICATION LANGUAGE AND STYLE

- .1 These specifications are written in the imperative mood and in streamlined form. The imperative language is directed to *Contractor*, unless stated otherwise.
- .2 Complete sentences by reading "shall", "*Contractor* shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.
- .3 Fulfill and perform all indicated requirements whether stated imperatively or otherwise.
- .4 When used in the context of a *Product*, read the word “provide” to mean “supply and install to result in a complete installation ready for its intended use”.

1.4 CONTRACT DOCUMENTS FOR CONSTRUCTION PURPOSES

- .1 *Contract Administrator* to supply *Contractor* with a complete set of *Contract Documents* in electronic form before commencement of the *Work*. *Contractor* may print hard copies for construction purposes as required.
- .2 *Drawings, Specifications*, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents which leaves doubt as to the intent or meaning, abide by Precedence of Documents listed in the General Conditions or obtain direction from the *Contract Administrator*.

1.5 PROJECT STAGING

- .1 Include the schedule sequence of construction to accommodate the proposed staging of the *Work*. *Contractor* may propose alternate phasing to the City of Winnipeg and *Contract Administrator* for review and approval to expedite the contract. Schedule to be submitted for review and approval by the *Contract Administrator* prior to start of *Work*.
- .2 It is the responsibility of the *Contractor* to coordinate all staging requirements with the *Construction Manager's* and City of Winnipeg use of the premises, including but not limited to utility interruptions, decanting, equipment removal and installations, and personnel movement. All costs associated with staging whether the suggested staging or any approved revised staging is utilized, to be included in the contract price.

1.6 DOCUMENTS AT THE SITE

- .1 Keep the following documents at *Place of the Work*, stored securely and in good order and available to City of Winnipeg and *Contract Administrator* in hard copy and/or electronic form:
 - .1 Current *Contract Documents*, including *Drawings*, *Specifications* and addenda.
 - .2 *Change Orders*, *Change Directives*, and *Supplementary Instructions*.
 - .3 Reviewed *Shop Drawings*, *Product* data and samples.
 - .4 Field test reports and records.
 - .5 Construction progress schedule.
 - .6 Meeting minutes.
 - .7 Manufacturer's certifications.
 - .8 Permits, inspection certificates, and other documents required by authorities having jurisdiction.
 - .9 Current as-built drawings.
 - .10 Material Safety Data Sheets (MSDS) for all controlled *Products*.

1.7 CONTRACTOR USE OF PREMISES

- .1 Except as otherwise specified, *Contractor* has unrestricted use of *Place of the Work* from time of *Contract* award until *Substantial Performance of the Work*.
- .2 *Contractor* to coordinate use of premise with *Construction Manager* on site.
- .3 Confine *Construction Equipment*, *Temporary Work*, storage of *Products*, waste products and debris, and all other construction operations to limits required by laws, ordinances, permits, and *Contract Documents*, whichever is most restrictive. Do not unreasonably encumber *Place of the Work*.
- .4 Time and noise Restrictions for Performing Work: Refer to all applicable City of Winnipeg bylaws.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 CONSTRUCTION PROGRESS SCHEDULE

- .1 Refer to Part D – Supplemental Conditions: D16 – Detailed Work Schedule

1.2 RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS

- .1 Obtain from *Contract Administrator* an electronic copy of the construction *Drawings* for the purpose of creating as-built drawings. Record information in electronic form, clearly identifying as-built deviations from the originally obtained construction *Drawings*.
- .2 Clearly label each drawing as “AS-BUILT DRAWING”. Record information concurrently with construction progress. Do not conceal *Work* until required information is recorded.
- .3 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 pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by Change Orders and Supplemental Instructions
 - .6 References to *Shop Drawings*, where *Shop Drawings* show more detail.
- .4 Do not use as-built drawings for construction purposes.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit specified submittals to *Contract Administrator* for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the *Work*. Failure to submit in ample time is not considered sufficient reason for an extension of *Contract Time* or for *Product* substitutions or other deviations from the *Drawings* and *Specifications*.
- .2 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.
- .3 Do not proceed with *Work* affected by a submittal until review is complete.
- .4 Present *Shop Drawings*, *Product* data, and samples in units as indicated on *Drawings*.
- .5 Review submittals, provide verified field measurements where applicable, and affix *Contractor's* review stamp prior to submission to *Contract Administrator*. *Contractor's* review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the *Work* and *Contract Documents*.
- .6 Verify field measurements and that affected adjacent *Work* is coordinated.
- .7 Submittals not meeting specified requirements will be returned with comments.
- .8 Do not propose Substitutions or deviations from *Contract Documents* via *Shop Drawing*, *Product* data and sample submittals.

1.2 REQUEST FOR INFORMATION (RFI)

- .1 A Request for Information (RFI) is a formal process used during the *Work* to obtain an interpretation of the *Contract Documents*. An RFI to not constitute notice of claim for a delay.
- .2 RFI's to be submitted electronically to *Contract Administrator* in .PDF format, unless otherwise indicated.
- .3 RFI form content to include:
 - .1 Project name
 - .2 Project number
 - .3 RFI number
 - .4 RFI title
 - .5 Date of RFI
 - .6 Date response is required
 - .7 Reference to applicable specification or drawing number
 - .8 Discipline affected
 - .9 Priority
 - .10 Submitted by (name, company, phone number)
 - .11 Submitted to (name, company, phone number)
 - .12 General Contractor sign-off

- .13 Cost impact (yes / no; dollar amount)
- .14 Schedule impact (yes / no; dollar amount)
- .15 Information requested
- .16 Requested by
- .17 Response
- .18 Answered by (name, company)
- .19 Date answered
- .4 RFI's are to be accompanied by a proposed solution where applicable.
- .5 For each RFI review, allow ten (10) *Working Days*.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Indicate *Products*, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the *Work*.
- .2 Where *Products* attach or connect to other *Products*, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to *Drawings*, *Specifications* and other already reviewed *Shop Drawings*.
- .3 Accompany submittals with a transmittal information including:
 - .1 Date.
 - .2 *Project* title and number.
 - .3 *Contractor's* name and address.
 - .4 Identification of each submittal item and quantity.
 - .5 Other pertinent data.
- .4 *Shop Drawing* submittals to 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, date, and signature of *Contractor's* authorized representative responsible for *Shop Drawing* review, indicating that each *Shop Drawing* has been reviewed for compliance with *Contract Documents* and, where applicable, that field measurements have been verified.
 - .1 Details of appropriate portions of the *Work* as applicable:
 - .2 Fabrication.
 - .3 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .4 Setting or erection details.
 - .5 Capacities.
 - .6 Performance characteristics.

- .7 Standards.
- .8 Operating weight.
- .9 Wiring diagrams.
- .10 Single line and schematic diagrams.
- .11 Relationships to other parts of the *Work*.
- .5 *Product* data submittals to include material safety data sheets (MSDS) for all controlled Products.
- .6 Submit electronic copy of *Shop Drawings* where specified in the technical *Specifications*.
- .7 Submit electronic copy of *Product* data sheets or brochures where specified in the technical *Specifications*.
- .8 Where a submittal includes information not applicable to the *Work*, clearly identify applicable information and strike out non-applicable information.
- .9 Supplement standard information to include details applicable to *Project*.
- .10 Allow ten (10) *Working Days* for *Contract Administrator's* review of each submittal and incorporate in submittals schedule specified in Section 01 32 00 – Construction Progress Documentation. Allow additional three (3) *Working Days* where *sub- Contract Administrator* review is required.
- .11 If upon *Contract Administrator's* review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of *Work* may proceed.
- .12 If upon *Contract Administrator's* review significant errors or omissions are discovered, a so noted copy will be returned for correction and resubmission. Do not commence fabrication or installation.
- .13 *Contract Administrator's* notations on submittals are intended to ensure compliance with *Contract Documents* and are not intended to constitute a change in the *Work* requiring change to the *Contract Price* or *Contract Time*. If *Contractor* considers any *Contract Administrator's* notation to be a change in the *Work*, promptly notify *Contract Administrator* in writing before proceeding with the *Work*.
- .14 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the *Work* proceeds. When resubmitting, notify *Contract Administrator* in writing of any revisions other than those requested by *Contract Administrator*.

1.4 SAMPLES

- .1 Submit samples for *Contract Administrator's* review in duplicate where specified in the technical *Specifications*. Label samples as to origin, *Project* name, and intended use.
- .2 Deliver samples prepaid to *Contract Administrator's* business address.
- .3 Notify *Contract Administrator* in writing of any deviations in samples from requirements of *Contract Documents*.
- .4 Where a required colour, pattern or texture has not been specified, submit full range of available *Products* meeting other specified requirements.
- .5 *Contract Administrator's* selection from samples is not intended to change the *Contract Price* or *Contract Time*. If a selection would affect the *Contract Price* or *Contract Time*, notify *Contract Administrator* in writing prior to proceeding with the *Work*.

- .6 Resubmit samples as required by *Contract Administrator* to comply with *Contract Documents*.
- .7 Reviewed and accepted samples will establish the standard against which installed *Work* will be reviewed.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INSPECTION BY AUTHORITY

- .1 Allow Authorities Having Jurisdiction 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.
- .2 Give timely notice requesting inspection whenever portions of the *Work* are designated for special tests, inspections or approvals, either when described in the Contract Documents or when required by law in the *Place of the Work*.
- .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*.

1.2 REVIEW BY CONTRACT ADMINISTRATOR

- .1 *Contract Administrator* may order any part of *Work* to be reviewed if *Work* is suspected to be not in accordance with Contract Documents.
- .2 If, upon review such *Work* is found not in accordance with Contract Documents, correct such *Work* and pay cost of additional review and correction.
- .3 If such *Work* is found in accordance with Contract Documents, *Owner* to pay cost of review and replacement.

1.3 INDEPENDENT INSPECTION AND TESTING AGENCIES

- .1 Except as otherwise specified, *Owner* to retain and pay for independent inspection and testing agencies to inspect, test, or perform other quality control reviews of parts of the *Work*.
- .2 Employment of inspection and testing agencies by *Contractor* or *Owner* does not relieve *Contractor* and *Subcontractors* from responsibility to perform the *Work* in accordance with Contract Documents.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and testing to ascertain full degree of defect. Correct defect and irregularities as advised by *Contract Administrator* at no cost to *Owner*. Pay costs for retesting and reinspection.
- .5 Refer to individual specification section for further information on inspection and testing where required.
- .6 Make good *Work* disturbed by inspection and testing.

1.4 PROCEDURES

- .1 Notify appropriate agency and *Contract Administrator* in advance of requirement for tests, in order that attendance arrangements can be made.

- .2 Submit samples and materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in *Work*.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 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 Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good *Work* damaged by such removals or replacements promptly.

1.6 TESTS AND MIX DESIGNS

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

1.7 CERTIFICATION

- .1 When specified in individual specification sections, submit certification by the manufacturer, installation/application *Subcontractor*, or the *Contractor* to *Contract Administrator*, in quantities specified for Product Data.
- .2 Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- .3 Certificates may be recent or previous test results on material or Product, but must be acceptable to *Contract Administrator*.

Part 2 Products

2.1 Not Used

Part 3 Execution

3.1 Not Used

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Provide temporary utilities as specified and as otherwise necessary to perform the *Work* expeditiously.
- .2 Remove temporary utilities from Place of the Work when no longer required.

1.2 DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- .2 Maintain standby equipment necessary to ensure continuous operation of dewatering system.
- .3 Do not pump water containing suspended materials or other harmful substances into waterways, sewers or surface drainage systems. Treat or dispose of such water in accordance with applicable regulatory requirements.

1.3 TEMPORARY WATER SUPPLY

- .1 Arrange and pay for a temporary supply of water required during construction.
- .2 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.

1.4 TEMPORARY HEATING AND VENTILATION

- .1 Arrange and pay for temporary heating and ventilation required during construction.
- .2 Vent construction heaters in enclosed spaces to the outside or use flameless type of construction heaters.
- .3 Provide temporary heat for the *Work* as required to:
 - .1 Facilitate progress of *Work*.
 - .2 Protect the *Work* against dampness and cold.
 - .3 Prevent moisture condensation on surfaces, freezing, or other damage to finishes or stored *Products*.
 - .4 Maintain specified minimum ambient temperatures and humidity levels for storage, installation and curing of *Products*.
 - .5 After building is enclosed, maintain interior temperature of minimum 10° C.
- .4 Provide temporary ventilation for the *Work* as required to:
 - .1 Prevent accumulations of fumes, exhaust, vapours, gases and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.
 - .2 Ventilate temporary sanitary facilities.

1.5 TEMPORARY ELECTRICAL POWER AND LIGHTING

- .1 Arrange and pay for temporary power and lighting required during construction.

- .2 Arrange and pay for necessary connections and disconnections of temporary power and lighting in accordance with regulatory requirements.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination is not less than 162 lx.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Provide temporary construction facilities as necessary for performance of the *Work* and in compliance with applicable regulatory requirements.
- .2 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .3 Maintain temporary construction facilities in good condition for the duration of the *Work*.
- .4 Remove temporary construction facilities from *Place of the Work* when no longer required.

1.2 CONSTRUCTION PARKING

- .1 Limited parking may be permitted at *Place of the Work*. Coord
- .2 inate with Construction Manager prior to starting *Work*.
- .3 Downtown parking is available, standard rates apply and are at the *Contractor's* own expense.

1.3 VEHICULAR ACCESS

- .1 Provide and maintain adequate access to *Place of the Work*.
- .2 Existing roads at *Place of the Work* may be used for access to *Place of the Work*, provided *Contractor* assumes responsibility for any damage caused by construction traffic, and prevents or promptly cleans up any mud tracking or material spillage.

1.4 SITE OFFICES

- .1 Provide a temperature controlled and ventilated office, with suitable lighting, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Coordinate location of offices with *Construction Manager*. Site office location to be reviewed and approved by *Construction Manager* prior to erection.

1.5 SANITARY FACILITIES

- .1 Provide sanitary facilities for workers.
- .2 Post notices and take such precautions as required by local health authorities.
- .3 Keep sanitary facilities clean and fully stocked with the necessary supplies.

1.6 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection systems and equipment during construction.

1.7 CONSTRUCTION SIGNS AND ADVERTISEMENTS

- .1 This project will not be used to advertise or promote systems, construction or assembly methods, tools or equipment used and/or incorporated therein without written approval of the *Contract Administrator* and City of Winnipeg.

- .2 No signs or advertisements, other than safety, warning, or directional signs, are permitted without written approval of the *Contract Administrator* and City of Winnipeg.

1.8 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders and temporary stairs as required.
- .3 Scaffolding materials are the responsibility of the *Subcontractor* involved, unless specifically noted otherwise.

1.9 HOISTING

- .1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment.
- .2 Hoists and cranes to be operated by qualified operator.
- .3 Hoisting materials are the responsibility of the *Subcontractor* involved, unless specifically noted otherwise.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Provide temporary barriers and enclosures necessary to protect the public and to secure *Place of the Work* during performance of the *Work*.
- .2 Comply with applicable regulatory requirements.
- .3 Maintain temporary barriers and enclosures in good condition for duration of the *Work*.
- .4 Remove temporary barriers and enclosures from *Place of the Work* when no longer required.

1.2 FENCING

- .1 Erect temporary security and safety site fencing of type and height determined by *Contractor*, subject to applicable regulatory requirements. Maintain site fencing in good repair until removed.
- .2 Provide lockable access gates as required to facilitate construction access.

1.3 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.4 EXTERIOR HOARDING

- .1 Erect temporary exterior site hoarding to comply with applicable regulatory requirements. Hoarding to be constructed to withstand wind and snow loads as required.
- .2 Maintain public side of hoarding clean and in good repair until removed.
- .3 Provide lockable access gates for construction equipment and lockable pedestrian doors as required to facilitate construction access.
- .4 Completely erect hoarding prior to *Work* commencing on site.

1.5 FIRE ROUTES

- .1 Maintain fire access routes, including overhead clearances, for use by emergency response vehicles.

1.6 PROTECTION OF BUILDING FINISHES

- .1 Provide necessary temporary barriers and enclosures to protect completed or partially completed finished surfaces from damage during performance of the *Work*.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Provide *Products* that are not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by *Contract Administrator*, furnish evidence as to type, source and quality of *Products* provided.
- .2 Unless otherwise specified, maintain uniformity of manufacture for like items throughout.
- .3 Permanent manufacturer's markings, labels, trademarks, and nameplates on *Products* are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.

1.2 PRODUCT OPTIONS

- .1 Wherever a *Product* or manufacturer is specified by a single proprietary name, provide the named *Product* only.
- .2 Wherever more than one *Product* or manufacturer is specified by proprietary name for a single application, provide any one of the named *Products*.
- .3 Wherever a *Product* is specified by reference to a standard only, provide any *Product* that meets or exceeds the specified standard. If requested by *Contract Administrator*, submit information verifying that the proposed *Product* meets or exceeds the specified standard.
- .4 Wherever a *Product* is specified by descriptive or performance requirements only, provide any *Product* that meets or exceeds the specified requirements. If requested by *Contract Administrator*, submit information verifying that the proposed *Product* meets or exceeds the specified requirements.

1.3 PRODUCT AVAILABILITY AND DELIVERY TIMES

- .1 Promptly upon contract award and periodically during construction, review and confirm *Product* availability and delivery times. Order *Products* in sufficient time to meet the construction progress schedule and the *Contract Time*.
- .2 If a specified *Product* is no longer available, promptly notify *Contract Administrator*. *Contract Administrator* will take action as required.
- .3 If delivery delays are foreseeable, for any reason, promptly notify *Contract Administrator*.
 - .1 If a delivery delay is beyond *Contractor's* control, *Contract Administrator* will provide direction.
 - .2 If a delivery delay is caused by something that was or is within *Contractor's* control, *Contractor* to propose actions to maintain the construction progress schedule for *Contract Administrator's* review and acceptance.
- .4 In event of failure to notify *Contract Administrator* at commencement of *Work* and should it subsequently appear that *Work* may be delayed for such reason, *Contract Administrator* reserves right to substitute more readily available *Products* of similar character, at no increase in *Contract Price* or *Contract Time*.

1.4 STORAGE, HANDLING AND PROTECTION

- .1 Store, handle, and protect *Products* during transportation to *Place of the Work* and before, during, and after installation in a manner to prevent damage, adulteration, deterioration and soiling.
- .2 Comply with manufacturer's instructions for storage, handling and protection.
- .3 Store packaged or bundled *Products* in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in *Work*.
- .4 Comply with the requirements of the workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, including requirements for labeling and the provision of material safety data sheets (MSDS).
- .5 Store *Products* subject to damage from weather in weatherproof enclosures.
- .6 Store sheet *Products* on flat, solid, supports and keep clear of ground. Slope to shed moisture.
- .7 Remove and replace damaged *Products*.

1.5 PRODUCT QUALITY

- .1 Products, materials, equipment and articles incorporated in *Work* to be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective Products, whenever identified prior to completion of *Work*, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective *Products* at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of *Products*, decision rests strictly with *Contract Administrator*.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout.
- .5 Permanent labels, trademarks and nameplates on *Products* are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.
- .6 No *Products* or materials containing asbestos or any other hazardous materials to be used on this project. Any *Products* or materials found containing asbestos to be removed from the site and replaced by a non - asbestos product at no cost to the *Owner*.

1.6 QUALITY OF WORK

- .1 Ensure Quality of *Work* is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify *Contract Administrator* if required *Work* is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. *Contract Administrator* reserves right to require dismissal from site any workers deemed incompetent or careless.

- .3 Monitor quality control over suppliers, manufacturers, *Products*, services, site conditions, and workmanship, to produce *Work* of specified quality.
- .4 Comply with manufacturers' instructions, including each step in sequence.
- .5 Should manufacturers' instructions conflict with Contract Documents, request clarification from *Contract Administrator* before proceeding.
- .6 Comply with specified standards as minimum quality for the *Work* except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- .7 Perform *Work* by persons qualified to produce required and specified quality.
- .8 Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- .9 Secure *Products* in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- .10 Decisions as to standard or fitness of quality of *Work* in cases of dispute rest solely with *Contract Administrator*, whose decision is final.

1.7 EXISTING UTILITIES

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submit name and address of registered land surveyor performing survey *Work*.
- .2 Submit to *Contract Administrator* the survey of the *Work* prepared and issued by a registered land surveyor as required by authorities having jurisdiction and on completion of the *Work*.
- .3 Maintain a complete, accurate log of control and survey *Work* as it progresses.
- .4 On completion of major site improvements, prepare a survey showing dimensions, locations, angles and elevations of *Work*.
- .5 Record locations of maintained, re-routed and abandoned service lines.

1.2 SUREVEY REFERENCE POINTS

- .1 Locate and confirm permanent reference points prior to starting site *Work*. Preserve and protect permanent reference points on site during construction.
- .2 Do not change or relocate reference points without prior written notice to *Contract Administrator*.
- .3 Report to *Contract Administrator* when a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .4 Require registered land surveyor to replace reference points in accordance with original survey.

1.3 SUREVEY REQUIREMENTS

- .1 Establish sufficient permanent benchmarks on site, referenced to established benchmarks by survey control points.
- .2 Confirm that existing survey reference points are in accordance with City of Winnipeg's survey and property limits.
- .3 Establish initial lines and levels for building layout.
- .4 Maintain a complete, accurate log of control and survey work as it progresses. Record locations with horizontal and vertical data in project record documents.
- .5 Stake for grading, fill and topsoil placement and landscaping features.
- .6 Establish pipe invert elevations.
- .7 Establish lines and levels for mechanical and electrical *Work*.

1.4 EXISTING UTILITIES AND STRUCTURES

- .1 Before commencing excavation, drilling or other earthwork, establish or confirm location and extent of all existing underground utilities and structures in work area.
- .2 Promptly notify *Contract Administrator* if underground utilities, structures, or their locations differ from those indicated in Contract Documents. *Contract Administrator* to provide appropriate direction.
- .3 Remove abandoned service lines within 2 metres of structures. Cap or seal lines at cut-off points.

- .4 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

1.5 VERIFICATION OF EXISTING CONDITIONS

- .1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work. Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.
- .2 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.
- .3 Notify *Contract Administrator* in writing of unacceptable conditions.

1.6 LOCATION OF EQUIPMENT AND FIXTURES

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL CLEANING REQUIREMENTS

- .1 Provide adequate ventilation during use of volatile or noxious substances.
- .2 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .3 Prevent cross-contamination during the cleaning process.
- .4 Remove waste materials, debris and recyclables from *Work* areas at end of each *Working Day*.

Part 2 Products

2.1 CLEANING MATERIALS

- .1 Cleaning Agents and Materials: Low VOC content. As recommended by Product manufacturer.

Part 3 Execution

3.1 PROGRESSIVE CLEANING AND WASTE MANAGEMENT

- .1 Maintain the *Work* in a tidy and safe condition, free from accumulation of waste materials and construction debris.
- .2 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables.
- .3 Schedule cleaning operations so that resulting dust, debris and other contaminants will not contaminate building systems.
- .4 Remove stains, spots, marks, and dirt from exterior facades.
- .5 Clean and remove snow and ice from exterior sidewalks, steps, driveways, roads, parking lots, and other paved surfaces as required to comply with applicable municipal regulatory requirements.

3.2 FINAL CLEANING

- .1 Remove from *Place of the Work* surplus *Products*, waste materials, recyclables, *Temporary Work*, and *Construction Equipment* not required to perform any remaining work.
- .2 Re-clean as necessary areas that have been accessed by *Contractor's* workers prior to *Substantial Performance of the Work*.
- .3 Remove stains, spots, marks, and dirt from exterior facades.
- .4 Sweep clean, power wash and remove snow and ice from exterior sidewalks, roads, parking lots, and other paved surfaces.
- .5 Use leaf blowers to clean landscaped surfaces.

END OF SECTION

Part 1 General

1.1 REGULATORY REQUIREMENTS

- .1 Comply with applicable regulatory requirements when disposing of waste materials.
- .2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.
- .3 Burying and burning of rubbish and waste materials is prohibited.
- .4 Remove waste materials, debris and recyclables from *Work* areas at end of each *Working Day*.

1.2 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 but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modelling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Neither immediately poisonous to humans nor poisonous 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 re-manufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the Project site to another site for re-manufacture 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 (VOC=s): 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 particle board, fibreboard, and some plywood; and foam insulation,
 - .4 When released, VOC=s 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.

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by *Contract Administrator*.
- .2 Protect, stockpile, store and catalogue salvaged items.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .4 Protect structural components not removed for demolition from movement or damage.
- .5 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage.

1.4 COORDINATION

- .1 *Contractor's* to cooperate with the *Construction Manager* to implement the Waste Management Plan.
- .2 Coordinate *Work* with other activities at site to ensure timely and orderly progress of the *Work*.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PREPARATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.
- .2 Obtain information relevant to all of the available programs prior to starting *Work* on the Project, and confirming the facilities ability to accept waste from the Project.
- .3 Execute *Work* with least possible interference or disturbance to normal use of premises.

3.2 WASTE MANAGEMENT IMPLEMENTATION AND DISPOSAL

- .1 *Contractor* to designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan the Project.

- .2 *Contractor* to provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- .3 *Contractor* to lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
- .4 Hazardous wastes to be separated, stored, and disposed of according to local regulations.
- .5 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.
- .6 Store volatile waste in covered metal containers, remove from premises at end of each *Working Day*.
- .7 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from *Place of the Work*, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.
- .8 Cover or wet down dry waste materials to prevent blowing dust and debris.

END OF SECTION

Part 1 General

1.1 OPERATION AND MAINTENANCE MANUAL

- .1 Prepare a comprehensive operation and maintenance manual, in the language of the contract, using personnel qualified and experienced for this task.
- .2 Submit an initial draft of the operation and maintenance manual for *Contract Administrator's* review. If required by *Contract Administrator's* review comments, revise manual contents and resubmit for *Contract Administrator's* review. If required, repeat this process until *Contract Administrator* accepts the draft manual in writing.
- .3 Two weeks prior to *Substantial Performance of the Work* submit final version to *Contract Administrator* in hard copy and electronic format. Provide three (3) hard copies.

1.2 OPERATION AND MAINTENANCE MANUAL FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, three D-rings, loose leaf, 216 x 279 mm, with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with typed or printed title "Operation and Maintenance Manual", name of Project or facility, and subject matter of contents.
- .5 Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate Product or system, with typed description of Product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide electronic copy of manual in PDF format.
- .10 Provide electronic copy of *Shop Drawings* in manual as 1:1 scaled drawings, format on USB flash drive or electronic media.

1.3 OPERATION AND MAINTENANCE MANUAL – GENERAL CONTENT

- .1 Table of contents for each volume.
- .2 Introductory information including:
 - .1 Date of manual submission.
 - .2 Complete contact information for *Contractor*, *Subcontractor* and *Contract Administrator* with names of responsible parties.
- .3 Schedule of *Products* and systems indexed to content of volume.
- .4 For each *Product* or system, include complete contact information for *Subcontractors*, *Suppliers* and *manufacturers*, including local sources for supplies and replacement parts.

- .5 *Product Data*: mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.
- .6 Reviewed *Shop Drawings*.
- .7 Permits, certificates, letters of assurance and other relevant documents issued by or required by authorities having jurisdiction.
- .8 Warranties.
- .9 Operating and maintenance procedures, incorporating manufacturer's operating and maintenance instructions, in a logical sequence.

1.4 OPERATION AND MAINTENANCE MANUAL - EQUIPMENT AND SYSTEMS CONTENT

- .1 Each Item of Equipment and Each System: include description of unit or system and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel Board Circuit Directories: Provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide *Contractor's* coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include testing and balancing reports.
- .15 Include additional content as specified in technical *Specifications* sections.

1.5 OPERATION AND MAINTENANCE MANUAL - PRODUCTS AND FINISHES CONTENT

- .1 Include Product data, with catalogue number, options selected, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured *Products*.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Include an outline of requirements for routine and special inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.
- .4 Include additional content as specified in technical *Specifications* sections.

1.6 OPERATION AND MAINTENANCE MANUAL - WARRANTIES CONTENT

- .1 Separate each warranty with index tab sheets keyed to Table of Contents listing.
- .2 List each warrantor with complete contact information.
- .3 Verify that documents are in proper form and contain full information. Ensure that warranties are for the correct duration and are in *Owner's* name.

1.7 FINAL RECORD DOCUMENTS

- .1 Prior to *Substantial Performance of the Work*, electronically transfer the marked up information from the record documents to a master set of drawings files provided by the *Contract Administrator* as follows:
- .2 Mark revised documents as "RECORD DOCUMENTS".
- .3 Employ a competent computer drafts person to indicate changes on the electronic set of record drawings.
- .4 Submit completed documents in .PDF format to *Contract Administrator*.
- .5 Final record documents to be submitted no later than thirty (30) days after *Substantial Performance of the Work*.

1.8 SPARE PARTS, MAINTENANCE, AND SPECIAL TOOLS

- .1 Supply spare parts, maintenance materials, and special tools in quantities specified in technical *Specifications* sections.
- .2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed *Products*.
- .3 Provide tags for special tools identifying their function and associated *Product*.
- .4 Deliver to and store items at location directed by *Consultant* and *Construction Manager* at *Place of the Work*. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.
- .5 Catalogue all items and submit to *Contract Administrator* an inventory listing organized by *Specifications* section. Include *Contract Administrator* reviewed inventory listing in operation and maintenance manual.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

PART 1 General

1.1 USE AND RELIANCE UPON GEOTECHNICAL REPORT INFORMATION

- .1 Geotechnical Report information is made available to Bidders to fulfill the City of Winnipeg's duty to disclose all relevant Project information to Bidders.
- .2 Bidders to interpret and draw their own conclusions about Geotechnical Project information. The City of Winnipeg assume no responsibility for such interpretations and conclusions.
- .3 Geotechnical Report information, or any part thereof, to not be construed as contract requirements unless also reflected in Drawings or Specifications, and in case of conflict the Drawings or Specifications will govern.
- .4 Bidders, acting reasonably, may rely on Geotechnical Report information in preparing their bids, subject to any qualifications stated in such Geotechnical Report information and unless expressly stated otherwise in this Section.
- .5 Reports, by their nature, cannot reveal all conditions that exist or can or might occur on the subject site. Should existing conditions be found or be a concern thereto, or to vary substantially from the Geotechnical Report, changes in the design and construction of foundations will be made as required.

1.2 GEO TECHNICAL REPORT INFORMATION

- .1 Geotechnical Reports; entitled as:
 - .1 Marketlands MXU Building – South Parcel, Geotechnical Investigation, Manitoba, dated September 2021 and prepared by: Dyregrov Robinson Inc.
 - .2 Reports attached as Appendix A.

PART 2 Products

2.1 (NOT USED)

PART 3 Execution

3.1 (NOT USED)

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3110.
 - .2 All referenced standard construction specifications found within CW 3110.
 - .3 All referenced standard details found within CW 3110.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3110.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3110.

Part 3 Execution

3.1 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3110.

END OF SECTION

Part 1 General

1.1 WORK INCLUDED

- .1 Comply with Division 1 - General Requirements and all documents referred to therein.
- .2 Provide all labour, materials, plant and equipment to complete the concrete formwork and falsework indicated in the Contract Documents, including the installation of cast in inserts and assemblies as therein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Concrete Reinforcement, Section 03 20 00 – Concrete Reinforcement.
- .2 Cast-in-Place Concrete, Section 03 30 00 – Cast-in-Place Concrete.
- .3 Concrete Floor Finishing, Section 03 35 10 – Concrete Floor Finishing.
- .4 Anchor assemblies, bolts and the like to be cast into concrete, Section 05 12 00 – Structural Steel.

1.3 REFERENCE STANDARDS, CODES AND ACTS

- .1 Conform to the requirements of the local building code identified on the Structural General Notes as amended by all subsequent Regulations issued to the date of this specification and applicable acts of authorities having jurisdiction.
- .2 All references to the Standards and publications noted below shall be to the edition referenced in the local building code identified on the Structural General Notes, or to the edition referenced in the latest published editions or revisions of all Standards published by the Canadian Standards Association issued to the date of this Specification, whichever is the later edition or revision.
- .3 All references noted below, which are not referenced by the local building code or the Standards published by the Canadian Standards Association, shall be to the latest edition and revision published to the date of this Specification.
- .4 Standards and publications referenced by the Standards noted below shall apply even if they are not included in the list. Where such reference is made, it shall be to that latest edition and revision published to the date of this Specification.

.1	CSA A23.1/ CSA A23.2	Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete
.2	CSA O86	Engineering Design in Wood
.3	CSA O121	Douglas Fir Plywood
.4	CSA O151	Canadian Softwood Plywood
.5	CSA O153	Poplar Plywood
.6	CSA O437 Series	OSB and Waferboard
.7	CSA O325.0	Construction Sheathing
.8	CSA S269.1	Falsework and formwork
.9	CAN/CSA-S269.3	Concrete Formwork

- .10 COFI (Council of Forest Industries of British Columbia) Exterior Plywood for Concrete Formwork
- .11 ACI 347.3R Guide to Formed Concrete Surfaces
- .5 Where there are differences between the Contract Documents and the codes, standards or acts, the most stringent shall govern.

1.4 TOLERANCES

- .1 Perform forming operations and place hardware so that finished concrete will be within the tolerances set out in CSA A23.1.
 - .1 Variations in building lines which result in extension of the building over lot lines or restriction lines will not be permitted.
- .2 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.5 QUALIFICATIONS

- .1 The formwork, falsework and reshoring shall be designed by a qualified professional engineer licensed by the authority having jurisdiction with a minimum of 5 years Canadian experience in the design of such temporary construction Work.

1.6 DESIGN

- .1 Formwork, falsework and reshoring.
 - .1 The Contractor shall design formwork, falsework and reshoring to safely support vertical and lateral loads until they can be supported by the structure.
 - .2 Design formwork to the requirements of CAN/CSA S269.3.
 - .3 Design falsework to the requirements of CSA S269.1.
- .2 Reshores in the lower storeys shall be capable of safely carrying the full weight of the concrete, falsework, formwork and all construction live loads posted to them prior to the removal of the first storey of shores supported by the lowest level of slab.
- .3 After reshores are removed from the first storey, the design and provision of reshores may be based on the assumption that each shored or reshored flexural member shares load in relation to its achieved strength, provided the flexural member has attained at least 70% of its specified 28 day strength.
- .4 Design shores for the slabs and beams to safely support the total vertical and lateral loads until the slabs and beams are complete and have reached 70% of their specified strength. Design the shores so that they can be unloaded gradually.

1.7 SUBMITTALS

- .1 Shop Drawings for Formwork, Falsework, and Reshoring
 - .1 The structural Drawings shall not be reproduced, in whole or in part, for use as shop drawings.
 - .2 Provide adequate space on all shop drawings immediately above the drawing title block for the Contract administrator's Shop Drawing review stamp. Where requested by the Contract administrator, the stamp is to be inserted by this section directly into the shop drawing prior to submission. The stamp shall be

positioned in the same location on each shop drawing, and in no case shall the allocated space be less than 63mm x 75mm. Request the details of these requirements from the Contract administrator no less than 2 weeks before the commencement of shop drawings.

- .3 Well in advance of construction, submit to the Contract administrator shop drawings showing the complete design and detailing of the slab formwork, falsework and reshoring systems stamped by a qualified professional engineer licensed by the authority having jurisdiction.
 - .4 As a minimum, the shop drawings shall show the following:
 - .1 All design assumptions including references to the relevant codes, standards and sets, design loads, assumed concrete placing rate and the like.
 - .2 Layout of formwork panels and shores;
 - .3 Formwork details related to stripping and reshoring;
 - .4 Camber;
 - .5 Sequence for installing reshores;
 - .6 Stripping schedule;
 - .7 Number of slabs reshored at any given time;
 - .8 Method, sequence, and schedule of construction, materials, arrangement of joints, form ties, shores, liners and locations of temporary embedded parts in architectural form concrete elements; and
 - .9 Complete details associated with forming sloped slabs together with placing and compaction procedures for sloping slabs, including details of construction and placing of top forms.
 - .5 Include in the shop drawing submission a method statement as to how the cambers specified in the Contract Documents will be achieved in the field.
- .2 Construction Joints
 - .1 Well in advance of construction, submit to the Contract administrator shop drawings showing the location of all horizontal and vertical construction joints in the structure. Drawings shall include plans, wall elevations and additional sections and details (as necessary) which clearly indicate the proposed location of the joints. Drawings shall include dimensions for all construction joints to reference grid lines and elevations.
 - .2 Drawings shall include any specific provisions or requirements where the elements are noted to be poured monolithically on the Contract Documents.
 - .3 Honeycombed Concrete
 - .1 Submit a proposed method statement for the repair of honeycombed concrete, including a list of suitable products, for the following depths of honeycombing:
 - .1 Less than 20 mm;
 - .2 20 mm to 60 mm; and
 - .3 Greater than 60 mm.
 - .4 Lift Drawings
 - .1 Submit lift drawings of the structure showing, all cast-in or embedded items, openings, recesses and sleeving required by the Work of all Specification

Sections, for the Contract administrator's review. Drawings shall be submitted a minimum of 30 days prior to the commencement of the reinforcement detailing of the area outlined on the lift drawings.

- .2 All embedded items, openings, sleeves and chases are not necessarily shown on the structural Drawings nor are their sizes or locations shown on the Drawings. Refer to architectural, mechanical and electrical Drawings and Specifications and the detailed shop drawings prepared for the Work of all Specification Sections for openings and sleeving requirements not shown, located and dimensioned on the structural Drawings.
 - .3 Openings, sleeves, chases embedded items and the like shall be fully dimensioned from grid lines in plan and floor levels in elevation. Information including sizes, dimensions, locations, elevations etc. shall be drawn to scale on a set of structural drawings.
 - .4 Openings and embedded items required for all aspects of the Work shall be shown and coordinated on a single set of lift drawings.
 - .5 Lift drawings are to be reviewed by the Contractor, prior to submission to the Contract administrator.
 - .6 The Contractor's review stamp shall be affixed to all lift drawings that are submitted for review.
- .5 Surveys
- .1 Submit surveys showing position of formwork, cast-in-place inserts and structural elements as noted below.
 - .2 As a minimum include the following:

- .1 Elevation and location of centreline with respect to grids of all piles;
- .2 Location of centreline of all columns with respect to grids at each floor level;
- .3 Location with respect to grids and horizontal alignment of all concrete walls at all floor levels;
- .4 Vertical alignment (plumbness) of all columns and walls at all floor levels;
- .5 Vertical alignment and elevator hoistway dimensions at all floor levels; and
- .6 Elevation of slab formwork and slabs at all columns, walls, centre of bays, midway between columns along gridlines and at cantilever ends, at points of maximum camber on all floor levels at the following times:
 - .1 Before concrete placement.
 - .2 After concrete placement, prior to removal of any formwork and reshores from below.
 - .3 Between 7 and 14 days after removal of all reshores immediately above and below the subject floor.
- .7 Location and alignment of edge of slabs with respect to grids at all floor levels;
- .8 Location and elevation of cast-in-place hardware at all levels; and
- .3 All surveys submitted must clearly indicate the date when the survey was carried out.
- .6 As-Built Drawings
 - .1 Mark on a complete set of final drawings any changes, additions or deletions that occur during construction as a result of the Contractor's Work, change orders, or for any other reason.
 - .2 For all shop drawings marked "Reviewed as Noted" or "Revise and Resubmit", update and submit a record set of these drawings at the completion of the structural Work. Ensure that these drawings reflect the changes and are coordinated with the final drawings noted above.

Part 2 Products

2.1 MATERIALS

- .1 Formwork
 - .1 Formwork lumber: Conform to O86.1 and CSA - O325.0.
 - .2 Falsework materials: Conform to CSA S269.1.
 - .3 Sheathings for exposed surfaces: New, Douglas Fir plywood not less than 19 mm thick, concrete form grade, sanded one side, conforming to CSA-O325.0.
 - .4 Preformed Steel Forms: Minimum 1.6 mm or 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

- .5 Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of the wet concrete mix until initial set.
- .6 Corners: Chamfered as required architecturally, in maximum lengths possible.
- .2 Waterstops
 - .1 Construction and Control Joints: Provide polyvinyl Chloride (PVC) waterstop Type 7 (internal type) or Base Seal Type 61 (external type) as manufactured by CPD Construction Products or an equivalent approved by the Contract administrator.
 - .1 Construction and Control Joints: Provide bentonite waterstop RX-101 as manufactured by ETCO.
 - .2 Movement Joints: Provide polyvinyl Chloride (PVC) waterstop Type 7C (internal type) or Baseal Type 62 (external type) as manufactured by CPD Construction Products or an equivalent approved by the Contract administrator.
- .3 Movement Joint Filler: Asphalt Fiber Movement Joint Filler by CPD Construction Products or approved equivalent.
- .4 Dovetail anchor slots: Minimum 0.8 mm thick (22 gauge) galvanized steel with insulation filled slots.
- .5 Flashing Reglets: Minimum 0.8mm (22 gauge) thick galvanized steel with alignment splines for joints.
- .6 Form Spacers: (Stay-in-place form spacers exposed to weather, earth, or moisture shall not be made of wood, and shall be corrosion and decay resistant.)

Part 3 Execution

3.1 PRE-CONSTRUCTION CONFERENCE

- .1 At least 60 days prior to the commencing of concrete construction, the Contractor shall hold a pre-construction meeting to review the requirements of the project.
 - .1 The Contractor shall ensure responsible representatives of every party that is involved in the concrete Work attend the conference, including but not limited to the following:
 - .1 The Contractor
 - .2 Subcontractor responsible for Concrete Forming
 - .3 Concrete Supplier
 - .4 Reinforcement Fabricator/Placer
 - .5 All Inspection and Testing Agencies
 - .6 Contract administrator
 - .7 City of Winnipeg
 - .2 Minutes of the meeting shall be recorded and distributed to all parties within 5 days of the meeting.

3.2 CONCRETE WORK AT EXISTING STRUCTURE

- .1 Prior to undertaking any Work in or adjacent to the existing structure, verify that conditions are as indicated on the Contract Documents. If they are not, do not proceed until the Contract administrator has given instructions.
- .2 Protect and support existing services that may interfere with Work in the existing structure.

3.3 EARTH FORMS

- .1 Earth forms are only permitted where shown on the Contract Documents.
- .2 Hand trim sides and bottom of earth forms. Remove loose soil and water prior to placing concrete.

3.4 FORMWORK

- .1 General
 - .1 Erect, support, brace, and maintain formwork to safely support vertical and lateral loads until they can be supported by the structure.
 - .2 All falsework erection shall be supervised by the professional engineer responsible for its design.
 - .3 All formwork shall be inspected by the Contractor and the professional engineer responsible for its design, prior to the concrete pour to ensure that they have been erected in conformance with the formwork shop drawings.
 - .4 Align joints in formwork and make water-tight. Keep form joints to a minimum.
 - .5 Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing prior to concreting.
- .2 Construction
 - .1 Form pile cap and slab sides unless pile cap and slab sides are shown to be placed against undisturbed soil in the Contract Documents.
 - .2 Mark building, grid or other lines on forms to permit the accurate positioning of dowels into concrete elements above and all other reinforcing steel.
 - .3 Construct templates and supports to rigidly fix reinforcing dowels in the forms prior to concreting.
 - .4 Set anchor rods, templates, steel connection units, hardware, and/or other inserts into the forms and secure them rigidly so that they do not become displaced during concreting.
 - .5 In the case of sloping slabs, employ suitable forming procedures compatible with the concrete placing and compaction techniques to ensure that completed concrete has the design characteristics specified in the Contract Documents, and in particular, to prevent movement of plastic concrete resulting in cracking, loss of bond, etc., and to achieve a surface equivalent to a fine wood float finish suitable to receive the roofing membrane.

- .6 Application of Form Release Agent
 - .1 Apply form release agent in accordance with the manufacturer's recommendations.
 - .2 Apply prior to placement of reinforcement, anchoring devices, and embedded items.
 - .3 Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings, which are affected by the agent. Soak inside surface of untreated forms with clean water and keep surfaces covered prior to placement of concrete
- .3 Sleeves, Recesses and Formed Openings
 - .1 Form sleeves, recesses and openings in accordance with reviewed sleeving drawings, except where such items are specified to be formed or sleeved by the appropriate Section in the Contract Documents.
 - .2 No sleeves, recesses, or openings through structural members shall be formed without the Contract administrator's approval.
 - .3 During cold weather, protect members from damage due to water freezing in confined areas, recesses, sleeves or formed 'openings'.
- .4 Cambers
 - .1 Where indicated in the Contract Documents, camber formwork such that hardened concrete, prior to stripping of forms, is cambered as indicated. Maintain beam depth and slab thickness indicated on the Contract Documents.

3.5 STRIPPING OF FORMS AND RESHORING

- .1 Where forms are stripped from horizontal or sloping members before concrete has reached its specified strength, reshore the members so that they can safely support their own load plus construction loads. In addition, ensure that the stripped member is of sufficient strength to safely carry its own weight over the area stripped out at any instant, together with any superimposed construction loads.
 - .1 Install reshores so that they are supported on members which can safely support the reshore load.
 - .2 As a guide, under the curing conditions specified in the Contract Documents, 70% of the 28 day strength should be attained 7 days after concreting in normal weather and 14 days after concreting in "Cold Weather".
 - .3 Base decision to strip forms upon satisfactory results of 7 day concrete cylinder tests and on Site curing conditions or on in situ tests.
 - .4 Stripping and reshoring shall proceed simultaneously so as not to leave an area greater than 80 sq. m. unsupported by either formwork or reshoring at any instant. Install reshores tight to construction above and below so that they will not significantly shorten under load, but take care not to preload the construction below or raise the construction above by over-tightening.
 - .5 Maintain reshoring or formwork in place for a minimum of 28 days or for such longer time as may be required to ensure that the concrete has reached its specified 28 day strength.
 - .6 Do not strip within one and a half bays of a construction joint until new concrete beyond the construction joint has reached 70% of its specified 28 day strength.

- .7 Side forms for vertical members may be stripped as soon as the concrete is sufficiently strong to stand unsupported and safely resist imposed loads.

3.6 CONSTRUCTION JOINTS

- .1 Obtain approval from the Contract administrator for location and details of construction joints not shown on the Contract Documents.

3.7 WATERSTOPS

- .1 Install waterstops in accordance with the manufacturer's requirements, to provide continuous water seal. Do not distort or pierce waterstop. Do not displace reinforcement when installing waterstops. Tie waterstops rigidly in place.
- .2 Splice waterstops in accordance with the manufacturer's requirements.
- .3 Where waterstops are noted to be installed adjacent to existing Work, prepare existing surfaces to receive waterstop in accordance with manufacturer's recommendations.

3.8 QUALITY CONTROL

- .1 Implement a system of quality control to ensure that the minimum standards specified in the Contract Documents are attained.
- .2 Bring to the attention of the Contract administrator any defects in the Work or departures from the Contract Documents which may occur during construction. The Contract administrator will decide upon corrective action and give recommendations in writing.
- .3 The Contract administrator general review during construction and inspection and testing by independent inspection and testing companies reporting to the Contract administrator are both undertaken to inform the City of Winnipeg of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of its contractual responsibility.

3.9 NOTIFICATION

- .1 Prior to commencing significant segments of the Work, give the Contract administrator and independent inspection and testing companies appropriate notification so as to afford them reasonable opportunity to review the Work. Failure to meet this requirement may be cause for the Contract administrator to classify the Work as defective.

3.10 INSPECTION AND TESTING

- .1 The City of Winnipeg or Contract administrator will appoint an independent inspection and testing companies to make inspections or perform tests as the Contract administrator directs. The independent inspection and testing companies shall be responsible only to the Contract administrator, and shall make only such inspections or tests as the Contract administrator may direct.

3.11 DEFECTIVE MATERIALS AND WORK

- .1 Where evidence exists that defective Work has occurred or that Work has been carried out incorporating defective materials, the Contract administrator may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the Work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be

made at the Contractor's expense, regardless of their results, which may be such that, in the Contract administrator 's opinion, the Work may be acceptable.

- .2 All testing shall be conducted in accordance with the requirements of the Building Code, except where this would, in the Contract administrator's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Contract administrator.
- .3 Materials or Work which fail to meet the requirements Specified in the Contract Documents may be rejected by the Contract administrator whenever found at any time prior to the Total Performance of the Work regardless of previous inspection. If rejected, defective materials or Work shall be promptly removed and replaced or repaired to the satisfaction of the Contract administrator, at no expense to the City of Winnipeg.

END OF SECTION 03 10 00

Part 1 General

1.1 WORK INCLUDED

- .1 Comply with Division 1 - General Requirements and all documents referred to therein.
- .2 Provide all labour, materials, plant and equipment to complete the steel reinforcement Work indicated in the Contract Documents and specified in this Section.

1.2 RELATED SECTIONS

- .1 Cast-in-place concrete, Section 03 30 00 – Cast-In-Place Concrete.

1.3 REFERENCE STANDARDS, CODES AND ACTS

- .1 Conform to the requirements of the local building code identified on the Structural General Notes as amended by all subsequent Regulations issued to the date of this Specification and applicable acts of authorities having jurisdiction.
- .2 All references to the Standards and publications noted below shall be to the edition referenced in the local building code identified on the Structural General Notes, or to the edition referenced in the latest published editions or revisions of all Standards published by the Canadian Standards Association issued to the date of this Specification, whichever is the later edition or revision.
- .3 All references noted below, which are not referenced by the local building code or the Standards published by the Canadian Standards Association, shall be to the latest edition and revision published to the date of this Specification.
- .4 Standards and publications referenced by the Standards noted below are to apply even if they are not included in the list. Where such reference is made, it shall be to that latest edition and revision published to the date of this Specification.
 - .1 ASTM A82/A82M Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A185/A185M Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .3 ASTM A496/A496M Steel Wire, Deformed, for Concrete Reinforcement.
 - .4 ASTM A497/A497M Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - .5 ASTM A704/A704M Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
 - .6 ASTM D3963/D3963M Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
 - .7 CSA A23.1/ CSA A23.2 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete
 - .8 CSA A23.3 Design of Concrete Structures.
 - .9 CSA S304.1 Design of Masonry Structures
 - .10 CSA A371 Masonry Construction for Buildings

- .11 CAN/CSA G30.18 Carbon Steel Bars for Concrete Reinforcement.
- .12 CAN/CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .13 CSA W186 Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .14 RSIC (Reinforcing Steel Institute of Canada) – Manual of Standard Practice.
 - .1 Where there are differences between the Contract Documents and the codes, standards, or acts, the most stringent shall govern.

1.4 QUALIFICATIONS

- .1 The Contractor shall ensure that those responsible for welding reinforcement shall be certified by the Canadian Welding Bureau under the requirements of W186.

1.5 SAMPLES AND ASSISTANCE

- .1 Supply samples of the following materials, the cost of which shall be paid for by the Contractor:
 - .3 Replace samples removed from the Site as necessary.
 - .4 Inform the Contract administrator when fabrication will be undertaken. Allow Contract administrator to access the fabricator's plant during fabrication process.

1.6 SUBMITTALS

- .1 Shop Drawings for Reinforcement
 - .1 The structural Drawings shall not be reproduced, in whole or in part, for use as shop drawings.
 - .2 Prepare reinforcement shop drawings and bar lists taking into account all openings and recesses shown on the architectural, structural, mechanical and electrical Drawings, and on the sleeving shop drawings prepared by all other Sections.
 - .3 Prepare shop drawings to a minimum scale of 1:50 or larger as deemed necessary by the Contractor. Shop drawings shall be clear and complete and shall allow placement of reinforcement without reference to the Contract Documents.
 - .4 Provide adequate space on all shop drawings immediately above the drawings title block for the Contract administrator's shop drawing review stamp. Where requested by the Contract administrator, the stamp is to be inserted by this section directly into the shop drawing prior to submission. The stamp shall be positioned in the same location on each shop drawing, and in no case shall the allocated space be less than 63 mm x 75 mm. Request the details of these requirements from the Contract administrator no less than 2 weeks before the commencement of shop drawings.
 - .5 Detail reinforcement in accordance with the Contract Documents, CSA A23.1, CSA S304.1 and detailing standards in RSIC Manual of Standard Practice.
 - .6 As a minimum, the shop drawings shall show the following:
 - .1 Bar sizes, spacing, lap lengths, location and quantities of reinforcement and welded wire fabric.

- .2 Mechanical splices.
- .3 Bar spacing requirements and provisions for spacers where required.
- .4 Locations where reinforcement is considered to be bundled, as defined by CSA A23.1.
- .5 Identification of each bar with a code mark corresponding to the bar lists.
- .6 Detail sections to fully illustrate placement of concrete reinforcement at areas such as openings, change of levels, spandrel elements, stairs and wherever else required.
- .7 Large scale detail concrete sections at areas of steel concentrations such as at intersections of beams and columns, column splices or wherever else required.
- .8 Placing sequence for areas with multiple layers of reinforcement.
- .9 Minimum clearances between reinforcement and minimum concrete cover.
- .10 Location, number and type of support accessories, including support bars suitably sized and spaced to rigidly support the weight of reinforcement and imposed loads during construction. Where 10M top bars and welded wire fabric are shown in the Contract Documents, provide adequate supports to ensure that these bars are not bent or displaced prior to or during the concreting operation.
- .11 Location and embedment of dowels.
- .12 Location of joint reinforcement in masonry walls.
- .13 The size, location, and elevation of mechanical splices, as well as required installation procedures.
- .14 Large-scale detail masonry sections at areas of steel concentrations such as at intersections of walls, beams, or wherever else required.
- .15 Detail sections to fully illustrate placement of masonry reinforcement at areas such as openings, at support of precast slabs, masonry beams and lintels, and wherever else required.
- .7 Provide dowels for reinforced masonry walls (load bearing or non load bearing) from slabs and walls. Coordinate location of walls with architectural Drawings.
- .8 Submit code marks or symbols used on reinforcement of each manufacturer so that the Contract administrator may identify grades and sizes of reinforcement.
- .2 Certificates
 - .1 Reinforcement from Canadian Manufacture: Provide the Contract administrator with a certified copy of the mill test reports for reinforcing steel showing physical and chemical analysis. For weldable reinforcement, include verification of its weldability. Reports to be submitted a minimum of 4 weeks prior to commencing fabrication.
 - .2 Reinforcement from Non-Canadian Manufacture: Provide test data from a Canadian Testing Laboratory proving that each size and grade of reinforcement proposed meets the requirements of the Contract Documents. Reinforcement approved by the Contract administrator as suitable for use shall be identified in a manner suitable to the Contract administrator. Only steel that has been approved by the Contract administrator will be accepted on the job Site.

- .3 As-Built Drawings
 - .1 Mark on a complete set of final drawings any changes, additions, or deletions that occur during construction as a result of the Contractor's Work, change orders, or for any other reason.
 - .2 For all shop drawings marked "Reviewed as Noted" or "Revise and Resubmit", update and submit a record set of these drawings at the completion of the structural Work. Ensure that these drawings reflect the changes and are coordinated with the final drawings noted above.

1.7 TOLERANCES

- .1 Perform fabrication and setting so that completed Work will be within the tolerances set out in CSA A23.1.
- .2 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

Part 2 Materials

2.1 REINFORCEMENT

- .1 Reinforcing Steel, Deformed: Canadian manufacture to CAN/CSA-G30.18, billet steel, Grade 400R, regular bars and 400W, weldable bars.

2.2 ACCESSORIES

- .1 Minimum gauge as required for support of stability of steel reinforcement during reinforcement placement and concreting operation.
- .2 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions [including load bearing pad on bottom to prevent vapour barrier puncture].
- .3 Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size, and shape as required.
- .4 Special Bar Supports for Reinforced Soil/Rock: Use precast concrete supports for exposed concrete beams and soffits and concrete cast against soil/rock. Precast concrete supports shall be made of concrete quality, class and strength at least equal to that specified in the Contract Documents for the member in which they are used.
- .5 Special Chairs, Bolsters, Bar Supports, Parking Structures and other structures containing Class 'C1' concrete: Support Accessories for [suspended parking garage slabs, ramps and the like] [provisions for future cathodic protection]: An approved plastic or non-corroding type of chair, bolster or spacer of sufficient strengths to rigidly support the weight of reinforcement and construction loads. Do not use plastic coated tipped steel chairs.

Part 3 Execution

3.1 FABRICATION

- .1 Fabricate reinforcement in accordance with:

- .1 CSA A23.1.
- .2 RSIC - Reinforcing Steel Manual of Standard Practice.
- .3 CSA-W186 Welded reinforcement.
- .2 Locate reinforcement splices not indicated on the Drawings, at point of minimum stress. Review location of splices with the Contract administrator. Stagger splices to minimize cross sectional area at any one point in beams and walls.
- .3 Unless noted otherwise in the Contract Documents, bend reinforcement once only and at room temperature of 18°C, do not straighten or rebend reinforcement and do not field bend reinforcement. Do not use bars with kinks or bends not shown on the Drawings. Replace bars which develop cracks or splits.

3.2 PLACEMENT

- .1 Prior to placing concrete, place support and secure reinforcement against displacement to CSA 23.1 and as indicated on reviewed placing drawings.
- .2 Do not displace or damage vapour barrier during reinforcement placement.
- .3 Accommodate placement of formed openings.
- .4 Maintain concrete cover as noted on the Contract Documents.
- .5 Where continuous drop panels or slabs thickenings are noted on the Drawings, place bottom slab reinforcement in the bottom of the continuous drop panel or slab thickening, unless noted otherwise on the Drawings.
- .6 Provide splices only where shown on the Contract Documents or reviewed shop drawings. No other splices will be permitted without approval of the Contract administrator.
- .7 Lap ends and sides of welded wire fabric as noted on the Drawings, but in no case less than 300 mm.
- .8 Take particular care not to damage form sheathing surfaces during installation of reinforcement.

3.3 QUALITY CONTROL

- .1 Provide a system of quality control to ensure that the minimum standards specified in the Contract Documents are attained.
- .2 Bring to the attention of the Contract administrator any defects in the Work or departures from the Contract Documents which may occur during Construction. The Contract administrator will decide upon corrective action and give recommendations in writing.
- .3 The Contract administrator's general review during construction and inspection and testing by the independent inspection and testing companies are both undertaken to inform the City of Winnipeg of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of its contractual responsibilities with respect to quality control.
- .4 Prior to commencing significant segments of the Work, give the Contract administrator and independent inspection and testing companies appropriate notification so as to afford them reasonable opportunity to review the Work. Failure to meet this requirement may be cause for the Contract administrator to classify the Work as defective.

3.4 INSPECTION AND TESTING

- .1 The City of Winnipeg or Contract Administrator will appoint the independent inspection and testing companies to make inspections or perform tests as the Contract administrator directs. The independent inspection and testing companies shall be responsible only to the Contract administrator, and shall make only such inspections or tests as the Contract administrator may direct.
- .2 When defects are revealed, the Contract administrator may request, at the Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.
- .3 Tests of reinforcing steel by independent inspection and testing companies.
 - .1 A series of specimens for each grade and size of reinforcing steel contained in any 100 tonnes and 10 tonnes for concrete reinforcement and masonry reinforcement respectively may be tested. A series of tests will include two bars for each test required of each size and grade of steel used. Reinforcing steel tests will be made in accordance with CSA Standards G30 Series.
 - .2 Nondestructive tests may be made on welded reinforcement.

3.5 DEFECTIVE MATERIALS AND WORK

- .1 Where evidence exists that defective Work exists or that Work has been carried out incorporating defective materials, the Contract administrator may have tests, inspections or surveys performed, analytical calculations of structural strength made, and the like, in order to help determine whether the Work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Contract administrator's opinion, the Work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of the Building Code, except where this would, in the Contract administrator's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Contract administrator.
- .3 Materials or Work which fails to meet the requirements specified in the Contract Documents may be rejected by the Contract administrator whenever found at any time prior to the Total Performance of the Work regardless of previous inspection. If rejected, defective materials or Work shall be promptly removed and replaced or repaired to the satisfaction of the Contract administrator, at no expense to the City of Winnipeg.

END OF SECTION 03 20 00

Part 1 General

1.1 WORK INCLUDED

- .1 Comply with Division 1 - General Requirements and all documents referred to therein.
- .2 Provide all labour, materials, plant and equipment to complete the cast-in-place concrete Work indicated on the Drawings and specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Concrete Reinforcement, Section 03 20 00 – Concrete Reinforcement.
- .2 Backfilling beneath slabs, Section 31 23 33.01 – Excavating, Trenching and Backfill

1.3 REFERENCE STANDARDS, CODES AND ACTS

- .1 Conform to the requirements of the local building code identified on the Structural General Notes as amended by all subsequent Regulations issued to the date of this Specification and applicable acts of authorities having jurisdiction.
- .2 All references to the Standards and publications noted below shall be to the edition referenced in the local building code identified on the Structural General Notes, or to the edition referenced in the latest published editions or revisions of all Standards published by the Canadian Standards Association issued to the date of this Specification, whichever is the later edition or revision.
- .3 All references noted below, which are not referenced by the local building code or the Standards published by the Canadian Standards Association, shall be to the latest edition and revision published to the date of this Specification.
- .4 Standards and publications referenced by the Standards noted below are to apply even if they are not included in the list. Where such reference is made, it shall be to that latest edition and revision published to the date of this Specification.
 - .1 CSA A23.1/ CSA A23.2 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete
 - .2 CSA A23.3 Design of Concrete Structures
 - .3 CSA A3000 Cementitious Materials Compendium.
- .5 Where there are differences between the Specifications and Drawings and the codes, standards or acts, the most stringent shall govern.

1.4 TOLERANCES

- .1 Perform placing operations so that completed Work will be within the tolerances set out in CSA A23.1.
- .2 Variations in building lines which result in extension of the building over lot lines or restriction lines will not be permitted.
- .3 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

1.5 QUALIFICATIONS

- .1 The 'foreperson' or 'lead hand' supervising the placement, consolidation, finishing and curing of the concrete shall be certified under an industry recognized concrete finishing program, such as the ACI Concrete Flatwork Finisher/Technician Certification Program.
- .2 The concrete supplier shall be certified by Concrete Manitoba and shall hold a current certification as "Producer Member" as issued by Concrete Manitoba.
- .3 Where concrete toppings are specified in the Contract Documents, the Contractor shall ensure that the concrete flooring contractor assumes responsibility for all aspects of the topping construction. This will include, but is not limited to the base course or substrate preparation, review of concrete mix design, concrete supply, bonding agents, placing, finishing and curing etc.

1.6 CONCRETE MIX DESIGN

- .1 Design of Concrete Mixes
 - .1 Concrete mixes are to be designed in accordance with the Performance Alternative outlined in CSA A23.1. The mixes shall be designed such that they will be homogeneous, uniformly workable, readily placeable into corners and angles of forms and around reinforcement by the methods of placing and consolidation employed on the Work, but without permitting materials to segregate or without permitting excessive free water to collect on the surface. The concrete, when hardened, shall have the qualities specified in the Contract Documents and in the concrete mix design.
 - .2 When designing the concrete mixes, the Contractor shall ensure that the supplier is cognizant of the curing requirements outlined in the Contract Documents and CSA A23.1. If a particular concrete mix requires curing in addition to that specified, the Contractor shall be responsible for providing this additional curing.
 - .3 Specified Strength: As called for on Drawings. Where walls are integral with columns of different specified strengths, cast walls and columns with concrete of the higher specified strength.
 - .4 Modulus of Elasticity (E): For each concrete mix design, the Modulus of Elasticity, shall not to be less than $(3300\sqrt{f'_c} + 6900) \times (Y_c/2300)^{1.5}$ MPa.
 - .5 Fly Ash: The use of fly ash in concrete that will be exposed to view or in concrete that will be exposed to freeze-thaw cycles or de-icing chemicals is subject to review and acceptance by the Contract administrator.
 - .6 Use of calcium chloride shall not be permitted.
 - .7 The Contractor shall coordinate the mix designs for suitability with concrete pumping.
 - .8 The Contractor shall design concrete mixes so they maintain their workability based on assumed minimum discharge and placing rates.
- .2 Toppings
 - .1 Design mix in accordance with requirements of Contract Documents and provisions of CSA A23.1.

1.7 SAMPLES AND ASSISTANCE

- .1 Concrete Test Cylinders
 - .1 Supply materials for concrete test cylinders, the cost of which shall be paid for by the Contractor.
 - .2 Cooperate in the execution of the concrete quality testing program. Furnish concrete required, protect specimens against injury and loss, and assist in the sampling and storage of specimens, as required.
 - .3 Sample concrete, cast cylinders and store in accordance with CSA A23.1 where directed by the Contract administrator.
 - .4 For all concrete compressive strength tests, 100mm x 200mm cylinders shall be used.

- .5 Provide sufficient field curing storage facilities so that cylinders representing the various areas can be safely stored in locations representing the curing conditions for those areas. Move the field cured cylinder storage facilities from area to area as the Work progresses.
- .2 Pullout Tests
 - .1 If requested by the Contract administrator, install pullouts to the requirements of the inspection and testing company.
 - .2 Installation of pullouts shall comply with the requirements of ASTM C900 and ACI 228.1.
- .3 Maturity Tests
 - .1 If pull-out tests are required, maturity meters shall be used to determine when pullout tests can be made.
 - .2 Installation, equipment and procedures shall comply with ACI 228R.
- .4 Substrate (Soil) Inspection
 - .1 Assist the geotechnical testing agency in making their inspections or tests.

1.8 SUBMITTALS

- .1 Surveys
 - .1 Submit surveys in accordance with Section 03 10 00 - Concrete Forming
- .2 Certificates
 - .1 The Contractor shall ensure that the concrete supplier submits a current “Producer Member” certification, as issued by Concrete Manitoba.
 - .2 Prior to beginning Work and when any change in materials or source of supply is proposed, provide the following certificates prepared by an independent inspection company;
 - .1 Certification that all raw materials used in the production of concrete proposed for the Work comply with the requirements of the Specifications and CSA A23.1.
 - .2 Certification that compressive strength, slump, entrained air content, and other specified properties will be met, using the proposed mixes.
 - .3 Certification that classes of exposure C-1, A-1 and C-XL will meet the 56-day limits specified in CSA A23.1 for the rapid chloride permeability test, using the proposed mixes.
 - .4 Certification that the chloride ion content in the concrete, before exposure, shall not exceed 0.06% by mass of the cementing materials.
 - .5 Certification that classes of exposure S-1, S-2 and S-3 will meet the maximum expansion limits for the temperature and age specified in CSA A23.1, using the proposed mixes.
 - .6 Certification that calcium chloride or any admixture formulation containing chloride shall not be used in concrete with classes of exposure S-1 and S-2.

- .3 The Contractor shall ensure that the concrete supplier submits representative chloride permeability test data distributed over a period of 56 days for concrete exposure classes C-1, A-1 and C-XL with and without calcium nitrite corrosion inhibitor or any other admixture containing ionic salts.
 - .4 The Contractor shall ensure that the concrete supplier submits their most current “Concrete Mix Design Statistical Analysis” records for the proposed concrete plant. These records shall indicate the concrete supplier’s average strength, standard deviation, coefficient of variation and target strength, as per the requirements of CSA-A23.1 and Concrete Manitoba.
- .3 Concrete Mix Designs
- .1 Well in advance of the supply of concrete to the project submit all concrete mix designs for review. The mix designs shall include, as a minimum the following information:
 - .1 Concrete strength;
 - .2 Type of hydraulic cement;
 - .3 Exposure class;
 - .4 Water-cement ratio;
 - .5 Maximum aggregate size;
 - .6 Maximum SCM replacement;
 - .7 Additional durability and architectural requirements;
 - .8 Slump range;
 - .9 Plastic air range;
 - .10 Method of placement;
 - .11 Dosage of corrosion inhibitor;
 - .12 Class of HVSCM (1 or 2);
 - .13 Other specific information regarding the source and type of all materials being proposed;
 - .14 Source of Supplementary Cementing Materials (SCM’s).
 - .15 Assumed minimum discharge and placing rates.
 - .2 Describe in detail on the mix design summary, the location(s) where each mix is to be placed in the structure.
- .4 Concrete Quality Plan
- .1 At least four weeks prior to the supply of concrete to the project, submit a complete “Concrete Quality Plan”.
- .5 Sloped Concrete Slabs
- .1 Well in advance of construction, submit complete details of placing and compaction procedures for sloping roofs, including details of construction and placing of top forms and top form panel.
- .6 Curing Procedures
- .1 At least four weeks prior to implementation in the field, submit a detailed description of the procedures which will be employed to cure the structure.
 - .2 As a minimum, the procedures shall indicate:

- .1 The method for protecting the concrete from evaporation of surface moisture from the fresh concrete;
 - .2 The type of curing method to be used;
 - .3 Details of how various surfaces will be cured (slabs, walls, columns, ramps etc.)
 - .4 How the surface will be kept moist, and the quality control requirements for keeping the surface moist;
 - .5 The time of initiation and duration of curing;
 - .6 Provisions to address potential problems such as high winds and hot and cold weather;
 - .7 The limitations of access, if any, to the surfaces being cured; and
 - .8 A Quality assurance/Quality control program detailing how the curing program will be implemented, monitored and documented.
- .3 Submit a 300mm x 300mm sample of each type of material (absorptive mat, fabric, plastic film, waterproof paper etc.) which will be used to cure the concrete.

Part 2 Products

2.1 MATERIALS

- .1 Concrete: Normal density concrete with an air-dry density between 2350 and 2450 kg/m³. Conform to CSA A23.1.
- .2 Cement Type: HS High Sulphate Resistant Portland Cement in all concrete in contact with soil or groundwater, and GU General Use Portland Cement or GUL General Use Portland-limestone Cement in all other concrete.
- .3 Supplementary Cementing Materials: Conform to CSA.A3001 Fly Ash, Type F, CI, CH, Ground Blast Furnace Slag, Type S, Silica Fume, Type SF.
- .4 Water: Clean, potable and not detrimental to concrete.
- .5 Nominal Size of Coarse Aggregate: 20 mm, except as noted below.
 - .1 Use pea gravel (5 mm to 10 mm) where concentration of reinforcement requires the use of a smaller diameter aggregate.
 - .2 Use 10 mm (maximum) aggregate in toppings that are less than or equal to 75 mm in thickness, and 20 mm aggregate in toppings greater than 75 mm in thickness.
- .6 Admixtures: Conform to CSA A23.1.
 - .1 Corrosion Inhibitor Admixture: Calcium nitrite based corrosion inhibitor, such as "DCI" or "DCI(S)" by W.R. Grace & Co. (or approved equivalent), shall be added at the rate of 10.1 litres per cubic metre of concrete, to all concrete designated Exposure Class 'C-1', unless noted otherwise in the Contract Documents. The corrosion inhibitor shall contain 30 ± 3 percent of calcium nitrite by weight. The selection of "DCI" or "DCI(S)" (or approved equivalent) shall be as directed by the admixture supplier, based on anticipated placing and curing conditions and the specific concrete mix design selected.

- .7 Curing Compound: Conform to CSA A23.1.
- .8 Grout Beneath Base Plates: Non-shrink flowable grout in-Pakt by King Construction Products or approved equivalent, having a compressive strength at 28 days of at least 35 MPa. Where grout is exposed to view or weather, use non-ferrous grout.
- .9 Unshrinkable Fill
 - .1 Cement type-General Use GU Portland
 - .2 Minimum 24 hour strength - 0.07 MPa
 - .3 Maximum 28 day strength - 0.4 MPa
 - .4 Class of exposure - Not Applicable
 - .5 Size of coarse aggregate - 20 mm to 40 mm
 - .6 Slump at point of discharge - 150 mm to 200 mm
 - .7 Calcium chloride or pozzolanic mineral admixtures shall not be used. Air entraining admixtures may be added if desired by the Contractor.
- .10 Sealant for Exposed Separation Strips, Construction Joints, and Temporary Opening Joints: Multi-Component Polyurethane 'Sikaflex 2C-SL' by Sika, or an equivalent approved by the Contract administrator.

Part 3 Execution

3.1 GENERAL

- .1 Ensure minimum concrete discharge and placing rates are maintained to avoid unexpected cold joints from forming in the structure.

3.2 PRE-POUR MEETING

- .1 Prior to the initial supply of concrete to the project, the Contractor must schedule a "pre-pour meeting" as outlined in the concrete supplier's concrete quality plan.

3.3 CONSTRUCTION JOINTS

- .1 Obtain approval from the Contract administrator for location and details of construction joints not shown on the structural Drawings.
- .2 Provided proper placing, curing and protection means and methods are employed by the Contractor, the maximum length/height of concrete pours shall be as follows:
 - .1 The maximum length of a suspended concrete slab pour shall be 40 m.
- .3 If the construction joints (including joints around temporary openings) will be exposed in its permanent condition, the joints must be caulked as outlined in this Specification.

3.4 UNSHRINKABLE FILL

- .1 Unshrinkable fill is intended for use locally in place of granular backfill below slabs-on-grade or within excavations where compaction of granular material is difficult to achieve. It is not intended for use below footings or around foundation walls, tunnels, laterally loaded caissons, etc., where vertical and/or lateral structural bearing capacities are required. Obtain written approval from the Contract administrator prior to using unshrinkable fill.
- .2 The unshrinkable fill material shall flow into the excavation so that it fills the entire space. Care shall be taken to ensure that no air is entrapped beneath horizontal projections or in other locations within the excavation.
- .3 Where bracing, shoring and/or sheeting is used to support the sides of the excavation or to prevent movements that could damage other services or adjacent pavements, this support system shall be removed as backfilling proceeds.

3.5 SLOPING SLABS

- .1 In the case of sloping slabs, employ suitable concrete placing and compaction procedures to ensure that completed concrete has the specified design characteristics, and in particular, to prevent movement of plastic concrete resulting in cracking, loss of bond, etc. and to achieve a surface equivalent to a fine wood float finish suitable to receive the roofing membrane.

3.6 PLACING CONCRETE

- .1 Place all concrete in accordance with CSA A23.1, the concrete supplier's requirements and as specified in this Section.
- .2 Immediately before placing concrete, clean forms and reinforcement of foreign matter.
- .3 Discharge concrete into forms in accordance with the time frames specified in CSA A23.1.
- .4 Place concrete on steel deck floors in a manner that avoids piling up of concrete. Do not drop concrete directly from buckets, but employ suitable means of distribution. Wet down deck during hot weather prior to concreting.
- .5 Remove concrete spilled onto forms around hoisting equipment before depositing concrete in these areas.
- .6 Pumping Concrete
 - .1 Pumping or pneumatic placing of concrete shall only be used if the velocity of discharge is reduced to a point where no separation or scattering of the concrete occurs, and the consistency of the mix has been designed to allow such a system with no adverse effects on the quality of concrete.
 - .2 The shotcrete process shall be deemed as being in contravention of the above clause.
 - .3 Excess grout or mortar used to lubricate pipelines, or washout water, must not be discharged into the forms.
- .7 Shotcrete
 - .1 The use of shotcrete to construct any part of the Work shall be at the sole discretion of the Contract administrator.

3.7 CURING CONCRETE

- .1 Cure all concrete in accordance with CSA A23.1, the concrete supplier's requirements and as specified in this Section. Wet Curing
- .2 HVSCM Concrete
 - .1 Cure all HVSCM concrete in accordance with the requirements of CSA A23.1. Wet curing shall commence immediately after placement and finishing of concrete.
- .3 Wet Curing
 - .1 The following provisions apply to HVSCM-1 concrete.
 - .2 Basic Curing Period - the concrete shall be protected from premature drying and extremes of temperatures, and shall be wet cured at a temperature of at least 10°C for a period of three (3) consecutive days. Wet curing shall commence immediately after placement and finishing of the concrete.
 - .3 Additional Curing for Durability - Immediately following the Basic Curing Period, continue to wet cure the concrete (at a minimum temperature of 10°C for an additional four (4) consecutive days or until the concrete reaches 70% of its 28 day compressive strength, whichever is greater.
 - .4 Wet curing is to be achieved using one or more of the techniques outlined in CSA A23.1.
 - .5 If an absorptive mat or fabric material is used, it is imperative that it be kept continuously wet, by means of sprinklers, soaker hoses, a layer of polyethylene sheeting above, or another acceptable means.
 - .6 The use of curing compounds shall not be permitted in these areas.

3.8 PROTECTION

- .1 Protect all concrete in accordance with CSA A23.1, the concrete supplier's requirements and as specified in this Section; to prevent freshly deposited concrete from adverse conditions such as high winds, precipitation, freezing, being exposed to abnormally high temperatures or temperature differentials, premature drying, and moisture loss, for a period of time necessary to develop the specified properties of the concrete.
- .2 Cold Weather Concreting
 - .1 Between the 15th of October of any year and the 15th of April of the following year, or when the temperature is at or below 5°C or anticipated to fall below 5°C within 24 hours of placing concrete, provide on hand and ready for use all equipment necessary for adequate cold weather protection and curing before concrete placement is begun.
 - .2 When fresh concrete is to be cast against existing concrete, prevent the loss of heat by extending the protection for the fresh concrete over the existing concrete.
 - .3 Insulate, or enclose within the protective housing, tie rods, reinforcement or metal which projects from the concrete being protected.
 - .4 Construct enclosures tight and safe for wind and snow loadings.

- .5 Maintain housing, enclosures and supplementary heat in place for entire period of protection, except that sections may be temporarily removed as required to permit placing additional forms or concrete provided the uncovered concrete is not permitted to freeze. Make up time lost from the required period of protection at the required temperature before protection is discontinued and removed. Protection is not to be completely removed until the concrete has cooled to within the temperature differential limits specified in CSA A23.1.
 - .6 Locate heating units to avoid heating concrete locally or drying it excessively. Avoid high temperature and dry heating within enclosures.
 - .7 Take particular care to maintain edges and corners of concrete at the required temperature owing to their greater vulnerability to freezing.
 - .8 Provide sufficient insulation, and heat as necessary, to prevent freezing of frost susceptible soil which lies against structural elements; in particular protect soil beneath footings and behind foundation walls until the building is completed.
- .3 Hot Weather Concreting
- .1 When the rate of moisture evaporation exceeds 0.5kg/m² per hour or when the temperature is greater than or equal to 27°C, employ the following measures in addition to the requirements of CSA A23.1:
 - .1 Use ice as mixing water, or an approved equivalent temperature reducing or set retarding admixture to lower the concrete temperature.
 - .2 Dispatch ready-mix trucks and organize Work to keep mixing time to a minimum. Minimize exposure of mixing trucks to the hot sun while waiting. Water shall be made available to spray the exterior of the drum while the truck is waiting to discharge its concrete.
 - .3 Provide adequate personnel and organize Work to keep placing time to a minimum.
 - .4 Place concrete in layers thin enough and areas small enough so that the time interval for placing is reduced and compaction will ensure complete union of adjacent portions.
 - .5 With formed concrete, reliance shall not be placed on the forms alone to provide curing. Spray formwork with water to keep it tight and free from cracking.
- .4 Protection of Completed Work
- .1 At all times during the Work, protect exposed concrete, exposed masonry and other exposed members from staining or becoming coated with concrete leakage due to continuing concreting operations. Members which become coated may be classed as defective by the Contract administrator.
 - .2 Protect exposed members from staining due to rusting of reinforcement projecting beyond construction joints.
 - .3 Take suitable measures to prevent spalling and cracking damage occurring to the structure due to water freezing in expansion joints, small holes, slots, depressions and take suitable measures to prevent damage occurring to foundations and the like due to frost action in the soil or backfill.
 - .4 The application of de-icing salts on completed Work is not permitted.
- .5

3.9 TREATMENT OF FORMED SURFACES

- .1 Do Work in accordance with CSA A23.1 and as follows:
 - .1 Provide smooth form finish to concrete surfaces exposed to public view and surfaces to receive plaster, damp-proofing, moisture resistant membrane and the like.
 - .2 Remove traces of form lining compound from concrete surfaces which may affect the bonding of following surface application.

3.10 QUALITY CONTROL

- .1 Implement a system of quality control to ensure that the minimum standards specified in this Section are attained.
- .2 Adhere to the requirements of the project "Concrete Quality Plan" prepared and submitted as required by this Specification.
- .3 Bring to the attention of the Contract administrator any defects in the Work or departures from the Contract Documents which may occur during Construction. The Contract administrator will decide upon corrective action and will provide recommendations in writing.
- .4 The Contract administrator's general review during construction and inspection and testing by independent inspection and testing agencies reporting to the Contract administrator are both undertaken to inform the City of Winnipeg of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of its contractual responsibility.

3.11 NOTIFICATION

- .1 Prior to commencing significant segments of the Work, give the Contract administrator and independent inspection and testing companies appropriate notification so as to afford them reasonable opportunity to review the Work. Failure to meet this requirement may be cause for the Contract administrator to classify the Work as defective.

3.12 INSPECTION AND TESTING

- .1 Appointment of Independent Inspection and Testing Companies
 - .1 The City of Winnipeg or Contract administrator will appoint the independent inspection and testing companies to make inspections or perform tests as the Contract administrator directs. The independent inspection and testing companies shall be responsible only to the Contract administrator, and shall make only such inspections or tests as the Contract administrator may direct.
 - .2 When defects are revealed, the City of Winnipeg may request, at the Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.
- .2 Concrete Quality Tests
 - .1 Concrete quality tests shall be carried out in accordance with CSA A23.1 and shall include the following:
 - .1 Slump
 - .2 Air content of fresh concrete
 - .3 Temperature of fresh concrete
 - .4 Compressive strength

- .5 Density (for low-density and semi-low-density concrete only)
- .6 Flexural strength
- .7 Splitting tensile strength
- .8 Chloride permeability
- .2 Cement and Aggregates: The Contract administrator may make tests on these materials as deemed necessary during the Work.
- .3 Compressive Strength Tests: Compressive cylinder testing will be carried out in accordance with CSA A23.1 and as follows: Three companion laboratory cured concrete standard compression test cylinders; one tested at 7 days and two tested at 28 days, constitute a strength test. During the placing of concrete in cold weather one additional field cured test cylinder will be made and tested at 7 days. The results of the 7 day tests related to curing procedure shall be the basis to strip soffit forms from horizontal or inclined members.
- .4 Cylinders for Chloride Ion Permeability Test
 - .1 C-1 concrete exposure class: Rapid chloride permeability test shall be carried out in accordance to CSA A23.1 and ASTM C1202 and as follows: Each test shall consist of 3 cylinder specimens. Concrete specimens are to be field cured in conditions similar to the in-situ concrete. Test one cylinder specimen at 7 days, one at 28 days and two at 56 days.]
- .3 Tensile Bond Tests: Tensile bond tests will be carried out in accordance with CSA A23.1 for all bonded toppings.
- .4 Grout under Baseplates: At least one strength test may be made each day that grout is placed under baseplates.

3.13 DEFECTIVE MATERIALS AND WORK

- .1 Where evidence exists that defective Work has occurred or that Work has been carried out incorporating defective materials, the Contract administrator may have tests, concrete coring, inspections or surveys performed, analytical calculations of structural strength made and the like in order to help determine whether the Work must be repaired or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Contract administrator's opinion, the Work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of the local building code identified on the Structural General Notes, except where this would in the Contract administrator's opinion cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Contract administrator.
- .3 Materials or Work which fails to meet the requirements specified in the Contract Documents may be rejected by the Contract administrator whenever found at any time prior to the Total Performance of the Work regardless of previous inspection. If rejected, defective materials or Work shall be promptly removed and replaced or repaired to the satisfaction of the Contract administrator, at no expense to the City of Winnipeg.

END OF SECTION 03 30 00

Part 1 General

1.1 SECTION INCLUDES

- .1 Railings.

1.2 RELATED REQUIREMENTS

- .1 Section 09 90 00 – Painting
- .2 Section 10 09 00 – Miscellaneous Specialties.

1.3 REFERENCES

- .1 ASTM A36/A36M-19 - Standard Specification for Carbon Structural Steel.
- .2 ASTM A53/A53M-18 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- .3 ASTM A123/A123M-15 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- .4 ASTM A153-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .5 ASTM A269/A269M-22 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .6 ASTM A307-21 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- .7 ASTM A500-03a - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- .8 ASTM A572/A572M Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- .9 ASTM A666-15 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- .10 ASTM A992/A992M Standard Specification for Structural Steel Shapes.
- .11 ASTM F593-17 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- .12 ASTM F3125/F3125M-22 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- .13 CSA W47.1(R2019) - Certification of Companies for Fusion Welding of Steel Structures.
- .14 CSA W47.2-11(R2020) - Certification of Companies for Fusion Welding of Aluminum.
- .15 CSA W55.3-08(R2018) - Certification of Companies For Resistance Welding Of Steel And Aluminum.
- .16 CSA W59-18 - Welded Steel Construction.

- .17 CAN/CSA-G164-M92 (R2003) - Hot Dip Galvanizing of Irregularly Shaped Articles.
- .18 CAN/CSA-S16.1-09 - Limit States Design of Steel Structures.
- .19 CSA-G40.21-04 Structural Quality Steels
- .20 CSA-G40.20 General Requirements for Rolled or Welded Structural Quality Steel,
- .21 CAN/CGSB-1.40-97 - Anti-corrosive Structural Steel Alkyd Primer.
- .22 CAN/CGSB-1.181-99 - Ready-Mixed, Organic Zinc-Rich Coating.
- .23 AISC – American Institute of Steel Construction – AESS Caterogies.
- .24 ANSI A14.3 - Ladders, Fixed, Safety Requirements.
- .25 SPCC - Society for Protective Coatings (formerly Steel Structures Painting Council):
 - .1 Steel Structures Painting Manual.

1.4 SUBMITTALS

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Provide shop drawings for all Work specified in this Section. Indicate materials, profiles, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories. Include erection drawings, elevations, and details where applicable.
 - .2 Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
 - .3 Shop drawings to bear the seal and signature of a qualified professional engineer registered in the Province of Manitoba.

1.5 QUALITY ASSURANCE

- .1 Conform to CSA W47.1, CSA W47.2, CSA W55.3, CSA W59.
- .2 Fabricator Qualifications: Company specializing in manufacturing the Products specified in this section with a minimum of five (5) years documented experience.
- .3 Installer Qualifications: Company specializing in performing the Work of this section with minimum five (5) years documented experience.
- .4 Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Certifications: Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 QUALIFICATIONS

- .1 Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the Province of Manitoba.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Stainless Steel Sheet, Strip, Plate and Flat Bar: ASTM A666, Minimum 75% recycled content, Type 304, AISI No. 4 Finish,
- .2 Stainless Steel Tubing: ASTM A269/A269M, Minimum 75 % recycled content, Seamless or welded with AISI No. 4 Finish.
- .3 Standard Stainless Steel Bolts, Buts And Washers: ASTM F593, Minimum 75% recycled content.
- .4 Steel: CSA G40.20/G40.21, Grade 300 W, Minimum 30% recycled content.
- .5 Angles, Channels and Plates: To G40.21, Grade 300W.
- .6 Hollow Structural Sections (HSS): CSA G40.20/G40.21m Grade 350W, Class H, Minimum 30% recycled content.
- .7 Steel Plates, Shapes, and Bars: ASTM A36.
- .8 Steel Sheet: ASTM A653, Mild Steel Sheet galvanized, G90, Commercial quality.
- .9 Steel Sections: To G40.21, Grade 350W.
- .10 Steel Tubing: To G40.21-350W CLASS C or ASTM A500, Grade C.
- .11 Steel Pipe: ASTM A53, Grade B Schedule 40, Standard weight.
- .12 Fasteners: Size and type to suit application.
- .13 High Strength Structural Bolts, Anchor Bolts, Nuts, and Washers: ASTM F3125/F3125M, galvanized to ASTM A153 for galvanized components.
- .14 Welding Materials: to CSA W59.
- .15 Shop and Touch-Up Primer: SPCC 15, Type 1, red oxide.
- .16 Alkyd Primer: to MPI #79, E3 environmental rating.
- .17 Galvanizing: Hot dip, unpassivated, to ASTM A123/A123M, Coating Grade 85, minimum 600 g/m2.
- .18 Zinc rich primer for galvanized surfaces: Zinc rich, readymix to CAN/CGSB-1.181, Ecologo Certified.
- .19 Grout: Non-shrink, non-metallic, flowable, 24 h, 15 MPa, pullout strength 7.9 MPa.

2.2 RAILINGS

- .1 Steel Pipe: To ASTM A53/A53M, Standard weight, Finish; AESS level 3 finish, Colour; To be determined by Consultant.
 - .1 Railing and Guard Mounting: As indicated on Drawings.
- .2 Supply for installation, steel brackets, supports, rungs, stringers, anchor bolts and angles as indicated. Drill for countersunk screws and anchor bolts.

2.3 FABRICATION - GENERAL

- .1 Review Contract Documents and provide all metal fabrications indicated.
- .2 Verify all dimensions prior to fabrication.
- .3 Notify Consultant of any proposed member substitutions and changed connection details.
- .4 Fabricate Work square, true, straight, and accurate, to required size, with joints closely fitted and properly secured.
- .5 Fit and shop assemble items in largest practical sections, for delivery to site.
- .6 Provide bolt holes where required for fastenings.
- .7 Use self-tapping shake-proof, countersunk, flat-headed screws on items required to be assembled by screws or as indicated.
- .8 Where possible, Work to be fitted and shop assembled, ready for erection.
- .9 Continuously seal joined members by continuous welds.
- .10 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.
- .11 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- .12 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- .13 Supply all items for building-in in ample time for incorporation into the Work without delay to other trades.
- .14 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATION TOLERANCES

- .1 Squareness: 3 mm maximum difference in diagonal measurements.
- .2 Maximum Offset between Faces: 1.5 mm.
- .3 Maximum Misalignment of Adjacent Members: 1.5 mm.
- .4 Maximum Bow: 3 mm in 1200 mm.
- .5 Maximum Deviation From Plane: 1.5 mm in 1200 mm.

2.5 FINISHES - STEEL

- .1 Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- .2 Do not prime surfaces in direct contact with concrete, or galvanized items, or where field welding is required until after installation.
- .3 Prime paint items with one coat of shop coat primer: to CAN/CGSB-1.40.
- .4 Zinc primer: Zinc rich, ready mix to CAN/CGSB-1.181.
- .5 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .6 Structural Steel Members: Galvanize after fabrication to ASTM A123. Provide minimum 2.0 oz/sq ft galvanized coating.
- .7 Non-structural Items: Galvanized after fabrication to ASTM A123. Provide minimum 1.25 oz/sq ft galvanized coating.

2.6 ISOLATION COATING

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

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that field conditions are acceptable and are ready to receive Work.
- .2 Verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Consultant.

3.2 PREPARATION

- .1 Coordinate sizes and locations of framing, blocking, reinforcements, and other related units of Work specified in other Sections to ensure that products of this section can be supported and installed in accordance to manufacturers written instructions.
- .2 Clean and strip primed steel items to bare metal and aluminum where site welding is required.
- .3 Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION - GENERAL

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.

- .2 Erect metalwork square, plumb, straight, and true, accurately fitted free from distortion or defects, with tight joints and intersections.
- .3 Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- .4 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .5 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .6 Provide components for building by other sections in accordance with shop drawings and schedule.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Field weld components indicated on reviewed shop drawings.
- .9 Perform field welding in accordance with AWS D1.1.
- .10 Obtain approval prior to site cutting or making adjustments not scheduled.
- .11 After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
- .12 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .13 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.4 INSTALLATION - HANDRAILS AND RAILINGS

- .1 Install handrail and railings in accordance with reviewed shop drawings and the manufacturer's written instructions. Maintain rail height and follow surface slope unless otherwise noted.
- .2 Provide anchors, plates and angles required for mounting railings.
- .3 Install components plumb and level, accurately fitted, free from distortion fitted, free from distortion or defects.
- .4 Prevent galvanic action by insulating metals and other materials from direct contact with incompatible materials. Coat concealed surfaces of aluminum alloys that will be in contact with grout, concrete, masonry, wood or dissimilar metals with a heavy coat of bituminous paint or neoprene gaskets.
- .5 Anchor railings securely to structure. Conceal bolts and screws whenever possible.

3.5 ERECTION TOLERANCES

- .1 Maximum Variation From Plumb: 6 mm per story, non-cumulative.
- .2 Maximum Offset From True Alignment: 6 mm.
- .3 Maximum Out-of-Position: 6 mm.

3.6 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Upon completion remove surplus materials, rubbish, tools and equipment.

3.7 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Surface preparation and field application of paints and coatings.

1.2 RELATED SECTIONS

- .1 Section 05 50 00 - Metal Fabrications.
- .2 Mechanical Identification.
- .3 Electrical Identification.

1.3 REFERENCES

- .1 The Master Painters Institute (MPI) 2020 - Architectural Painting Specification Manual.
- .2 NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.
- .3 SPCC - Society for Protective Coatings (formerly Steel Structures Painting Council):
 - .1 Steel Structures Painting Manual.

1.4 SUBMITTALS

- .1 Samples: Submit two samples, minimum 200 mm x 200 mm in size illustrating selected colour, gloss/sheen and textures for each colour selected.
 - .1 Colour samples to be approved by Contract Administrator prior to proceeding with Work.
- .2 Retain reviewed and approved samples on-site to demonstrate acceptable standard of quality for appropriate on-site surfaces.
- .3 Maintenance: At project completion, provide list complete with manufacturer, paint type and colour coding for all colours used for Owner's later use in maintenance.

1.5 QUALITY ASSURANCE

- .1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.
- .2 Applicator: Company specializing in performing the Work of this section with minimum five (5) years documented experience.
- .3 Acceptable materials, preparations, workmanship and all items affecting the Work of this section to conform to requirements of the latest edition of The Master Painters Institute (MPI) "Architectural Painting Specification Manual".
- .4 All primers, paint, coatings, stains and varathanes used, to be listed under the latest edition of MPI - Approved Products Listing.
- .5 Paint materials for paint systems to be products of a single manufacturer, unless noted otherwise.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, protect and handle products to site in accordance with manufacturers written instructions.
- .2 Deliver products to site in sealed, original labeled containers. Inspect to verify acceptability.
- .3 Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, colour designation, and instructions for mixing and reducing.
- .4 Store paint materials at minimum ambient temperature of 7° C and a maximum of 32° C, in ventilated area, and as required by manufacturer's instructions.
- .5 Where toxic, volatile or flammable materials are being used, provide adequate fireproof storage and take all necessary precautions and post adequate warnings as required.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. Do not clean equipment using free draining water.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil-soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .7 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection for verifiable re-use or re-manufacturing.
- .8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- .2 Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- .3 Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- .4 Minimum Application Temperatures for Latex Paints: 7° C for Interiors; 10° C for Exterior; unless required otherwise by manufacturer's instructions.
- .5 Provide lighting level of 860 lx measured mid-height at substrate surface.
- .6 Ensure adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above minimum requirements for 24 hours before, during and after paint application.

1.9 EXTRA MATERIALS

- .1 Provide three (3) 4L cans of each of each type and colour of primer, paint, stain and coating to Owner. Store where indicated.
- .2 Label each container with colour, type, sheen and room locations in addition to the manufacturer's label.

Part 2 Products

2.1 PAINT

- .1 Paint Systems - Exterior:
 - .1 Exterior Galvanized Metal (not chromate passivated) (Over-head decking, Eavestroughs, Downpipes, Ducts Etc) (Doors, Frames Railings Pipes, Etc):
 - .1 MPI EXT 5.3J – W.B. Light Industrial Coating, Finish; To be determined by Contract Administrator.
- .2 Paint Colours: Allow for three (3) colours to be determine by Contract Administrator.

2.2 MATERIALS

- .1 Coatings: Ready mixed, except field catalyzed coatings, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
- .2 Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified to be the highest quality product of an MPI listed manufacturer and to be compatible with paint materials being used as required.
- .3 Patching Materials: Latex filler.
- .4 Fastener Head Cover Materials: Latex filler.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that surfaces and substrate conditions are dry and properly prepared in accordance with MPI Painting Manual and are ready to receive Work.
- .2 Examine surfaces scheduled to be finished prior to commencement of Work. Report any condition that may potentially affect proper application.
- .3 Test shop applied primer for compatibility with subsequent cover materials.
- .4 Do not apply finishes unless moisture content of surfaces are below the paint manufacturer's recommended maximums.

3.2 PREPARATION

- .1 Remove and store electrical plates, mechanical louvers, door and window hardware, light fixture trim, escutcheons, and other miscellaneous hardware prior to preparing and painting surfaces. Clean and replace hardware upon completion of painting Work.
- .2 Surface preparation and mixing and tinting requirements for all surfaces to be in accordance with MPI Painting Manual requirements.
- .3 Correct defects and clean surfaces which affect Work of this section. Remove existing coatings that exhibit loose surface defects.
- .4 Ensure surfaces are dry, clean, and free from dust, dirt, grease, oil, rust, mortar spatters, salts and any other foreign matter likely to affect the adhesion and the appearance of paint finishes.
- .5 Protect adjacent surfaces and Work of other trades from damage resulting from Work of this section.
- .6 Seal with shellac and seal marks which may bleed through surface finishes.
- .7 Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- .8 Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.
- .9 Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- .10 Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; Rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- .11 Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand, power tool, wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

- .12 Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- .13 Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 APPLICATION

- .1 Apply products in accordance with manufacturer's written instructions and MPI Painting Manual.
- .2 Apply each coat to uniform coating finish and thickness in accordance with manufacturer's instructions. Thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted
- .3 Allow applied coat to dry before next coat is applied.
- .4 Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 39”.
- .5 Tint each coat of paint progressively lighter to enable confirmation of number of coats.
- .6 Sand wood and metal lightly between coats to achieve required finish.
- .7 Apply minimum four (4) coats of paint where deep or bright colours are used to achieve satisfactory and uniform results.

3.4 CLEANING AND PROTECTION

- .1 Remove paint where spilled, splashed, splattered or sprayed as Work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.
- .3 Protect completed coating applications from damage by subsequent construction activities.

3.5 INTERIOR GLOSS LEVELS

- .1 Interior Finishes (unless noted otherwise) – New Construction:
 - .1 Interior Gypsum Walls: Gloss Level 3 – 5
 - .2 Interior Gypsum Ceilings: Gloss Level 1 – 3
 - .3 Interior Wood Door and Trim: Gloss Level 5
 - .4 Interior HM Door/ Frame – Gloss Level 5
 - .5 Exposed Structure / Service Ceilings – Gloss Level 1 (Dry-fall product).
- .2 MPI Gloss Levels:

	Description	Gloss at 60°	Sheen at 85°
Gloss Level 1	Traditional matte	5 units	10 units max.
Gloss Level 2	Velvet - like finish	Max 10 units	10 - 35 units
Gloss Level 3	Traditional eggshell	10 - 25 units	10 - 35

Gloss Level 4	Satin - like finish	20 – 35 units	35 units min.
Gloss Level 5	traditional semi-gloss	35 – 70 units	
Gloss Level 6	Traditional gloss	70 – 85 units	
Gloss Level 7	High gloss	More than 85	

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Waste Bin.

1.2 REFERENCES

- .1 CAN/ULC-S102:2018 - Standard Method Of Test For Surface Burning Characteristics Of Building Materials And Assemblies.
- .2 ASTM E 136-19a - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C
- .3 ASTM E84-21a - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- .1 Product Data: Provide product data on general construction, component connections, finishes and details.
- .2 Shop Drawings: Indicate size, arrangement, hardware and all necessary accessories for items in this section.
 - .1 Shop Drawings to provide dimensional details for all components, connection details, spacing requirements, anchor or mounting details, and all other relevant dimensions.
 - .2 Provide Shop Drawings stamped and signed by a Professional Engineer registered or licensed in the Province of Manitoba, Canada for review prior to fabrication.

1.4 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for fire rated requirements for rating as indicated, in accordance with UL Assembly No.

1.5 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.
- .2 Installer Qualifications: Company specializing in performing the Work of this section with minimum five (5) years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Store products in manufacturer's labeled, unopened packaging until ready for installation and field finishing.
- .3 Store materials to protect from exposure to harmful weather conditions and within manufacturer's published limits for temperature and humidity.
- .4 Replace defective or damaged materials with new.

1.7 FIELD MEASUREMENTS

- .1 Verify that field measurements are as indicated on approved Shop Drawings.

Part 2 Products

2.1 WASTE BIN

- .1 Waste Bin: Lid Type; Standard lid, User opening; Full open, Lid Colour; Black, Locking Latch, Lifting Bags; Standard lifting bag, Framing Material; Aluminum, Framing Colour; Silver.
 - .1 Signage; To be determined by Consultant.
 - .2 Acceptable Manufacturer:
 - .1 Molok, M-5000.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions are ready to receive Work.
- .2 Verify that required utilities are available, in proper location, and ready for use.

3.2 PREPARATION

- .1 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that products of this section can be supported and installed in accordance to manufacturers written instructions.

3.3 INSTALLATION – WASTE BIN

- .1 Install waste bins and accessories in accordance with manufacturers written instructions.
- .2 Attach anchors and hardware to bottom of container.
- .3 Dig pit to a depth of approx. 1500 mm. Ensure pit is 600 mm wider than diameter of container with room to compact proper to ground level. Compact and level the bottom of the pit, lift container into the pit.
- .4 Ensure container is straight and level. Install all container top rings level with other container top rings.
- .5 Encase base anchors fully in concrete. Backfill once concrete is cured, compact the ballast every 200 mm.
- .6 Slope finishing layer 3% from container. Ensure the finish grade meets container at specified height marked on front of container.

3.4 CLEANING

- .1 Upon completion of the work, remove surplus materials, rubbish and debris. Leave areas in neat clean and orderly condition.

END OF SECTION

1. GENERAL

1.1 REFERENCES

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the edition in force (if not indicated), including in particular, but without limitation:
- .3 International CSA
 - .1 CSA C22.2 number F10, Canadian Electrical Code, Part I (20th Edition), Safety Standard for Electrical Installations.
 - .2 CNA-C235-F83(C2000), Recommended voltages for alternating current networks from 0 to 50 000 V.
 - .3 Electrical and electronical equipment manufacturers association of Canada (EEMAC).
 - .4 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
 - .5 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .6 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

- .1 Electrical and electronical terms: unless otherwise specified or indicated, the terminology used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 DESIGN REQUIREMENTS

- .1 Operating voltages must comply with the standard CAN3-C235.
- .2 Motors, electric heaters, the control /regulation/command and distribution devices must operate satisfactorily at the frequency of 60 Hz within normal operating limits established by above standard.
 - .1 Equipment must operate without damage in extreme operating conditions established in above standard.
- .3 Operating language requirements: provide identification nameplates and labels for control items in English for the control/ command devices.

1.4 SUBMITTALS

- .1 Submit required documents and samples in accordance with Section 20 00 00.

-
- .2 Submit for review single line electrical diagrams framed under plexiglass and place them where indicated.
 - .1 Electrical distribution system in the main electrical room.
 - .3 Submit for review fire alarm riser diagram, plan, and zoning of building, framed under plexiglass, and place it near the control panel and the fire alarm annunciator panel.
 - .4 Workshop drawings
 - .1 Drawings shall contain the seal and signature of an engineer.
 - .2 The wiring diagrams and installation details of equipment have to indicate the location, layout and arrangement, the control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation.
 - .3 Wiring diagrams must indicate the circuit terminals and internal wiring for each equipment and the interconnection between different equipments.
 - .4 Indicate drawing clearances for operation, maintenance, and replacement of operating equipment devices. Submit copies of the drawings, at least 600 mm x 600 mm, and technical sheets, to the Consultant.
 - .5 If changes are required, notify Contract Administrator of these changes before they are made.
 - .5 Quality Control
 - .1 Provide CSA certified equipment and material.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Permits and fees: in accordance with general conditions of contract.
 - .4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.
 - .6 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 -FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

- .1 Qualifications: electrical work must be carried out by qualified, licensed electricians, by a master electrician or by an electrical contractor licensed by the province in which the work will be performed or apprentices in accordance with authorities jurisdiction as per the conditions of provincial law respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentice's program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

- .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .2 Site Meetings
 - .1 Site Meetings: the manufacturer's on-site inspections must include site visits at the following stages:
 - .1 Once the products delivered and stored on the site, and the preparatory work has been completed, but before the installation work covered by this section begins.
 - .2 Two (2) times during the progress of work, that means, once completed to 25% and then to 60%.
 - .3 Upon completion of work and cleaning.

1.6 SYSTEM STARTUP

- .1 Instruct the consultant, the client's representant and operating personnel in operation, care and maintenance of systems, equipment system and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant with all aspects of its care and operation.

1.7 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in relevant sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and for each device.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in case of failure.
 - .5 Other instructions as recommended by the manufacturer of each system or device.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions in approved locations.
- .5 For operating instructions exposed to weather, a weather-resistant materials or weatherproof enclosures must be provided.

- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.8 ELECTRICAL CONTRACTOR QUALIFICATIONS

- .1 The electrical contractor authorized to bid on the project must be experienced with all types of electrical work related to the project.
- .2 The electrical contractor must assign a foreman and experienced electricians for the duration of the project, without replacement throughout the entire process.
- .3 The electrical contractor must have the competence to carry out all the work of his contract without subcontracting a part of it.

2. PRODUCTS

2.1 QUALITY CONTROL

- .1 Load balance
 - .1 Measure the phase current of the panel boards with normal loads (lighting) operating at the time of acceptance. Adjust the branch circuit connections to obtain the best balance of current between the different phases and note the changes made to the original connections.
 - .2 Measure phase voltages at the devices and adjust transformer taps so that the voltage obtained is within 2% of rated voltages of equipment.
 - .3 Once the measurements are completed, submit a load balancing rapport as prescribed in the Documents and samples to be submitted part 1. The report must indicate the operating currents under normal loads recorded on the phases and neutrals distribution panels, dry-core transformers and motor control centers. Specify the time and date of each load was measured and the circuit voltage at the time of measurement.
- .2 Carry out the tests of the following elements:
 - .1 Power generation and distribution network, including phasing, voltage, ground control and load balancing
 - .2 Circuits from branch distribution panels, Lighting system and control/ regulation devices.
 - .3 Motors, heaters and associated control/regulation equipment, including controls for sequenced operation of systems where applicable.
 - .4 Fire alarm system and communication network.
 - .5 Insulation resistance testing.
 - .1 Measure using a 500V megohmmeter, the insulation value of circuits, distribution cables and devices with a nominal voltage of not more than 350V.

- .2 Measure using a 1000V megohmmeter, the insulation value of circuits and appliances with a nominal voltage between 350V and 600V.
- .3 Check the value of the resistance to ground before proceeding to power-up.
- .3 Carry out tests in the presence of the consultant.
- .4 Provide measuring devices, indicators, equipment and personnel required for the execution of tests during the execution of the work and their completion.
- .5 Manufacturer's field services
 - .1 Obtain a written report from the manufacturer verifying the compliance of the work with the specified criteria with respect to handling implementation, application of products as well as protecting and cleaning of the work, then submit this report in accordance with the section documents to submit part1.
 - .2 The manufacturer must make recommendations regarding the use of the products and carry out periodic visits to verify that the implementation has been carried out according to his recommendations
- .6 Clean and touch up shop painted surfaces that have been scratched or damaged during shipment and installation. Use paint of the same type and color as the original pain.
- .7 Clean hooks, brackers, fasteners and other exposed devices not galvanized, and apply primer to protect against rust.

2.2 ELECTRICAL MOTORS, APPLIANCES AND COMMAND / CONTROL EQUIPMENT

- .1 Verify installation and coordination responsibilities for motors, equipment and command / controls, as indicated.
- .2 Electrical wiring and piping of command / control circuits: in accordance with section 26 29 03 electrical specifications, except for wiring, piping and connections operating below 50 V and relating to command / control system as prescribed in the sections on mechanical installations and shown on the drawings of mechanical installations.

2.3 CAUTION SIGNS

- .1 Caution signs: in accordance with the instructions of the Consultant.
- .2 Signs coated with baked-on enamel paint, not less than 175 mm x 250 mm.

2.4 WIRING TERMINALS

- .1 Ensure pods, terminals and the screws wiring terminal are suitable for both copper and aluminum conductors.

2.5 IDENTIFICATION OF MATERIALS

- .1 To designate electrical appliances, use nameplates or labels conforming to the following requirements:

- .1 Indicator plates: 3 mm thick lamicoïd plastic laminate engraved plates, with white matte-finish melamine face and black core, mechanically fastened with self-tapping screws, engraved to the core of the plate.
- .2 Format as shown in the table below.

INDICATOR PLATE FORMAT			
Format 1	10 x 50 mm	1 line	Letters 3 mm high
Format 2	12 x 70 mm	1 line	Letters 5 mm high
Format 3	12 x 70 mm	2 lines	Letters 3 mm high
Format 4	20 x 90 mm	1 line	Letters 8 mm high
Format 5	20 x 90 mm	2 lines	Letters 5 mm high
Format 6	25 x 100 mm	1 line	Letters 12 mm high
Format 7	25 x 100 mm	2 lines	Letters 6 mm high

- .2 Labels: Unless otherwise indicated, use plastic labels with embossed letters 6 mm high.
- .3 Markings and labels must be approved by the Consultant before manufacturing.
- .4 Provide at least twenty-five (25) letters per plate and label.
- .5 Terminal box and junction box indicating plates shall indicate the network and / or voltage characteristics.
- .6 Devices must be labeled with format 3, with the inscription (INVENTORY ARTICLE NUMBER). Number according to customer's instructions.
- .7 Indicator plates for disconnectors, starters and contactors shall indicate the controlled device and the voltage.
- .8 Terminal box and pull box indicating plates shall indicate the network and voltage.
- .9 Transformer rating plates shall indicate power, primary and secondary voltages.
- .10 Identify socket outlets and switch with a self-adhesive lamicoïd plate to be installed over the cover plate. Dimensions of the lamicoïd plate, size, type and background colors and lettering, circuit number and text to be coordinated in advance with the customer and with the engineer.

2.6 WIRING IDENTIFICATION

- .1 The two ends of the phase, neutral and grounding conductors of each artery and branch circuit shall be identified by Brady, Panduit or equivalent self-adhesive labels.
- .2 The identification of each neutral wire and each ground wire shall reflect the circuit number they serve.
- .3 Each wire shall have the appropriate color according to the electrical code:
 - .1 Red, black and blue for phases, white for neutral and green for ground, FOR GROUNDED NETWORK.

- .2 Orange and strand for 120V circuit, and green for ground, FOR ISOLATED NETWORK.
- .4 Maintain phase sequence and colour coding throughout.
- .5 Colour coding must comply with the standard: to CSA C22.1.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Assign a colour code to conduits, boxes and metallic sheathed cables.
- .2 Apply plastic tape or paint as a means of identification on conduits or cables every 15m and at the crossings of walls, ceilings, and floors.
- .3 Prime colours bands must be 25 mm wide and for auxiliary colours it's 20 mm wide

	Prime	Auxiliary
Up to 250 V	Yellow	
Up to 600 V	Yellow	Green
Up to 5 kV	Yellow	Blue
Up to 15 kV	Yellow	Red
Telephone and network	Blue	
Other Communication Systems	Green	Blue
Fire alarm	Red	
Emergency Voice	Red	Blue
Voice system	White	
Security system	Red	Yellow
Other security systems	Grey	

2.8 IDENTIFICATION OF JUNCTION BOXES

- .1 Voltage and circuit numbers shall be marked with black felt on the ducts on both sides of the covers. No marking should be made on the lids of the boxes.

2.9 FINISHES

- .1 The surfaces of the metal envelopes must be finished in the workshop and be coated with an anti rust primer inside and outside, with at least two coats of finish enamel paint.
 - .1 Paint outdoor electrical equipment "equipment green" finish.
 - .2 Paint indoor switchgear and distribution enclosures must be in light grey referring to standard EEMAC 2Y-1.

3. EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 LABELS, INDICATORS PLATES AND NAMEPLATES

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and readable after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Crossing sleeves for concrete structures: plastic pipe with a 40 diameter allowing the free passage of the conduit and exceeding the concrete surface by 50mm on each side.
- .2 If plastic sleeves are used in fire rated walls or floors, remove them before installing the conduits.
- .3 Install cables, conduits and fittings embedded or plastered over, by arranging them neatly against the structure building so furring strips can be kept to minimum.

3.4 LOCATION OF OUTLETS AND RECEPTACLES

- .1 Locate outlets and receptacles in accordance with Section 260532 -Outlet Boxes, Conduit Boxes and accessories
- .2 Do not install outlets and receptacles back-to-back in a wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 The location of outlets and receptacles may be changed without an additional charge or credit, providing distance does not exceed 3000 mm, and notice is given prior to installation.
- .4 Locate light switches near the doors on the latch side.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms near the doors on the latch side.

3.5 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacle
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.

.3	Above top of counters or counter splash backs:	175 mm.
.4	In mechanical rooms:	1400 mm.
.3	Outlets for phone and intercom:	300 mm.
.4	Outlets for phone and intercom wall mounted:	1500 mm.
.5	Fire alarm stations:	1200 mm.
.6	Fire alarm bells/strobes:	2100 mm.
.7	TV outlets:	300 mm.
.8	Wall speaker:	2100 mm.
.9	Door button:	1200 mm.
.10	Panel-boards: as required by Code or as indicated.	

3.6 COORDINATION OF PROTECTIVE DEVICES

- .1 Co-ordination study by manufacturer of protective equipment to be provided with shop drawings for approval.
- .2 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings. Verify co-ordination with upstream devices.

3.7 WIRING

- .1 Connect luminaires to lighting circuits.
 - .1 Install wiring in rigid or flexible conduit as indicated.

3.8 LUMINAIRES SUPPORT

- .1 Luminaires mounted in suspended ceiling must be supported independently of the ceiling in accordance with the requirements of the local inspection agency.

3.9 ALIGNEMENT OF LUMINAIRES

- .1 Fixture mounted in light strips must be properly aligned so as to form an uninterrupted straight strip.
- .2 Individually mounted luminaires must be parallel or perpendicular to building layout lines

END OF SECTION

1. GENERAL

1.1 REFERENCE

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .1 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the actual edition (if not indicated).
 - .1 CSA International
 - .1 CAN/CSA-C22.2 number 18-F98(C2003), Outlet boxes, conduits boxes, fittings, and accessories.
 - .2 CAN/CSA-C22.2 number 65-F03(C2008), wire connectors (trinalational standard with UL 486A-486B et NMX-J-543-ANCE-03).
 - .2 National Electrical Manufacturers Association (NEMA)

2. PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper, sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper, sized to fit copper conductors 10 AWG or less.
- .3 Steel clamps or connectors as required to CAN/CSA-C22.2No.18 for:
 - .1 TECK armored cable
 - .2 Flexible conduit
 - .3 Aluminum sheathed cable

3. EXECUTION

3.1 VERIFICATION

- .1 Verification of conditions: Before installing the cable and box connectors, ensure that the condition of surfaces / supports previously implemented under other sections or contracts is acceptable and in accordance with the manufacturer's written instructions.
 - .1 Do a visual inspection of surfaces / supports.
 - .2 Immediately notify the engineer of any unacceptable conditions detected.

-
- .3 Begin installation work only after correcting the unacceptable conditions and after receiving the approval of the engineer.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and then depending of the case do the following:
- .1 Install pressure connectors and tighten screws using manufacturer's recommended compression tool. Installation must comply with torque testing from the standard CAN/ CSA C22.2No.65.
 - .2 Install lighting fixture connectors and tighten to CAN/ CSA C22.2No.65. Replace insulating cap.
 - .3 Install outlet box connectors.
 - .4 When aluminum alloy is authorized, the repairs must be carried out according to Canadian electrical code-2021 version. The use of connectors approved for aluminum and a joint compound.
 - .5 In corrosive or damp areas, cover the seals with a thermosetting terminal cap to ensure a perfect gasket seal and prevent oxydation of the copper by contact with the air. Model such as THOMAS & BETTS HSC series.

END OF SECTION

Wires and cables (0 - 1000 V)

1. GENERAL

1.1 REFERENCE

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the actual edition (if not indicated).
 - .1 CSA International
 - .1 CSA C22.2 n 0.3, Electrical wire and cable test methods
 - .2 CSA-C22.2 n 131 et 174, type cable TECK 90.
 - .3 CSA-C22.2 n 48 – Safety standards for non-metallic sheathed cables
 - .2 Underwriters Laboratories of Canada (ULC).
 - .1 ULC-S139-00, Method of Fire Test for Evaluation of Integrity of Electrical Cables

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit required data sheets and manufacturer's specifications and documentation. The data sheets must include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger; minimum size: 12 AWG.
- .2 Copper conductors: of specified size, insulated with cross-linked thermosetting polyethylene, for 600V, and type RW90 XLPE or RWU90 XLPE without jacket.

2.2 TECK CABLE 90

- .1 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper or ACM alloy, size as indicated.
- .2 Isolant
 - .1 Polyéthylène (XLPE).
 - .2 Nominal voltage: 600 V.
- .3 Inner jacket: PVC.

Wires and cables (0 - 1000 V)

- .4 Metal armor: flat galvanized steel.
- .5 Overall covering: thermoplastic PVC.
- .6 Fastenings
 - .1 One hole, steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 U-shaped channel type supports for two or more cables placed at 2000 mm centers.
 - .3 Threaded rods: 6 mm dia. to support suspended U-shaped channels.
- .7 Connectors:
 - .1 Model approved and suitable for TECK cable.

2.3 MINERAL INSULATED CABLES

- .1 Mineral insulated cables shall be in accordance with ULC-S139-00.
- .2 Conductors: Bare, solid annealed copper of size indicated.
- .3 Insulation: compressed magnesia powder or silicon dioxide, forming a compact homogeneous mass throughout the length of the cable.
- .4 Outer jacket: seamless, annealed copper, type MI, rated at 600V and 250°C.
- .5 Fire resistance rating: two hours.
- .6 Connectors: Field installed, approved for MI cables.
- .7 Termination kits: field installed, approved for MI cables.
- .8 Brackets, fasteners, flanges, etc. shall be copper.

2.4 ARMoured CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Cable type: AC90.
- .3 Metal armor: interlocking type fabricated from aluminum strip.
- .4 Connectors: steel.
- .5 Cables, type: ACWU90, PVC jacket over armour, in accordance with Building Code requirements for the building class of this project, in the case of cables placed in a wet place.
- .6 Cable shall be fitted with anti-short circuit connectors.
- .7 Restricted use in areas not subject to mechanical damage (such as suspended ceilings) for the final connection of each lighting fixture from the nearby junction box and for vibration-prone appliances. Connection with AC90 cable from one device to another is not accepted.

Wires and cables (0 - 1000 V)

2.5 ALUMINUM SHEATHED CABLES

- .1 Conductors: copper, size as indicated.
- .2 Insulation: cross-linked polyethylene, type RA90, for nominal voltage of 600 V.
- .3 Sheath: continuous, aluminum, without longitudinal seam, smooth or corrugated throughout.
- .4 Outer jacket: Thermoplastic applied to the jacket and conforming to building code requirements for the building class of this project for direct burial and wet lay cables.
- .5 Aluminum Sheathed Cable Fasteners
 - .1 Single hole steel clamps for exposed cables 25mm or less. Two hole flanges for cables over 25mm. Aluminum mounting brackets only for single conductor cables.
 - .2 U-brackets for groups of two or more cables, placed at 1500 mm centres and within 300 mm of each box or fitting.
 - .3 Threaded suspension rods: 6 mm diameter, for U-shaped supports.

2.6 CONTROL CABLES

- .1 Type LVT: 2 soft annealed copper conductors, sized as indicated,
 - .1 Thermoplastic insulation.
 - .2 Outer covering of thermoplastic jacket, and armour of closely wound aluminum wire.
- .2 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated,
 - .1 PVC insulation type TW 40°C.
 - .2 Tape coated with paramagnetic material and overall covering of flat steel.
 - .3 Outer jacket: steel strap stapled armor.

2.7 NON-METALLIC SHEATHED CABLES

- .1 Non-metallic sheathed copper cables, type NMD90, of the size indicated.
 - .1 Insulation: cross-linked polyethylene.
 - .2 Sheathing: FT1 rated PVC.

3. EXECUTION

3.1 ON-SITE QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Electricity – Common work results.
- .2 Perform tests before turning on the electrical system.

Wires and cables (0 - 1000 V)

3.2 CABLE INSTALLATIONS – GENERAL

- .1 Carry out cable terminations in accordance with Section 26 05 20 - Cable and Box Connectors 0 - 1000 V.
- .2 Use cable color code in accordance with 26 05 00 - Electricity – Common work results.
- .3 Parallel feeding arteries shall be of the same length.
- .4 Attach or clip power supply line cables to distribution centers, pull boxes and terminations.
- .5 Route hidden wiring through walls in downhill or vertical loops to facilitate future work. Unless otherwise indicated, avoid routing the wiring from the bottom up as well as horizontally into the walls.
- .6 Use only two-wire circuits for leads to surge-suppressed outlets and for permanently connected electronic and computer equipment. Common neutral circuits are prohibited.
- .7 Control wiring shall be identified by clamps with numbering corresponding to the legend of the shop drawings.

3.3 INSTALLATION OF THE BUILDING WIRING

- .1 Install wiring:
 - .1 In ducts, in accordance with Section 26 05 34 - Conduits, conduit fastenings and conduit fittings.
 - .2 In buried raceways, in accordance with Section 33 65 76 - Underground Electrical Conduit for Direct Burial.

3.4 INSTALLATION OF TECK 90 CABLES (0 – 1000 V)

- .1 Use this cable in damp, wet, aggressive areas or as indicated on plans.
- .2 As much as possible, group cables on U-brackets.
- .3 Lay exposed and concealed cables securely with flanges.
 - .1 Cables, when installed in cable trays, shall be grouped according to the level of insulation.

3.5 INSTALLATION OF MINERAL INSULATED CABLES

- .1 Install cables according to manufacturer's recommendations.
- .2 Install exposed and concealed cables by securely fastening with clamps.
- .3 Support 2 hours fire rated cables at 1m intervals.
- .4 Terminate cable ends with factory made termination kits.

Wires and cables (0 - 1000 V)

- .5 Insert stripped conductor ends into thermoplastic sleeves at cable ends.
- .6 Provide sleeves at the inlet and outlet of cables embedded in cast-in-place concrete or masonry structures.
- .7 Unless otherwise specified, splicing of cables is prohibited.

3.6 INSTALLATION OF ARMOURED CABLES

- .1 As much as possible, group cables on U-brackets.
- .2 Generally, all electrical installation is under ductwork. However, the following options are permitted in the following special cases:
 - .1 In suspended ceilings, lighting circuits shall be EMT pipes. A length of 1500 mm of armored cables is permitted for the final connection to the luminaires. A maximum of four (4) luminaires per junction box.
 - .2 Reinforced cable may also be used to supply sockets and heaters in gypsum partitions. Like luminaires, the maximum permissible length is 5 m between the junction box and the outlet.
 - .3 Unless otherwise indicated, all wiring is concealed in architectural elements. Use in hollow and dry walls.
 - .4 Unless otherwise specified, no surface installation is permitted without the prior approval of the Engineer.
 - .5 Vertical stroke only. No horizontal race will be accepted.
 - .6 Cables, when installed in cable trays, must be grouped according to the level of insulation.
 - .7 Do not drown cables in mortar.
 - .8 In suspended ceilings, cables shall be supported independently of the ceiling and not placed on the ceiling.

3.7 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

3.8 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Install cables.
- .2 Install straps and box connectors to cables as required.

END OF SECTION

Grounding - Secondary

1. GENERAL

1.1 REFERENCE

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the actual edition (if not indicated).
 - .1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.
 - .2 CSA C22.2 N° 41 – Grounding devices

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit required shop drawings, manufacturer's specifications, and documentation. The data sheets must include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as indicated, to electrically conductive underground water pipe.
- .2 Grounding conductors: bare cooper, annealed, tined, stranded in size as indicated.
- .3 Insulated grounding conductors: green, copper, with diameter as indicated.
- .4 Ground omnibus bars cooper, dimensions 450 mm x 50 mm x 6 mm (minimum), with insulating supports, fixings, and connectors.
- .5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to.
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Jumper, braids and link bars
 - .6 Pressure wire connectors

Grounding - Secondary

2.2 ACCEPTABLE PRODUCTS AND / OR / MANUFACTURERS

- .1 THOMAS & BETTS, BURNDY, ERICO or approved equivalent.

3. EXECUTION

3.1 VERIFICATION

- .1 Verification of conditions: Before installing grounding equipment, make sure that the condition of the surfaces / supports previously implemented under other sections or contracts is acceptable and permits the work in accordance with the manufacturer's written instructions.
 - .1 Visually inspect surfaces / supports.
 - .2 Immediately notify the Engineer of any unacceptable conditions detected.
 - .3 Begin installation work only after correcting unacceptable conditions.

3.2 INSTALLATION – GENERAL

- .1 Install continuous grounding system including, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install an isolated green wire in all conduits.
- .3 Install connectors in accordance with manufacturer's instructions.
- .4 Protect exposed grounding conductors from mechanical injury.
- .5 Perform thermite welding of buried connections, connections to electrodes and connections to an underground water pipe with good conductivity.
- .6 Use mechanical connectors to connect devices equipped with ground terminals.
- .7 Soldered joints not permitted.
- .8 Install bonding wire on flexible conduits securely attached to exterior of conduit connected to grounding stub, solderless terminal, wire clamp or screw with Belleville washer.
- .9 Install flexible connecting braids at the joint of the armored bars when the connection is not provided by the material itself.
- .10 Put in ground the steel frame of the building as well as the metal cladding.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Ground secondary service pedestals.

Grounding - Secondary

3.3 GROUNDING OF THE NETWORK AND THE CIRCUITS

- .1 Drive three (3) electrodes at least 3m apart in undisturbed soil stems should be driven in, not laid in trenches
- .2 Run a 3/0 AWG grounding wire from service panel neutral bus to rods and installed at least 600mm deep.
- .3 Make network grounding connections and neutral circuits of the primary 600V network secondary 120/208V and /or 120/240v.

3.4 GROUNDING EQUIPEMENT

- .1 Make required grounding connections for all equipment including service outlets, transformers, switchgear, raceways, motor racks, motor control centers, starters, control panels, framework steel, generator sets, alternators, elevators and escalators, distribution panels, outdoor lighting network and cable trays. Service grounding.
- .2 Use a 6 AWG copper conductor in a 21 mm EMT conduit to connect each of the following services, if applicable:
 - .1 The main duct of each ventilation system

3.5 GROUNDING OMNIBUS BARS

- .1 Mount cooper bus bars on insulated brackets attached to wall of electrical and communication equipment rooms.
- .2 Connect equipment of the electrical installation room, and the equipment of the IT communication room to the grounding bus bar using individual bar cooper conductors, standed, size 2/0 AWG.

3.6 COMMUNICATION SYSTEMS

- .1 Make ground connexions to the phone, sound, fire alarm, security systems as follows:
 - .1 Phone: put in ground in accordance with the requirements of the phone company
 - .2 Sound, fire alarm, security and intercommunications as indicated.

3.7 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

Grounding - Secondary

END OF SECTION

1. GENERAL

1.1 REFERENCE

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the actual edition (if not indicated).

2. PRODUCT

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface installation and complete suspended installation with all accessories and hardware.

2.2 ACCEPTABLE PRODUCT AND / OR MANUFACTURER

- .1 SUPERSTRUT of THOMAS & BETTS or approved equivalent.

3. EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to hollow or solid masonry surfaces, ceramic and plaster with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete surfaces with expandable anchors.
- .3 Secure equipment to hollow masonry walls or suspended ceilings using toggle switch bolts.
- .4 Secure surface mounted equipment with twist clips fasteners to inverted T bar ceilings. Ensure that T bars suspension are strong enough to support the weight of equipment specified before installation.
- .5 Support equipment, conduits or cables using clips, spring loaded bolts, cable clamps designed as accessories for ‘U’ profiles.
- .6 Fasten exposed conduits or cables to building structure or building components using clamps to secure them.
 - .1 One-hole steel clamps to fix surface conduits and cables of 50 mm in diameter or less.
 - .2 Two-hole steel clamps to fix conduits and cables larger than 50 mm.
 - .3 Use clamps to fix conduit to exposed steel framing work.
- .7 Suspended support systems.

-
- .1 Support each cable or conduit with 10 mm diameter threaded rods and spring clips.
 - .2 Support at least two (2) cables or conduits on 'U' shape supported by 10 mm diameter threaded suspension rods when it's impossible to attach them directly to the building structure.
 - .8 For surface mounting of two or more conduits use U shape installed at 1500 m centres.
 - .9 Install brackets, mounts, hangers, clamps and other types of metal supports where indicated and where it's necessary to support conduits and cables.
 - .10 Ensure adequate support for pipes and cables laid vertically without wall fixing, up to the equipment.
 - .11 Do not use wire lashing or perforated strap to support or fix pipes or cables.
 - .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade.
 - .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

1. GENERAL

1.1 REFERENCE

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the actual edition (if not indicated).
 - .1 CSA International
 - .1 CSA C22.1- F18, Electricity Canadian code, part one, 23rd edition.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit required data sheets, manufacturer's instructions, and documentation. The data sheets must include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS

2.1 SPLITTERS

- .1 Construction: sheet metal enclosures, welded corners, fitter with formed hinged lid, suitable for locking in closed position.
- .2 Terminations: mains and branch lugs and connection blocks must correspond to the size and number of input and output conductors connected to them as indicated.
- .3 Spare terminals: provide at least three (3) spare terminals or lugs for each connector block or terminal block rated less than 400A.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: steel, welded boxes, and rigid PVC boxes when ducts are made of PVC.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.
- .3 Covers for surface mounting: cover lids, for screwing.

2.3 CABINETS

- .1 Construction: welded, sheet steel cabinets with hinged door, handle, latch and lock supplied with two (2) keys.

- .2 Type E, empty cabinets: with folded edges, for surface mounting and with interlocking edges, for flush mounting, as indicated.
- .3 Type T, cabinets for terminals: with folded edges, for surface mounting and with interlocking edges, for flush mounting, as indicated, supplied with 19 mm thick smooth pine plywood support panel (good on one side).

3. EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Install splitters as indicated in mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except if indicated otherwise.

3.2 CABINET, JUNCTION AND PULL BOXES INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Only main junction and pull boxes are shown. Provide sufficient pull boxes to ensure that ducts between each box are not more than 30 meters in length or equivalent to four (4) elbows of 90 ° as required by CSA C22.1.
- .3 Place terminal blocks in T-cabinets as indicated.

3.3 IDENTIFICATION

- .1 Equipment identification: Provide equipment identification in accordance with section 26 05 00.
- .2 Labels: Install size 2 identification labels indicating system name, admissible current, the voltage and the number of the phases, or others indicated information.

END OF SECTION

1. GENERAL

1.1 REFERENCE

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the actual edition (if not indicated).
 - .1 CSA International
 - .1 CSA C22.1- F18, Electricity Canadian code, part one, 23rd edition.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit required shop drawings, manufacturer's instructions, and documentation. The data sheets must include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 Outlet boxes of at least 102 mm size as required.
- .3 Grouped boxes where several small devices are installed in the same place.
- .4 Solid lids for boxes without small equipment.
- .5 Outlet boxes of 347V for switching devices of 347V.
- .6 Combined boxes with partitions when the outlet of more than one network are grouped there.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized steel boxes.
- .2 Grouped single boxes, at a minimum 76 mm x 50 mm x 38 mm or as indicated, for flush mounting. Outlet boxes of 102 mm side when more than one conduit enters from the same side with extension frames and plaster frames as required.
- .3 Junction boxes of a minimum size 102 x 54 x 48 mm. connected to surface-mounted EMT tubes,
- .4 Outlet square boxes or octagonal of 102 mm by side for lighting fixture outlets.
- .5 Extension frames and plaster frames for flush mounting in plaster walls covered with ceramic tiles.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

- .1 Type FS or FD molded aluminum boxes as required, with factory-threaded openings and mounting brackets for surface wiring of switches and receptacles.

2.6 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

2.7 SERVICE FITTINGS

- .1 'High voltage' receptacle fitting base made of two (2) pieces aluminium stainless steel casing, molded, with satin brushed finish for two double outlets and 1 single double outlet. Bottom plate with two knockouts for centered or off-centre installation. 12mm x 102mm extension piece as indicated
- .2 Pedestal type 'low voltage' fitting made of two 2 pieces aluminum stainless steel casing, molded, with satin brushed finish to accommodate one or two phone connectors.

3. EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges, foam, or similar approved material to prevent entry of debris during construction work. Remove these materials upon completion of work.
- .3 For outlet boxes installations mount outlets flush with finished wall using plaster rings to allow edges of wall covering to be 6 mm or less from opening.
- .4
- .5 The openings in the boxes must be of dimensions corresponding to those of the conduit's connections and the armored cable. It is forbidden to use washers reducers.

- .6 Vacuum interior of outlet boxes before installing the small equipment.
- .7 Locate outlet boxes as required.

END OF SECTION

1. GENERAL

1.1 REFERENCE

- .1 Unless otherwise indicated, perform all work in accordance with the "Winnipeg Electrical By-law No 72/2022" and the "2021 Canadian Electrical Code, 25th edition" and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the actual edition (if not indicated).
 - .1 CSA International
 - .1 CAN/CSA-C22.2 No 18-F98(C2003), Outlet boxes, conduit boxes, fittings and accessories, National Standard of Canada.
 - .2 CSA C22.2 No 45-FM1981(C2003), Rigid metal conduits
 - .3 CSA C22.2 No 56-F04, Flexible metal conduits and liquid tight flexible metal conduits.
 - .4 CSA C22.2 No 83-FM1985(C2003), Electrical metallic tubing.
 - .5 CSA C22.2 No 211.2-FM1984(C2003), Rigid unplasticized polyvinyl chloride conduits.

1.2 DOCUMENTS / SAMPLES TO BE SUBMITTED FOR APPROVAL / INFORMATION

- .1 Submit the required documents and samples in accordance with the general and specific conditions of the estimate and specific sections thereof issued by the owner and / or the Architect.
- .2 Data sheets:
 - .1 submit the required data sheets as well as specifications and the manufacturer's documentation concerning the products concerned.
 - .2 Submit manufacturer's documentation for affected cables.

1.3 QUALITY ASSURANCE

- .1 Test report: submit test reports delivered from recognized independent laboratories.
- .2 Certificates: submit documents signed by the manufacturer, certifying that the products, materials and equipments meet the requirements for physical characteristics and performance criteria.
- .3 Instructions: Submit manufacturer's installation instructions supplied by the manufacturer.

2. PRODUCTS

2.1 CABLES AND REELS

- .1 Cables must be supplied on reels.
 - .1 Each cable and each reel or winding shall be marked or labeled with the cable length, nominal voltage, conductor size, production batch number and reel number.
- .2 Each reel or winding must only consist of one continuous cable with no splice.
- .3 Identify cables used exclusively for direct current applications.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel, threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .4 Flexible metal conduit: to CSA C22.2 No. 56, steel, aluminum or liquid-tight flexible metal.
- .5 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

- .1 One hole steel clamps to secure exposed ducts whose nominal diameter is equal or less than 50 mm.
 - .1 Two-hole steel clamps to secure ducts whose nominal diameter is bigger than 50 mm.
- .2 Beam hangers to secure conduits to exposed steel work.
- .3 Threaded rods, 6 mm diameter., to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: conforming to CAN/CSA C22.2 No. 18, specially manufactured for the specified conduits. Coating: the same as that used for the ducts.
- .2 Prefabricated L fittings to be installed where 90° elbows are required on conduits of 25 mm and larger.
- .3 Fittings and connecting sleeves for metallic electrical tubes.
 - .1 With set crew joints.

2.5 FISH CORD

- .1 Polypropylene.

3. EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's requirements, recommendations and written specifications, including any technical bulletins available, instructions for handling, storing and installing products and indications of the technical data sheets.

3.2 INSTALLATION

- .1 Install exposed conduits so as not to reduce headroom in exposed locations and use as little space as possible.
- .2 Conceal conduits except in mechanical and electrical rooms and in unfinished areas.
- .3 install conduits on the surface or as indicated.
- .4 Unless otherwise indicated, use rigid aluminum threaded conduits.
- .5 Use electrical metallic tubing (EMT) except when the conduits are embedded in concrete structures and when the conduits are located more than 2.4 m above the ground and there is no risk of damage.
- .6 Use flexible metal conduit for connection to motors in dry areas, connection to incandescent lighting fixtures, recessed and without a prewired outlet box, connection of lighting fixtures to surface or recessed fluorescent fixtures, or elements mounted in removable metal partitions.
- .7 Use flexible liquid tight metal conduit for connection to motors or vibrating equipment in damp or wet rooms or corrosive locations.
- .8 Install sealing fittings on conduits installed in hazardous areas.
 - .1 Fill them with sealant.
- .9 Use conduit with a minimum size of 19 mm for lighting and power circuits:
- .10 Bend conduit cold.
 - .1 Replace conduit that have got a reduction of more than 1/10th of its original diameter due to crushing or deformation.
- .11 Mechanically bend steel conduit over 19 mm diameter.
- .12 Field threads on rigid conduit performed in site must be of sufficient length to draw conduits up tight.
- .13 Install pull wire in empty conduits.
- .14 Run two (2) 25 mm spare conduits up to ceiling space and two (2) 25 mm spare conduits down to ceiling space from each flush panel.
 - .1 Terminate these conduits in 152 mm x 152 mm x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.

-
- .15 Remove and replace blocked conduit parts.
 - .1 Do not use liquids to clean out conduits.
 - .16 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Install conduits parallel or perpendicular to building layout lines.
- .2 Install conduits behind infrared or gas fired heaters leaving 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel, if applicable.
- .4 Where possible, group conduits into U-brackets or wall-mounted brackets.
- .5 Unless otherwise specified, conduits shall not pass-through structural elements.
- .6 In the case of conduits placed parallel to steam or hot water piping, a lateral clearance of at least 75 mm shall be provided. Also provide a clearance of at least 25 mm in the case of crossovers.

END OF SECTION

Service equipment

1. GENERAL

1.1 REFERENCES

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.

1.2 DOCUMENTS/SAMPLE TO BE SUBMITTED FOR APPROVAL

- .1 Submit the required documents and samples in accordance with the general and specific conditions of the estimate and specific sections on the subject issued by the owner and/or the Architect.
- .2 Submit required data sheets, manufacturer's instructions, and documentation for service equipment. Data sheets should include product characteristics, performance criteria, physical size, finish and limitations.

2. PRODUCTS

2.1 EQUIPMENT

- .1 Fusible disconnect switch: in accordance with section 26 28 23-fused and non fused switches.
- .2 Enclosed circuit breaker: in accordance with section 26 28 16.02-Molded case circuit breakers. Ratings as shown.
- .3 Circuit breaker panel boards: in accordance with section 26 24 16.01-Circuit breaker panel boards and fuse fuses: ratings as indicated.
- .4 Cabinet type A, for electricity distributor meter junction box, pull box, distribution box: in accordance with section 26 05 31- junction, pull and distribution cabinets and boxes. Dimensions cabinets and boxes.
- .5 Ground fault protection apparatus: in accordance with section 26 28 20-Ground fault protection devices-Class A.

3. EXECUTION

3.1 INSPECTION

- .1 Verification of conditions: before proceeding with the installation of the connection equipment, ensure that the condition of the surfaces/supports previously implemented under the terms of other sections or contracts is acceptable and allows the work to be carried out in accordance with to the manufacturer's written instructions.

Service equipment

3.2 INSTALLATION

- .1 Install connection equipment.
- .2 Make connections to incoming power supply
- .3 Make connections to load circuits from distribution board.
- .4 Install ground fault protection equipment (if applicable).
- .5 Connect to ground terminals in accordance with 26 05 28-Secondary Grounding.
- .6 Provide the necessary means to meet the requirements of the electricity distributor regarding the installation of its metering devices.

END OF SECTION

Lighting equipment

1. GENERAL

1.1 REFERENCES

- .1 Unless otherwise indicated, perform all work in accordance with the “Winnipeg Electrical By-law No 72/2022” and the “2021 Canadian Electrical Code, 25th edition” and in accordance with municipal regulations.
- .2 In addition, perform the work in accordance with any other code or any other standard having jurisdiction, according to the edition in force (if not indicated), including, but without limitation:
 - .1 CSA International
 - .1 C22.2 No. 43-08 (R2013) - Lamp holders.
 - .2 C22.2 No. 74-96 (R2015) - Electric Discharge Lamp Materials.
 - .3 C22.2 No. 84-05 (R2015) - Incandescent Lamps
 - .2 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
 - .3 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - .4 ASTM International Inc.
 - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
 - .5 ICES-005-07, Radio Frequency Lighting Devices.
 - .6 Underwriters Laboratories of Canada (ULC).

1.2 SHOP DRAWINGS AND DATA SHEETS

- .1 Submit required data sheets, manufacturer's instructions, and documentation. The data sheets must include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit complete photometric data of proposed luminaires, established by an independent testing laboratory, and have them reviewed by the Engineer.
 - .1 These photometric data must include the following, if applicable: table illustrating, the CVP rate and equipment spacing between fixtures.

Lighting equipment

- .3 The following requirements are intended to establish a certain quality of materials and services to be used for the project.
 - .1 Where an equipment or material is prescribed by a catalog number, the Contractor may submit an equivalence request for the equipment or materials. This request for equivalence must be submitted with the tender, otherwise it will not be considered. Any equivalence proposal for lighting fixtures specified in the plans and / or specifications, must be provided together with the drawings and / or photos and submitted in together with the electrical Contractor's tender form. The drawings of the proposed equipment must include the technical characteristics and physical appearance similar to the specified equipment (dimension, color, finish, efficiency, proposed model number, photometric curves, copy of results issued by an independent laboratory, proof of CSA approval). In addition, the sample of the proposed equipment and the calculation of the lighting level must be available on request for further analysis.
 - .2 The list of proposed lighting fixtures must be presented in the following manner: type / model number / unit cost / applicable credit.
 - .3 The Architect and the Engineer reserve the right to analyze, refuse or accept lighting products subject to equivalence.
 - .4 If an equivalent product is proposed, the contractor must, at the time of submission of the bid, submit a price based on the proposed product and specify the catalog number.
 - .5 The request for equivalence will be made in writing during the bid and will be analyzed within 30 days of the awarding of the contract.
 - .6 The Contractor is responsible for proving equivalence and paying the costs.
 - .7 If the characteristics of the approved equivalent equipment or material require changes to the plans and to the work to be performed, the Contractor shall pay the costs of all these changes. If the proposed equipment or material is refused, provide, and install the equipment or material specified by number, at no further cost.
 - .8 The mention of manufacturers' names in plans and specifications following a product specified by a catalog number does not mean that the Engineer guarantees the existence of an equivalent product from these manufacturers, nor that the Engineer will accept a product of these marks. It is the responsibility of the Contractor to ensure the equivalence of the products he uses in his bid and to prove it when submitting the tender. The Engineer and the Architect will be the only judges of the equivalence of a product.

1.3 LAYOUT OF LAMPS AND BALLASTS

- .1 Dispose and recycle fluorescent lamps in accordance with local regulations.
- .2 Dispose of old ballasts containing PCB.

Lighting equipment

1.4 WARRANTY

- .1 Replace all lamps or fixture that have burned out within 3 months of the date of provisional acceptance.

2. PRODUCTS

2.1 LAMPS

- .1 The type of lamp is as described in the list of lighting fixtures.
- .2 LED lamps
 - .1 Power: As indicated.
 - .2 Color temperature: 3500 K.
 - .3 Initial lumens: As indicated.
 - .4 Lifetime: 50 000 hours minimum.

2.2 FINISH

- .1 Finishing coat and construction of lighting fixtures must be ULC approved, and CSA certified for the type of installation planned.

2.3 LUMINAIRES AND ACCESSORIES

- .1 Units supplied complete with all accessories required for their installation and proper operation, such as ballasts, plaster frames, suspensions, gaskets, lamps, etc.
- .2 Fluorescent lamp sockets will be silver plated to ensure positive lamp contact.
- .3 Before ordering the recessed luminaires, check with architectural plans, the type of ceiling and submit the luminaires that are suitable for them, notwithstanding what is indicated in the specifications and plans. Similarly, when the ceiling type is metal lath, provide the frames approved by the Architect to the Engineer to make an appropriate assembly.
- .4 In the technical rooms, the devices of the strip type must be provided with protective grill
- .5 The metal parts of lighting fixtures installed outdoor will be specially treated for this purpose. Fit the devices with gaskets.
- .6 Any device found too noisy will be corrected or replaced by the Contractor.

2.4 LIGHT DISTRIBUTION DEVICES

- .1 According to the indications of the luminaire nomenclature.

2.5 LIGHTING EQUIPMENT

- .1 LED type (indoor)

Lighting equipment

- .1 Unless otherwise stated, insulated or non-insulated (as indicated) die-cast aluminum mounting frame suitable for types of acoustic tile and gypsum suspended ceiling. The mounting frame must include a junction box, retaining clips to hold the reflector and mounting bars.
 - .2 Metal surfaces of the reflector shall be smooth and uniform.
 - .3 Finishes and borders, as indicated.
- .2 Outdoor type
- .1 Unless otherwise specified, weatherproof enclosures, molded aluminum with fins, to facilitate heat dissipation.
 - .2 Die-cast aluminum lens frame with integrated hinges.
 - .3 Coating (finish) in electrostatic powder of color as indicated.

2.6 ACCEPTABLE PRODUCTS AND / OR MANUFACTURERS

- .1 Provide manufacturers' lighting fixtures as specified in plans or approved equivalent.

3. EXECUTION

3.1 INSTALLATION

- .1 Install luminaires in designated locations as indicated. Consult architectural details for the exact location of the luminaires.
- .2 Install all lamps required for each lighting fixture. They must be in place and in good condition on the date of provisional acceptance.
- .3 Mounting height as indicated on drawings or as determined by the Engineer on site.
- .4 Install luminaires only when all work likely to damage or soil them has been completed.
- .5 In mechanical, refrigeration, ventilation, air conditioning, substations rooms and other places where there is ceiling piping or ventilation ducts, install the luminaires on rods of appropriate length so that the light beam is not obstructed. No luminaires should be installed until all fixtures and piping are in place.
- .6 In a continuous row of fixtures, all luminaires in the same row must be of the same type. Luminaire housings installed in continuous rows are held together by two 8-32 bolts and nuts.
- .7 Anchors and suspensions for light fixtures
 - .1 Luminaires placed directly on the surface under concrete slabs are held in place with expansion anchor bolts.
 - .2 Use suspension rods for suspended fluorescent fixtures.
 - .3 The spacing between support rods must be as the recommendations of the different manufacturers.

Lighting equipment

- .4 Electrical output must be located above one of the luminaire supports.
- .8 Luminaires must be adequately supported for the type of ceiling system in which they are mounted.
- .9 Light fixtures must not be used as temporary lighting at any time.
- .10 Upon acceptance of the work, all light fixtures must be thoroughly cleaned and without scratches.

3.2 WIRING

- .1 Connect luminaires to lighting circuits.
- .2 Install wiring in rigid or flexible conduits or as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 Luminaires mounted in suspended ceiling must be supported independently of the ceiling and subject to the approval of the Architect.

3.4 LUMINAIRE ALIGNMENT

- .1 Fixtures mounted in light strips must be properly aligned to form an uninterrupted straight strip.
- .2 Align luminaires mounted individually must be parallel or perpendicular to building grid lines.
- .3 When there is more than two (2) lighting fixtures suspended in a continuous row, install a wiring duct to ensure perfect alignment.

3.5 VERIFICATION

- .1 Check lighting fixtures and replace defective fixtures and accessories.
- .2 Perform tests in accordance with Section 26 05 00 – Common work results.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3170.
 - .2 All referenced standard construction specifications found within CW 3170.
 - .3 All referenced standard details found within CW 3170.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3170.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3170.

Part 3 Execution

3.1 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3170.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3170.
 - .2 All referenced standard construction specifications found within CW 3170.
 - .3 All referenced standard details found within CW 3170.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3170.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3170.

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Remove all debris, stones and concrete rubble from the site before commencing grading.
- .2 Compact to a minimum of 95% Standard Proctor Maximum Dry Density.

3.2 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3170.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 3 – CW 2030.
 - .2 All referenced standard construction specifications found within CW 2030.
 - .3 All referenced standard details found within CW 2030.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 2030.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 2030.

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Contractor to verify depth of existing utilities prior to construction and will be responsible for the protection and maintenance of existing utilities throughout construction.
- .2 Water, sanitary sewer, and storm sewer piping trench backfill will be Class 2 compacted to 98% Standard Proctor Density.

3.2 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 2030.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3130.
 - .2 All referenced standard construction specifications found within CW 3130.
 - .3 All referenced standard details found within CW 3130.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3130.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3130.

Part 3 Execution

3.1 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3130.

END OF SECTION

Part 1 General

- .1 The City of Winnipeg Standard Construction Specification for Aggregate Base Courses that was current in the 2022 construction season (Revision 21) will be used, not the most recent version.

1.2 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3110-R21.
 - .2 All referenced standard construction specifications found within CW 3130-R21.
 - .3 All referenced standard details found within CW 3130-R21.

1.3 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3110-R21.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3110-R21.
- .2 Sub-base material to be in accordance with the geotechnical report (*Dyregrov Robinson Inc. – Market Lands MXU Building –South Parcel (2021)*).

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Compact to a minimum of 98% Standard Proctor Maximum Dry Density.

3.2 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3110-R21.
- .2 A minimum of 2 in-place density tests which pass the specified compaction are required for each type of granular material placed.

END OF SECTION

Part 1 General

- .1 The City of Winnipeg Standard Construction Specification for Aggregate Base Courses that was current in the 2022 construction season (Revision 21) will be used, not the most recent version.

1.2 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3110-R21.
 - .2 All referenced standard construction specifications found within CW 3110-R21.
 - .3 All referenced standard details found within CW 3110-R21.

1.3 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3110-R21.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3110-R21.
- .2 Base material to be in accordance with the geotechnical report (*Dyregrov Robinson Inc. – Market Lands MXU Building –South Parcel (2021)*).

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Compact to a minimum of 98% Standard Proctor Maximum Dry Density.

3.2 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3110-R21.
- .2 A minimum of 2 in-place density tests which pass the specified compaction are required for each type of granular material placed.

END OF SECTION

PART 1 – GENERAL

1.1 General Requirements

- .1 General specifications shall govern the work in this section.

1.2 Related Work

- .1 Refer to applicable sections.

1.3 Source Quality Control

- .1 Obtain Contract Administrator's approval of stone / precast pavers if different from recommended supplier.
- .2 Maximum weight loss after 50 cycles of freezing and thawing when totally immersed in a 3% NaCl solution shall not exceed 0.35%.
- .3 Provide a written and signed guarantee / warranty in the name of the Owner.
- .4 The guarantee / warranty to cover the replacement of the defective materials and workmanship of all work specified for a period of one (1) years from the Substantial Performance of the Work.
- .5 Upon written instruction from the Contract Administrator that the stone / precast paving and related work is defective, promptly replace or repair the defective work.

1.4 Delivery and Storage

- .1 Deliver stone / precast pavers as required for immediate installation.
- .2 Remove from the site all stones which have been chipped, broken, cracked or otherwise damaged.
- .3 Store sand and / or limestone fines on site in location designated by the Contract Administrator.
- .4 Keep stone / precast pavers free from contact with earth, concrete, mortar, roofing, bitumen, membrane waterproofing and other material which would stain or adhere to surfaces.

1.5 Protection

- .1 Protect existing buildings, lawns, trees, pool surface, service poles, wires, underground services and concrete paving located on this or adjoining properties from damage while this work is in progress.
- .2 Make good damage resulting hereto.

PART 2- PRODUCTS

2.1 Materials

- .1 Pavers:
 - .1 Concrete Unit Paver Type A – Pedestrian areas
Composition : Similar to Series 3000 Unilock or Equivalent
Size: Refer to drawings
Colour: To be chosen by Contract Administrator from complete manufacturer's palette.
 - .2 Concrete Unit Paver Type B – High vehicular traffic
Composition : Similar to Series 3000 Unilock or Equivalent
Size: Refer to drawings
Colour: To be chosen by Contract Administrator from complete manufacturer's palette.

- .3 Concrete Unit Paver Type C (Sidewalks)
Acceptable product : Barkman Holland Stone Paver
Size: 210 X 105 X 80 mm
Colour: Natural

- .2 Bedding Course:
Clean sand, sharp and free of deleterious materials.

- .3 Granular Base:
Granular 'A', clean material, conforming to OPSS 1010. .

- .4 Paver Edge Restraint:
Rigid, heavy duty metal paver edge as per Unit Pavers Manufacturer's requirements.

- .5 Joint Sand
Clean sand, sharp and free of deleterious materials.

PART 3- EXECUTION

3.1

- .1 Following approval of subgrade, place, grade and compact the stone base in 75 mm layers in accordance with MTC Form 314 to a tolerance of maximum 12.5 mm.
- .2 Compact each layer to a minimum of 98% maximum dry density as determined by ASTM Designation D698. Supply and apply water, both to aid in compaction and to provide dust control.
- .3 Place and compact bedding course to specified density.
- .4 Lay stone / precast pavers to finished grades shown on drawings.
- .5 Sawcut stone / precast pavers to fit accurately, neatly and without damaged edges in order to provide the layout as indicated on the drawings. Place stone / precast pavers in position with joints not exceeding 3 mm unless specified otherwise. Mechanical cutting will not be permitted.
- .6 Compact stone pavers into bedding course with a heavy vibrating compactor. Fill all joints with sand or high performance aggregate and sweep over stones in several directions, and sprinkle with water to ensure compaction of sand in joints.

END OF SECTION

Part 1 General

- .1 The City of Winnipeg Standard Construction Specification for Concrete Paving that was current in the 2022 construction season (Revision 17) will be used, not the most recent version.

1.2 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3310-R17.
 - .2 All referenced standard construction specifications found within CW 3310-R17.
 - .3 All referenced standard details found within CW 3310-R17.

1.3 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3310-R17.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3310-R17.

Part 3 Execution

3.1 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3310-R17.
- .2 A minimum of 2 sets of 3 cylinders are required to determine the acceptability of the concrete placed for curbs.
- .3 Cylinder breaks:
 - .1 1-7 day
 - .2 2-28 day.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

1. Provide all design, labor, methods, Products, equipment, and accessories for soil cells as shown on drawings, specified herein, and as required for the complete and proper execution of Work of this Section.
2. Subcontractors must provide trees with the specified net soil volume within a structured rooting space provided by the soil cell system.
3. Section Includes:
 1. Furnishing and installing soil cell system, geotextile, geogrids, subbase material, backfill, drainage system, root barrier, and mulch, and the installation of Growing Medium.

1.2 REFERENCES

1. American Society for Testing and Materials International (ASTM):
 1. ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
2. City of Winnipeg Standard Construction Specifications, including but not limited to:
 1. Sub-Grade, Sub-Base and Base Course Construction
 2. Supply and Installation of Geotextile Fabrics
 3. Seeding

1.3 DESIGN REQUIREMENTS

1. Design structure to support loads up to and including City of Winnipeg standards for sidewalks.
2. Design structures to be filled with growing medium as specified; the required limitations of delivery, storage, and handling; the requirement to retain soil peds; and requirements to compact and in-situ test soil compaction to the ranges specified.
3. Design soil cells for the purpose of growing tree roots, and rainwater filtering, detention and retention.
4. Design soil cells so that each soil cell or stack of soil cells shall be structurally independent of all adjacent soil cell stacks such that a single stack or group of stacks can be removed after the completion of installation to facilitate future utility installation and repair.
5. Structural design of each Soil Cell unit shall facilitate movement of roots and water between each cell and between edges of cell system and surrounding soils. Design shall facilitate installation, compaction and in-situ soil compaction testing; installation and maintenance of utilities within and under soil cells; movement and expansion of roots; and lateral capillary

movement of water.

1.4 DEFINITIONS

1. Aggregate Subbase (below soil cells): Aggregate material between the bottom of the soil cell frame and the compacted subgrade below, designed to distribute loads from the frame to the subgrade.
2. Aggregate Base Course (above cell deck): Aggregate material between the paving and the top of the soil cell deck below designed to distribute loads across the top of the deck.
3. Backfill: The earth used to replace or the act of replacing earth in an excavation beside the soil cell to the excavation extents.
4. Finish Grade: Elevation of finished surface of growing medium or paving.
5. Geogrid: Net-shaped synthetic polymer-coated fibers that provide a stabilizing force within soil structure as the fill interlocks with the grid and as defined in Part 2 – Products.
6. Geotextile: A geosynthetic fabric, applied to either the soil surface or between materials, providing filtration, separation, or stabilization properties.
7. Growing Medium: Soil as defined in Section 32 91 19 intended to fill the soil cell system and other planting spaces.
8. Root Barrier: Plastic root diversion device.
9. Root package: The earthen package containing the root system of the tree as shipped from the nursery.
10. Soil Cells: Structural system designed to be filled with growing medium for tree rooting and support of vehicle loaded pavements.
11. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill.
12. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

1.5 SUBMITTALS

1. Submittals to be in accordance with Subcontract.
2. Product Data: Submit manufacturer's Product data, performance criteria and other documentation for each material specified in this Section proposed for use.

3. Upon seven (7) days prior to start of installation of items in this section, the Subcontractor shall provide submittals required in this section to the City for review and approval.
4. Shop Drawings: Submit Shop Drawings for the work of this Section.
5. Samples: Provide the following samples:
 1. Soil cells.
6. Submit the following:
 1. Manufacturer's certified analysis for standard products.
 2. Soil cell manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.
7. Submit Environmental Requirements and Procedures as follows:
 1. Submit materials water management plan that describes how materials will be managed at the site to prevent erosion and siltation from stored materials.
 2. Submit testing data, waste material disposal plan for disposal of all excavated soil and fill material.
 3. Submit letters and certificates of approval certifying that all fill material, including all aggregates and backfills.
8. Compaction testing results: Submit results of all compaction testing required by the specifications including the bulk density test of the mock up and installed soil, and the compaction testing log of penetrometer and moisture meter readings to the City for approval.
9. Qualification Data: Submit documentation of the qualifications of the soil cell installer sufficient to demonstrate that the installer meets the requirements of paragraph "Quality Assurance".
10. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 1. Manufacturer's certified analysis for standard products.
 2. Soil cell manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.
11. Sequencing and Scheduling:
 1. General: Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
 2. Schedule all utility installations prior to beginning work in this section.
 3. Where possible, schedule the installation of soil cells after the area is no longer required for use by other trades and work. Protect installed soil cells from damage in the event that work must occur over or adjacent to the completed soil cells.

1.6 QUALITY ASSURANCE

1. Qualifications:
 1. Installers: Provide work of this Section executed by competent installers with minimum 5 years experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.
 1. Submit list of completed projects of similar scope and scale to the City, demonstrating capabilities and experience.
 2. The installer and the field supervisor shall have a minimum of five years successful experience with construction of similar scope in dense urban areas.
 3. Installer's Field Supervision: Installer is required to maintain an experienced full-time supervisor on Project site when work is in progress. This person shall be identified during the Pre-installation Conference, with appropriate contact information provided, as necessary. The same supervisor shall be utilized throughout the Project, unless a substitution is submitted to and approved in writing by the Client's Representative.
 4. Installer will be required to take part in a half-day training session provided by the manufacturer. Training session to be attended by all foremen and key personnel involved in installation. Manufacturer will provide additional training during mock-up installation
 2. Licensed Professionals: Employ a full time professional structural engineer registered in the Province of Winnipeg to:
 1. Design components of The Work of this Section requiring structural performance.
 2. Provide stamped and signed Shop Drawings.
 3. Provide periodic construction review in order to ensure that the soil cells are constructed in accordance with the construction documents.
2. Mock-Up: Provide mock-up as follows:
 1. Construct mock-up of complete installation at site. Installation of mock up shall be in the presence of the Client's Representative.
 2. Mock-up shall be a minimum of 10 square meters and include complete soil cell system installation with sub base compaction, drainage installation, base course aggregate and geotextile as required, geogrids, backfill, growing medium with compaction, and top geotextile.
 3. Mock-up area may remain as part of installed work at end of Project provided that it remains in good condition and meets requirements of Contract Documents.
3. Pre-Installation Meetings:
 1. Prior to start of installation of soil cells, meet at the Site with the Client's Representative, Construction Contractor and soil cells installer to review installation layout, procedures, means and methods. The soil cell Winnipeg Professional Engineer responsible for the periodic review of the installation shall attend the pre-

installation meeting.

1.7 DELIVERY, STORAGE AND HANDLING

1. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer. Protect materials from deterioration during delivery and while on Site.
2. Bulk Materials: Do not deliver or place backfill, soils and soil amendments in frozen, wet, or muddy conditions.
 1. Do not dump or store bulk materials near structures, utilities, sidewalks, pavements, and other facilities, or on existing trees, turf areas or plants.
 2. Provide protection including tarps, plastic and or matting between all bulk materials and any finished surfaces sufficient to protect finish material.
 3. Soil material to meet project specification 32 91 19 Topsoil and Finish Grading as well as the MOECC Table 2 Agricultural SCS including EC and SAR.
3. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within project limits as needed.
4. Soil cells: Protect soil cells from damage during delivery, storage and handling.
 1. Store under tarp to protect from sunlight when time from delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris.
 2. Handling is to be performed with equipment appropriate to size (height) of Cells and site conditions, and may include, hand, handcart, forklifts, extension lifts, small cranes, etc., with care given to minimize damage to soil cells. Backhoes, front-end loaders and skid steers are considered inappropriate for soil cell transport and placement.

1.8 SITE CONDITIONS

1. Verification of Existing Conditions and Protection of New or Existing Improvements: Before proceeding with work in this section, the Installer shall carefully check and verify all dimensions, quantities, and grade elevations, and inform Client's Representative immediately of any discrepancies.
 1. Carefully examine civil, record, and survey drawings to become familiar with existing underground conditions before digging. Verify location of all aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system, and take proper precautions as necessary to avoid damage to such improvements and plants.
 2. In the event of conflict between existing and new improvements notify the Client's Representative in writing and obtain written confirmation of any changes to the work prior to proceeding.

1. When new or previously existing utility lines are encountered during the course of excavation, notify the Client's Representative in writing and make recommendations as to remedial action. Proceed with work in that area only upon approval of appropriate remedial action. Coordinate all work with the appropriate utility Subcontractors, utility company or responsible public works agency.
2. Weather Limitations: Do not proceed with work when subgrades, soils and growing mediums are in a wet, muddy or frozen condition.
3. Where construction sequencing requires work during cold weather, protect sub grades and bulk materials from freezing using covers or as needed heated tenting. Sub grades that are sufficiently well drained to preclude the buildup of ice may be installed and built upon during freezing weather provided the surface is cleared of snow and any ice bound material.
4. Protect partially completed soil cell installation against damage from other construction traffic when work is in progress, and following completion with highly visible construction tape, fencing, or other means until construction is complete. Prevent all non-installation related construction traffic over the completed soil cell installation; only allowing loads less than the design loads.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Acceptable Manufacturers:
 - 1.1. DeepRoot Green Infrastructure, LLC
2. Substitutions: Manufacturers seeking approval of their products are required to comply with the City of Winnipeg Instructions to Bidders, generally contained in the Project Manual.

2.2 DESCRIPTION

1. The term Silva Cell shall be used to refer to a single Silva Cell.
2. Silva Cells shall be designed for the purpose of growing healthy trees and providing stormwater management.
3. Silva Cells shall be modular, structural systems.
4. Each Silva Cell shall be structurally-independent from all adjacent Silva Cells for incorporating utilities and other site features as well as for future repairs.
5. Silva Cells shall be capable of supporting loads up to and including AASHTO H-20 (United States) or CSA-S6 87.5 kN (Canada) when used in conjunction with approved pavement profiles.
6. Silva Cells shall be open on all vertical faces and horizontal planes and shall have no interior walls or diaphragms.
7. Silva Cells shall be capable of providing a large, contiguous, continuous volume of planting soil that does not inhibit or prevent the following:
 - 7.1. Placement of planting soil
 - 7.2. Walk through compaction
 - 7.3. Compaction testing of planting soil, once in place

- 7.4. Movement and growth of roots
 - 7.5. Movement of water within the provided soil volume, including lateral capillary movement
 - 7.6. Installation and maintenance of utilities placed within, adjacent to, or below the Silva Cell.
8. Silva Cells shall be able capable of being filled with a variety of soil types and soils that include peds 2 inches (50 mm) or larger in diameter as is appropriate for the application, location of the installation, and tree species.

2.3 MATERIALS AND ACCESSORIES

1. Silva Cell System Components: Each "Silva Cell" soil cell module (hereafter Silva Cell or "cell") is composed of one base, 6 post assemblies, and one deck.
 - 1.1. **Silva Cell System 2x :**
 - 1.1.1. Components: One base, six 2x posts, and one deck.
 - 1.1.2. Assembled Dimensions (Each Cell): 47.2 inches long by 23.6 inches wide by 30.9 inches high (1200 mm long by 600 mm wide by 784 mm high).
2. Silva Cell Materials and Fabrication:
 - 2.1. Bases and Posts: Homopolymer polypropylene.
 - 2.2. Decks: Fiberglass reinforced, chemically-coupled, impact modified polypropylene.
3. Manufacturer's Related Silva Cell Installation Accessories:
 - 3.1. Strongbacks: An accessory designed to stabilize the Silva Cell posts temporarily, during soil placement, and removed for reuse prior to placing decks.
 - 3.2. Anchoring Spikes: 10" landscape spike for securing assembled Silva Cells to subbase.

2.4 RELATED PRODUCTS

1. Root Barrier: Recyclable, black, injection molded panels manufactured with a minimum 50 percent post-consumer recycled polypropylene plastic with UV inhibitors, and integrated zipper joining system which allows instant assembly by sliding one panel into another; for redirecting tree roots down and away from hardscapes.
 - 1.1. Panel Sizes: No. UB18-2: 24 inches long by 18 inches deep by 0.080 inches thick (61 cm long by 46 cm deep by 2.03 mm thick); .
 - 1.2. Products: DeepRoot Tree Root Barrier (DeepRoot Green Infrastructure, LLC)
2. Geogrid: Net-shaped woven polyester fabric with PVC coating, uniaxial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, and acids; used to provide a stabilizing force within soil structure as the fill interlocks with the grid.
 - 2.1. Tensile strength at ultimate (ASTM D6637): 1850 lbs/ft (27.0 kN/m) minimum
 - 2.2. Creep reduced strength (ASTM D5262): 1000 lbs/ft (14.6 kN/m) minimum
 - 2.3. Long term allowable design load (GRI GG-4): 950 lbs/ft (13.9 kN/m) minimum
 - 2.4. Grid aperture size (MD): 0.8 inch (20 mm) minimum
 - 2.5. Grid aperture size (CD): 1.28 inch (32 mm) maximum
 - 2.6. Roll size: 6-foot (1.8-m) width is preferred, up to 18-foot (5.4-m).

- 2.7. Products meeting this specification:
 - 2.7.1. Stratagrid SG 150;
 - 2.7.2. Miragrid 2XT;
 - 2.7.3. Fortrac 35 Geogrid;
 - 2.7.4. SF 20 Biaxial Geogrid;
3. Geotextile: composed of high tenacity polypropylene yarns which are woven into a network such that the yarns retain their relative position and is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.
 - 3.1. Tensile strength at ultimate (ASTM D4595):
 - 3.1.1. 4800 lbs/ft (70.0 KN/m) MD minimum
 - 3.1.2. 4800 lbs/ft (70.0 KN/m) CD minimum
 - 3.2. Tensile strength at 5% strain (ASTM D4595)
 - 3.2.1. 2400 lbs/ft (35.0 KN/m) MD minimum
 - 3.2.2. 3000 lbs/ft (43.8 KN/m) CD minimum
 - 3.3. Flow rate (ASTM D4491): 30 gal/min/ft² (2648 l/min/m²) minimum
 - 3.4. Apparent opening size (ASTM D4751): 30 sieve (0.60 mm)
 - 3.5. UV Resistance (at 500 hours): 80 percent strength retained
 - 3.6. Products meeting this specification:
 - 3.6.1. Mirafi HP570;
 - 3.6.2. Geolon PP40;
 - 3.6.3. Nilex Woven 2044 (Nilex);
4. Plastic Cable Ties: A tensioning device or tool used to tie similar or different materials together with a specific degree of tension.

2.5 OTHER RELATED MATERIALS

1. Wood Blocking: Nominal dimensioned untreated lumber used for spacing assembled Silva Cells.
2. Inspection Pipes:
 - 2.1. Perforated pvc pipe 75mm diam.
 - 2.2. Unperforated pvc pipe 75mm diam.
 - 2.3. All accessories and fittings
3. Aggregate Subbase (Below Silva Cell Base): Refer to engineering specifications
4. Aggregate Base Course (Above Silva Cell Deck): Refer to engineering specifications
5. Aggregate Base Course for Porous Pavement (Above Silva Cell Deck): Refer to engineering specifications
6. Setting Bed for Unit Pavers (Above Silva Cell Deck): Refer to Unit Paving section
7. Backfill Material (Adjacent to Silva Cells): Clean, compactable, coarse grained fill soil free of organic material, trash and other debris, and free of toxic material injurious to plant growth.
8. Planting Soil: Refer to Section 32 91 19 - Planting Soil.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the conditions under which the Silva Cells are to be installed.
 - 1. Carefully check and verify dimensions, quantities, and grade elevations.
 - 2. Carefully examine the Drawings to become familiar with the existing underground conditions before digging. Verify the location of aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system.
 - 3. Notify the Contractor and the Contract Administrator in writing in the event of conflict between existing and new improvements, of discrepancies, and other conditions detrimental to proper and timely completion of the installation.
 - 4. Obtain written approval of changes to the Work prior to proceeding. Proceed with installation only after changes have been made and unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Take proper precautions as necessary to avoid damage to existing improvements and plantings.
- B. Prior to the start of Work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the complete Silva Cell system.
- C. Coordinate installation with other trades that may impact the completion of the Work.

3.03 TEMPORARY PROTECTION

- A. Protect open excavations and Silva Cell system from access and damage both when Work is in progress and following completion, with highly visible construction tape, fencing, or other means until related construction is complete.
- B. Do not drive vehicles or operate equipment over the Silva Cell system until the final surface material has been installed.

3.04 EXCAVATION

- A. General: Excavate to the depths and shapes indicated on the Drawings. Provide smooth and level excavation base free of lumps and debris.
- B. Confirm that the depth of the excavation is accurate and includes the full section of materials required to place the subbase aggregate, Silva Cell, and pavement profile as indicated on the Drawings.
- C. Over-excavate beyond the perimeter of the Silva Cell to allow for:
 - 1. The extension of aggregate subbase beyond the Silva Cell layout as shown on the Drawings.
 - 2. Adequate space for proper compaction of backfill around the Silva Cell system.
- D. If unsuitable subgrade soils are encountered, consult the Owner's geotechnical consultants for directions on how to proceed.
- E. If conflicts arise during excavation, notify the Contract Administrator in writing and make recommendations for action. Proceed with Work only when action is approved in writing.

3.05 SUBGRADE COMPACTION

- A. Compact subgrade to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method, or as approved by the Owner's geotechnical representative.
- B. Do not exceed 10 percent slope for subgrade profile in any one direction. If the 10 percent slope is exceeded, contact manufacturer's representative for directions on how to proceed.

3.06 INSTALLATION OF GEOTEXTILE OVER SUBGRADE

- A. Install geotextile over compacted subgrade.
 - 1. Lay geotextile flat with no folds or creases.
 - 2. Install the geotextile with a minimum joint overlap of 18 inches (450 mm).

3.07 INSTALLATION OF AGGREGATE SUBBASE BELOW SILVA CELL BASES

- A. Install aggregate subbase to the depths indicated on the Drawings.
- B. Extend subbase aggregate a minimum of 6 inches (150 mm) beyond the base of the Silva Cell layout.
- C. Compact aggregate subbase to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method.
- D. Do not exceed 10 percent slope on the surface of the subbase. Where proposed grades are greater than 10 percent, step the Silva Cells to maintain proper relation to the finished grade.

3.08 INSTALLATION OF SILVA CELL BASE

- A. Install the Silva Cell system in strict accordance with manufacturer's instructions and as specified herein; where requirements conflict or are contradictory, follow the more stringent requirements.
- B. Layout and Elevation Control:
 - 1. Provide layout and elevation control during installation of the Silva Cell system to ensure that layout and elevations are in accordance with the Drawings.
- C. Establish the location of the tree openings in accordance with the Drawings. Once the trees are located, mark the inside dimensions of the tree openings on the prepared subbase.
- D. Locate and mark other Project features located within the Silva Cell layout (e.g. light pole bases, utility pipes). Apply marking to identify the extent of the Silva Cell layout around these features. Follow the layout as shown on the Drawings to ensure proper spacing of the Silva Cell bases. Refer to the Drawings for offsets between these features and the Silva Cells.
- E. Check each Silva Cell component for damage prior to placement. Reject cracked or chipped units.
- F. Place the Silva Cell bases on the compacted aggregate subbase. Start at the tree opening and place Silva Cell bases around the tree openings as shown on the Drawings.
- G. Working from tree opening to tree opening, place Silva Cell bases to fill in the area between tree openings.
 - 1. Maintain spacing no less than 1 inch (25 mm) and no more than 6 inches (150 mm) apart, assuming geotextile covering the decks meets the specifications in section 2.04 paragraph C.
- H. Follow the Silva Cell layout plan as shown on the Drawings.
- I. Install Silva Cell bases around, over, or under existing or proposed utility lines, as indicated on the Drawings.

- J. Level each Silva Cell base as needed to provide full contact with subbase. Adjust subbase material, including larger pieces of aggregate, so each base sits solidly on the surface of the subbase. Silva Cell bases that rock or bend over any stone or other obstruction protruding above the surface of the subbase material are not allowed. Silva Cell bases which bend into dips in the subbase material are not allowed. The maximum tolerance for deviations in the plane of the subbase material under the bottom of the horizontal beams of each Silva Cell base is 1/4 inch in 4 feet (6 mm in 1200 mm).
- K. Anchor Silva Cell base with 2 anchoring spikes per base.
 - 1. For applications where Silva Cells are installed over waterproofed structures, use wood blocking or similar spacing system consistent with requirements of the waterproofing system to maintain required spacing.

3.09 INSTALLATION OF SILVA CELL POSTS

2x Silva Cell System:

- 1. Attach 2x posts to the installed Silva Cell base. Each base will receive six 2x posts. Place the end of the post with tabs into the base. Rotate post clockwise to snap in place.

3.10 INSTALLATION OF STRONGBACKS, GEOGRID, BACKFILL AND PLANTING SOIL

- 1. For Silva Cell systems that have a perforated drain line located inside or adjacent to the system, consult Drawings for layout and details for requirements.
- 2. Install strongbacks on top of the Silva Cell posts by snapping into place over installed posts prior to installing planting soil and backfill.
 - 2.1. Strongbacks are required only during the placement and compaction of the planting soil and backfill.
 - 2.2. Move strongbacks as the Work progresses across the installation.
 - 2.3. Remove strongbacks prior to the installation of the Silva Cell decks.
- 3. Install geogrid around the perimeter of the Silva Cell system where the compacted backfill and planting soil interface.
 - 3.1. Do not place geogrid between the edge of the Silva Cells and adjacent planting areas.
 - 3.2. Cut the geogrid to allow for a 6-inch (150-mm) overlap at the Silva Cell base and a 12-inch (300-mm) overlap at the Silva Cell deck.
 - 3.3. Provide a minimum 12-inch (300-mm) overlap between adjacent sheets of geogrid.
 - 3.4. Secure geogrid with cable ties below the top of the posts, along the post ridges.
- 4. Place the first lift of backfill material loosely around the perimeter of the Silva Cell system, between the geogrid and the sides of the excavation. Place backfill to approximately the midpoint of the Silva Cell post. Do not compact.
- 5. Place the first lift of planting soil in the Silva Cell system to approximately the midpoint of the Silva Cell post.
 - 5.1. Level the planting soil throughout the system.
 - 5.2. Walk-through the placed planting soil to remove air pockets and settle the soil.
 - 5.2.1. Lightly compact soils by walking through the soil following placement.
 - 5.2.2. Walk through compaction shall result in 75-85 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Do not exceed root limiting compaction for the given soil type.
- 6. Compact the first lift of backfill material, previously spread, to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method or in accordance with Project Specifications for hardscape areas, whichever is greater.
- 7. Add and compact additional backfill material so that the final finished elevation is at approximately the same level of the placed planting soil within the Silva Cells.
 - 7.1. Maintain the geogrid between the Silva Cell system and the backfill material at all times.

8. Place the second lift of backfill material loosely around the perimeter of the Silva Cell system, between the geogrid and the sides of the excavation so that the material is 2 to 3 inches below the top of the posts. Do not compact.
9. Place the second lift of planting soil inside of the Silva Cell to the bottom of the strongbacks. Walk through compact.

3.11 INSTALLATION OF INSPECTION PIPES

1. Install 75 mm diam. PVC inspection pipes to finished plantation grade.
2. Prepare inspection pipes as per drawing. Cover inspection pipes with geotextile to protect perforated area. Secure geotextile with single-purpose ties (tyrap).
3. Ensure inspection pipes extend from surface to granular foundation (under soil cell frames) and/or are connected to water collection systems.
4. Attach inspection pipes as backfill is installed to ensure final location and elevation.
5. Install inspection covers over each pipe as detailed on plans.

3.12 INSTALLATION OF SILVA CELL DECK

1. Obtain final approval by the Contract Administrator of planting soil installation prior to installation of the Silva Cell decks.
2. Remove strongbacks, level out the planting soil, and immediately install decks over the posts below. Place deck over the top of the posts. Push decks down until the deck clips lock into the posts, snapping the deck into place.
3. Fold the 12 inches (300 mm) of geogrid onto the top of the decks.

3.13 FINAL BACKFILL PLACEMENT AND COMPACTION

1. Place and compact final lift of backfill material to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method, such that the backfill is flush with the top of the installed deck. Do not allow compacting equipment to come in contact with the decks.

3.14 INSTALLATION OF GEOTEXTILE AND AGGREGATE BASE COURSE OVER THE DECK

1. Ensure geotextile meets the specifications in section 2.04 paragraph C.
2. Place geotextile over the top of the deck and extend to the edge of the excavation. Overlap joints a minimum of 18 inches (450 mm). Leave enough slack in the geotextile for the aggregate base course to push the geotextile down in the gaps in between the decks.
3. Install the aggregate base course (including aggregate setting bed if installing unit pavers) over the geotextile immediately after completing the installation of the fabrics. Work the aggregate from one side of the layout to the other so that the fabric and aggregate conform to the Silva Cell deck contours.
4. Maintain equipment used to place aggregate base course completely outside the limits of the Silva Cell excavation area to prevent damage to the installed system.
5. For large or confined areas, where aggregate cannot easily be placed from the edges of the excavated area, obtain approval for the installation procedure and types of equipment to be used in the installation from the Silva Cell manufacturer.

6. Compact aggregate base course(s) to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Utilize a vibration or plate compactor with a maximum weight of 800 lbs (362.87 kg).
7. Do not drive vehicles or operate equipment over the completed aggregate base course.

3.15 INSTALLATION OF CONCRETE CURBS AT TREE OPENINGS, AGGREGATE SUBBASE AND PAVEMENT ABOVE THE SILVA CELL SYSTEM

1. Place concrete curbs along planting areas and tree openings as shown on the Drawings to retain the aggregate base course from migrating into the planting soil.
2. When staking concrete forms (e.g. curbs around the tree openings), prevent stakes from penetrating the Silva Cell decks.
3. Turn down edge of concrete paving to the Silva Cell deck along the edges of tree openings or planting areas to retain the aggregate base course material.
4. When paving type is a unit paver or other flexible material, provide a concrete curb under the paving at the edge of the Silva Cell deck to retain the aggregate base course material at the tree opening.
5. Place paving material over Silva Cell system in accordance with the Drawings.
 - 5.1. The Silva Cell system does not fully meet loading strength until the final paving is installed. Do not operate construction equipment on top of the Silva Cell system until paving installation has been completed.
6. Use care when placing paving or other backfill on top of Silva Cell system to prevent damage to the Silva Cell system or its components.

3.16 INSTALLATION OF ROOT BARRIERS

1. Install root barrier in accordance with manufacturer's installation instructions.

3.17 INSTALLATION OF PLANTING SOIL WITHIN THE TREE PLANTING AREA

1. Remove rubble, debris, dust and silt from the top of the planting soil within the tree opening that may have accumulated after the initial installation of the planting soil within the Silva Cells.
2. Install additional planting soil within the tree openings, to the depths indicated on the Drawings.
 - 2.1. Use the same soil used within the Silva Cells for planting soil within the tree openings.
3. Compact planting soil under the tree root ball as needed to prevent settlement of the root ball.
4. Place trees in accordance with the Drawings.

3.18 PROTECTION

1. Keep construction traffic away from the limits of the Silva Cells until the final pavement profile is in place. The Silva Cell system does not fully meet loading strength until the final paving is installed.
 - 1.1. Do not operate equipment directly on top of the Silva Cell system until paving installation has been completed.
 - 1.2. Provide fencing and other barriers to prevent vehicles from entering into the Silva Cell area.
2. When the Silva Cell installation is completed and the permanent pavement is in place, limit traffic and construction related activities to only loads less than the design loads.

3.19 CLEAN UP

1. Perform clean up during installation and upon completion of the Work. Maintain the site free of soil, sediment, trash and debris. Remove excess soil materials, debris, and equipment from the site following completion of the Work of this Section.
2. Repair damage to adjacent materials and surfaces resulting from installation of this Work using mechanics skilled in remedial work of the construction type and trades affected.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 03 30 00 – Cast-in-Place Concrete.
- .2 Section 03 30 01 – Concrete Walks, Curbs, and Gutters.
- .3 Section 32 22 13 – Rough Grading.
- .4 Section 32 93 10 – Planting.

1.2 REFERENCES

- .1 City of Winnipeg Standard Construction Specification: CW 3540 Topsoil Placement; most recent.
- .2 Agriculture and Agri-Food Canada : The Canadian System of Soil Classification, Third Edition, 1998.
- .3 Canadian Council of Ministers of the Environment : PN1340-2005, Guidelines for Compost Quality.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water : EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Construction Progress Schedules – Horizontal Bar Chart.2

2 PRODUCTS

2.1 MATERIALS

- .1 Loam: arable soil (land suitable for cultivation) neither too rich in clay nor too poor in sand, with an organic matter content of between 4% and 5% for sandy loam and between 2% and 3% for clayey loam. The soil must be free of subsoil, roots, plants, toxic materials, stones and other foreign bodies, and have an acidity level (pH) of 5.5 to 7.5. Topsoil containing grass or weeds is not acceptable.
- .2 Black soil: soil consisting of decomposing products, fairly soft and homogeneous, free from colloidal residues, wood, sulfur and iron, with a maximum water content of 15%. Shredded particle size must be

less than 6 mm.

- .3 Coarse sand: natural sand only, with particle size within the limits specified in the following table. No more than 45% of particles shall be retained between two (2) consecutive sieves of this table. Grain size must be determined in accordance with test method CAN/CSA-A23.2-2A.

Sieve size	Total mass passing the sieve, in %	Sieve size
10 mm	100	
5 mm	95 to 100	
2.5 mm	80 to 100	
1.25 mm	50 to 90	
630 µm	25 to 65	
315 µm	10 to 35	
160 µm	2 to 10	
2 µm	0 to 8	

- .4 Organic components (manure and/or compost) :

Organic components shall be derived from a biological process ensuring the decomposition of by-products of plant and/or animal origin (excluding poultry manure) into a stable organic product rich in humic compounds. The material will be homogeneous, potting soil-like in appearance and free of foul odors. Manure should be at least two years old.

2.2 SOIL MIX

Mix No. 1 (for tree planting and turfing).

- .1 Mixture composition (volumetric proportion) :
- .1 One part black soil;
 - .2 One part coarse sand;
 - .3 Two parts loam;

2.3 SOIL TESTING

- .1 Provide, for each mixture indicated in this section, a certificate of analysis signed by a chemist including organic matter content, pH, N, P, K content, as well as a granulometry analysis, at least 30 days prior to the start of spreading operations.
- .2 Amend soil if it does not meet requirements of this section.
- .4 Organic matter: the organic matter present in mixtures will be verified by oxidation, using the "Walkley / Black" method.
- .5 Chemical elements: the various chemical components of the potting soil mixture must be in proportions conducive to normal plant growth. Soil mixtures must include certain chemical elements in the proportions given in the table below:
-

CHEMICAL COMPONENTS	PROPORTION
Phosphorus (P)	50 - 100 ppm
Potassium (K)	125 - 175 ppm
Magnesium (Mg)	150 - 200 ppm
Calcium (Ca)	500 - 2 700 ppm

2.3 SOIL MIX SPECIFICATIONS

- .1 Mixtures must :
1. be free from residues of pesticides, heavy metals or other contaminants;
 2. be uniform, homogeneous;
 3. contain no object larger than two (2) centimetres in diameter.
- .2 Mix No. 1 for tree planting and turfing; mix must have a :
- Organic matter between 4-7%
 - Water pH between 6-7
 - Cation exchange capacity between 10-20 MEQ/100g
 - Setting 20%
 - Electric conductance below 1.25 ms/cm
 - P (Melich 3) higher than 40ppm
 - K (Melich 3) higher than 126ppm
 - Mg (Melich 3) higher than 151ppm
 - Ca (Melich 3) higher than 1001

3 EXECUTION

3.1 PREPARATION OF EXISTING GRADE

- .1 Topsoil preparation of existing grade to conform to requirements of City of Winnipeg standard construction specifications.

3.2 PLACING AND SPREADING OF TOPSOIL

- .1 To conform to requirements of City of Winnipeg standard construction specifications.

3.3 SOIL AMENDMENTS

- .1 Apply lime, sulphur or other soil amendment at rate determined and recommended by the soil testing laboratory.
- .2 Mix soil amendment well into full depth of planting medium by cultivating or rototilling prior to application of fertilizer.

3.4 APPLICATION OF FERTILIZER

- .1 To conform to requirements of City of Winnipeg standard construction specifications.

3.5 FINISH GRADING

- .1 To conform to requirements of City of Winnipeg standard construction specifications.

3.6 ACCEPTANCE

- .1 To conform to requirements of City of Winnipeg standard construction specifications.

3.7 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required off site.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 00 – Cleaning and Waste Processing.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENT

- .1 This section applies to the supply of materials, labor and equipment required for planting work.

1.2 RELATED WORK

- .1 Section 32 91 19 : Topsoil placement ;
- .2 Excavating, Trenching and Backfilling: Refer to engineering specifications ;

1.3 REFERENCES

- .1 City of Winnipeg Standard Construction Specification: CW 3540 Topsoil Placement; most recent.
- .2 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .3 Canadian Council of Ministers of the Environment
 - .1 PN1340-2005, Guidelines for Compost Quality.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 QUALITY CONTROL

- .1 General :
 - .1 All plants will be nursery-grown and will have the characteristics of the species. Dimensions and species will be as shown in the planting list.
 - .2 The Contract Administrator must approve the plants at the supplier's and on delivery to the site before they are planted. If the Contractor fails to do so, the plants may be rejected after planting.
- .2 Plant supply :
 - .1 Given the size of the trees and the choice of species, the Contractor must place his plant orders as soon as the contract is signed to ensure that all plants are available for planting. The Contractor must also set aside a reserve quantity of each species of plant for potential replacement between now and final acceptance of the work.
 - .2 No substitutes will be accepted without the authorization of the Contract Administrator. As soon as the contract is signed, the Contractor must take steps with the potential supplier(s). Inform the Contract Administrator of the source(s) of supply and provide proof of his plant order(s) corresponding to the bid schedule within one (1) month of signing the contract.

.3 Selection et acceptance of trees at supplier location:

- .1 All trees will be inspected and selected at their place of origin by the Contract Administrator. The Contractor shall arrange for the visit to the nurseries of origin. The Contract Administrator travel expenses will be payable by the Owner. The Contractor will be responsible for his own travel expenses.
- .2 A permanent label, with the name of MARKETLANDS, will be affixed to each tree selected. This tag must also identify the tree species and size. These labels must be intact when the trees are approved for the worksite.

1.6 TRANSPORTATION AND STORAGE

- .1 Protect plants from damage during transport. Deliver plants in a closed truck. During delivery and storage on site, all plants must be protected from solar radiation, wind, frost, excessive heat, and the dangers of sudden temperature changes.
- .2 Roots must be kept moist at all times.
- .3 The Contractor is responsible for the unloading of trees upon delivery to the site and assumes sole responsibility for any damage or injury to plants.

Contractor also coordinates delivery and planting operations to minimize time lapse between excavation and planting.
- .4 If trees or other plants cannot be planted immediately or within a maximum of two days, they must be stored in a protected, shaded area. Rootballs are to be covered with mulch (gauged) and kept moist until planting.
- .5 Any injury to the plant caused by transport or handling may result in rejection of the plant, before, during and after planting.

1.7 APPROVAL BEFORE PLANTING

- .1 The following points are checked at the time of approval :
 - Presence of tag;
 - Condition of tree and root ball following uprooting, handling and transport;
 - Entomopathological problems not detected in nursery.
- .2 In the case of unbroken trees, a second inspection will be carried out after leafing.
- .3 Trees found to be non-compliant at the time of approval will be refused and must be returned to the supplier. Contractor to arrange delivery of replacement plants with supplier as soon as possible.

1.8 CALENDAR

- .1 Contractor shall obtain approval from Contract Administrator prior to commencing work specified in this section.
- .2 Submit for approval by Contract Administrator and City of Winnipeg a detailed delivery and planting schedule coordinated with Supplier. Planting method and time shall be submitted for approval and integrated with other site activities.

1.10 QUALITY ASSURANCE

- .1 Landscape Contractor: must be a member in good standing of the horticultural trades' association.
- .2 Planting Supervisor: Landscape technician certified in planting.
- .3 Landscape Maintenance Supervisor: Landscape technician certified in landscape maintenance.
- .4 Planting and Maintenance Supervisor (Foreman): Must have a minimum of 8 years experience in similar projects of the same scope.
- .5 Work to be done in presence of Contract Administrator.

1.11 SUBMITTALS

- .1 Technical data sheets
- .2 Submit required technical data sheets and manufacturer's instructions and documentation for mycorrhizae, anti-drying agents, anchoring material, mulch and rodent protection. Technical data sheets must indicate product characteristics, performance criteria, dimensions, limits and finish.
- .3 Provide for acceptance two (2) samples of each of the following types of materials to Contract Administrator 15 days prior to commencement of work :
 - rodent protection ;
 - mulch ;
 - geotextile ;
 - anchoring material: clamping ratchet for 50mm strap, 50mm wide strap, screw anchor and anti-strangulation stirrup (hook);
- .4 Samples to be delivered to site office.

1.12 SUBSTANTIAL COMPLETION

- .1 Upon completion of landscaping work, substantial completion is given after verification and satisfaction of the Contract Administrator. Substantial completion of the planting work shall take place at the same time substantial completion for all the work in this lot. Substantial completion of the planting work will take place provided that:

- All plants installed on site are in good health and meet normal growth conditions;
- They comply with the planting list requirements in terms of species and size;
- They are free from insects and disease.

.2 Plant identification labels are removed after substantial completion.

1.14 WARRANTY

- .1 The Contractor guarantees the supply and planting of all plants for a period of twelve (12) months In accordance with the requirements set out in the general conditions, the warranty period only begins to run from the date of final acceptance for work received without reservation (without deficiencies or work to be completed) and from the lifting of any such reservation recorded in writing by construction professionals for all other work. A financial guarantee may be required by the City of Winnipeg during this period to guarantee satisfaction of the work.
- .2 The Contractor must replace, at his own expense and according to the specifications of the plans and specifications, all dead or non-vigorous plants until the end of the warranty period. Replacement plants must be of the same species, size, quality and warranty required for the original plants.
- .3 Contractor to remove dead plants within ten days of notification by Contract Administrator and replace immediately or if time is not right in next planting season. If the dead trees or other vegetation are not removed within ten days of this notice and replacement not carried out before the period required in the estimate, the City of Winnipeg will carry out the work at the Contractor's expense and the sums will be deducted from the amount still to be paid or from the performance deposit. This cost will not be disputable by the Contractor.
- .4 The Contractor must have the Contract Administrator inspect the plants at the end of the warranty period.
- .5 The Contract Administrator reserves the right to extend the Contractor's liability for another year if, at the end of the initial warranty period, foliage and development do not appear to be sufficient, or questionable, to ensure future growth.
- .6 Contractor's warranty includes materials, labour, equipment, and tools necessary to replace all plants which do not meet the growing conditions required in this section.
- .7 All materials and planting methods used for re-planting must consider site conditions and be approved by Contract Administrator. The Contractor must ensure that the method used will not cause damage to plants already established.
- .8 All planting materials and methods used for plant replacement must meet all specifications of this specification.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Water: Potable, clean and free of mineral salts and substances harmful to plant growth.
- .2 Anchoring system: have all elements of the anchoring system approved by the Contract Administrator:
 - Galvanized steel screw anchor with helix and eye 8mm diam. X 800mm long.
 - Safety belt-type tensioning strap
 - Manual tensioning ratchet with flat base for strap
 - Anti-strangulation stirrup (strap fastening hook)
- .3 Rodent protection:
Tree protector type Quest black plastic mesh no. HC 315 (maximum 1/2" mesh spacing) or approved equivalent. Each trunk protector must measure a minimum of 15 cm in diameter, and more depending on trunk diameter x 80 cm in height. The protector will be secured with black self-locking ties (Tie Wrap) set at 30 cm from the ground to the finished height of the protector.
- .4 Mulch (in planting beds) :
 - Rameal fragmented wood (RCW) mulch composed of hardwood fragments containing a maximum of 20% softwood. The mulch must be uniform in size, with fragments no larger than 50 x 50 x 5 mm. Mulch must be free of foliage and branches smaller than 5 mm.
 - Mulch must be fresh, i.e. show no signs of decomposition.
 - Contractor to provide mulch sample for approval 10 days prior to commencement of planting.
- .5 Mulch for trees planted in grassed area: white clover seeding.
- .6 Fertilizer:
Mycorrhizae according to type of plant to be planted and manufacturer's written recommendations: Mycorrhizae containing at least 15 spores/g of Glomus intraradices (endomycorrhizae) and a minimum of 132,250 spores/g of ectomycorrhizal fungi such as Mycorrhizae Myke Pro Paysagiste or approved equivalent.
- .7 Planting mix:
 - Refer to specifications in section 32 91 19 "Topsoil and Finish Grading" of this specification.
- .8 Geotextile membrane in rolls such as TEXEL model 7612.
- .9 River pebbles washed in shades of grey, 50mm diam.

2.2 PLANTING

1. General :
 - 1.1. All planting material must be of first quality. All plants must correspond to the planting tables presented in the planting plan.
 - 1.2. All plants used in planting must be nursery grown.
 - 1.3. All plants to be free of disease, insects, blemishes or bruising, structurally sound and with a strong, fasciculated root system.
 - 1.4. Trees: trees with straight trunks and full branching characteristic of the species.
2. Trees
 - 1.1. Quality and source of supply:

Supply top quality, nursery-grown trees. Tree size is measured at 30cm from the ground for trees with trunk diameters of 100mm and over, and at 15cm from the ground for trees with trunk diameters of less than 100mm. Trees are measured when their branches are in their normal position. The dimensions given for tree height and branch development are obtained from the dimensions of the main part of the tree.
 - 1.2. All plants will be nursery grown and have species characteristics. Dimensions and species shall be as shown on planting list. No substitutes will be accepted without authorization of Contract Administrator. Containerized plants will be accepted if they have been grown for at least one season, but no more than two seasons, in the same container. Containers must be large enough for root development.
 - 1.3. Other tree characteristics:

Provide trees with firm, fasciculated roots, free from disease, insects, defects and wounds, and well developed. Supply trees with straight trunks and uniform branching characteristic of the species. Trees must have been regularly transplanted or their roots regularly pruned.
 - 1.4. Cold storage: trees from cold storage are not accepted.
 - 1.5. Digging equipment: use hydraulic spades or clamshell buckets as digging equipment.
 - 1.6. Root ball trees :
 - 1.6.1. Deciduous trees taller than 3 m must be provided with a large firm root ball. Rootballs must be composed of 75% fasciculated, nutritious roots. This excludes the use of native trees grown in light, sandy, rocky soil.
 - 1.6.2. Remove the rootballs from the pits, place them in a wire mesh basket lined with jute and capable of withstanding a lot of handling, then tie the mesh with heavy rope. Care must be taken not to damage tree trunks with the ties or rope used to hold the trellis in place. Any tree contained in a basket deemed defective and/or unsafe will be rejected.
 - 1.6.3. At all times, do not expose rootballs to sudden temperature variations or torrential rain.
 - 1.6.4. Trees in containers: The tree must have been grown in its container for at least 10 months. The root system must be well established in the growing medium. Rootlets must be visible around the

outside. Container soil must be specific to container growing.

2.3 REPLACEMENT

1. Replacement of damaged trees:
For subsequent work, the Contractor shall take care not to damage the trees. Any replacement of trees injured or damaged by subsequent work carried out by the Contractor or one of his subcontractors will be at the Contractor's expense.
2. Replacement of dead trees:
If a tree suffers too great a transplant shock, the Contract Administrator will be entitled to request replacement of the tree. Costs incurred by tree replacement, including removal of the dead tree and any other items required to carry out the work in accordance with the plans and specifications, will be borne by the Contractor. The Contractor shall coordinate tree replacement with the parties involved in accordance with the method of execution described in Part 3 of this section.
3. Contractor will be responsible for unloading, planting, watering of replacement trees awaiting planting and maintenance of trees upon delivery to site until provisional acceptance of work.
4. Replacement trees must be of the same species, size, quality and guarantee required for original plants.

PART 3 – EXECUTION

3.1 GENERAL

- .1 Use wooden stakes to mark plant locations as indicated on drawings and have staking approved by Contract Administrator prior to planting.
- .2 Contractor to take all necessary precautions during excavation work to protect existing underground conduits.
- .3 If any inconsistencies are noted with the plans, the Contractor shall immediately notify the Contract Administrator.
- .4 Contractor to keep site clean and pits dry. Immediately remove accumulated soil and debris from hard surfaced areas. Avoid damage to work done by others, otherwise repair damage.
- .5 Protect surrounding structures when digging pits. Use tarpaulins to receive excavated soil if necessary.
- .6 Excavations must never be left open and piles of earth must not be allowed to remain after work has ceased.

3.2 SELECTION AND ACCEPTANCE OF PLANTING

- .1 All plants will be inspected and selected at the production nursery and by the Contract Administrator. The Contractor and his Supplier shall organize and participate in the visit to the nursery(ies) so as to facilitate the inspection work to locate the plants to be checked.

3.3 HANDLING AND DELIVERY

- .1 Remove and root ball plants at the appropriate time to ensure a solid root ball at time of delivery. Trees already in wire baskets must be lined with jute and a new basket. Depending on the state of root development, the customer may require the second basket to be larger. Trees requiring spring planting must be planted during the vegetative rest period.
- .2 Plant removal and rootballing shall only be carried out when conditions are conducive to the health and proper growth of the trees. Trees must be uprooted just before being transported to the worksite. They must not be stored for any length of time after rootballing. Rooting must be carried out during the vegetative rest period in early spring, before leafing, and after the hardening period in autumn.
- .3 Coordinate delivery of plants with digging of pits so that digging and planting take place at approximately the same time.
- .4 Tie tree branches securely and protect trees from friction and wide temperature variations during transport. Cover trunks with geotextile fabric and do not tie trees with rope or wire, as this may damage bark, break branches or destroy the natural shape of the trees. Support root ball of large trees when lifting.
- .5 The root system must be kept moist between the time of removal and approval of the trees at the site. Protect bare roots with damp straw, peat moss, sawdust or other acceptable material to prevent moisture loss during transport and storage.
- .6 Shipment of plants from nursery to job site to be made as soon as possible.
- .7 Contractor must transport plants in a truck with a closed box. Branches shall be tied during transport. During delivery and storage, all plants shall be protected from solar radiation, wind and the hazards of sudden temperature changes.
- .8 Supplier shall notify Contract Administrator of expected time of departure from nursery and time of arrival of plants at job site.
- .9 The Landscape Contractor, subcontractor of the General Landscaping Contractor, is responsible for unloading and takes sole responsibility for any damage or injury to plants.

3.4 PLANTING SEASON

- .1 Contractor to proceed with planting work according to schedule coordinated with General Contractor and City of Winnipeg.
- .2 Proceed with planting only when conditions are favourable for the health and proper growth of the plants.
- .3 Normal planting periods for deciduous trees are spring and fall, even if grown in plugs. In the case of planting during the growing season, care should be taken to ensure a good start-up; hot days and hours of intense sunlight should be avoided. Water abundantly and regularly.

3.5 EXCAVATING

- .1 Dig planting pits and transport excavated material off site or as directed by Contract Administrator.
- .2 Unless otherwise indicated on plan, pits shall be 45 degree and shall be dug in such a way as to leave adequate space for the placement of potting soil around the roots.
- .3 Prepare planting pits as specified in Topsoil and Finish Grading section.
- .4 The depth of the planting pit for trees in the ground must be limited to the actual height of the root ball (based on collar level) and must rest on undisturbed or well compacted soil.
- .5 When spacing between plants is greater than 1500 mm, they must be planted in individual pits.
- .6 Before planting, remove any water that may have accumulated in the pits. Notify Contract Administrator if ground water is involved. Remove debris, branches, stones larger than 100 mm and all harmful materials from planting pit.
- .7 In the case of heavy soils, ensure drainage of planting pits if natural drainage does not exist. Have method approved by Contract Administrator.
- .8 The Contractor must pay particular attention to any irrigation pipes or markers previously placed in the planting islands to avoid damaging them.

3.6 BACKFILLING

- .1 Contractor to fill planting pits as indicated on plan and as specified in section 32 91 21 "Topsoil and Finish Grading" of these specifications.

3.7 TREE PLANTING

- .1 Loosen pit bottom to a depth of 150 mm.

- .2 Protect trunk, crown and root ball during transport and handling. Use a forked device with three (3) support points or a suitable clamp, which ensures that the tree remains in a vertical position during handling. Contractor's equipment to be approved by Customer's Representative prior to planting.
- .3 Clear top of rootball to establish collar level. Determine actual rootball height based on collar. Place the plants upright in the pits, arranging them so that they produce the best effect and blend in with the surrounding structures.
- .4 Place the rootball so as to ensure that the level of the collar corresponds to the finished level of the adjacent soil.
- .5 For rootballs in tontines, loosen the canvas and cut off the top 1/3 of the height of the rootball, taking care not to undo the canvas. It is forbidden to remove the canvas or rope from under the root ball. In the case of container-grown plants, remove the pot without undoing the root ball.
- .6 Never leave non-biodegradable wrapping materials in pits.
- .7 Add and pack potting soil in 150 mm layers to eliminate air pockets. Do not use frozen or water-saturated potting soil. After spreading 2/3 of the potting soil, fill the pit with water. When the water has completely penetrated the soil, backfill the pit to the level of the collar and finished soil.
- .8 For trees planted in the ground, use the substrate to form a water-holding trough, 150 to 200 mm high, at the edge of the planting pit, with an inner radius corresponding to the outer radius of the root ball.
- .9 For trees planted in paved areas in soil cell system:
 - .1 Use the substrate to form a water retention basin, 100 mm high, at the edge of the planting pit, with the inside radius of the basin corresponding to the outside radius of the root ball.
 - .2 Place a geotextile fabric over the entire surface of the planting pit, avoiding wrinkles and ensuring that the geotextile clears the trunk.
 - .3 Place a 50mm-diameter river pebble over the entire surface of the planting pit planting pit, ensuring that the pebble completely clears the space required for the tree grate structure.
 - .4 Fill the grid opening around the trunk with the 9.5mm-diameter pebble.

3.8 STABILISATION

- .1 Anchoring hardwood trees :
Push the triangular anchors into the bottom of the hole until only the tie-down rings are visible.

Thread the tensioning straps through the lashing rings of each anchor, then pull them back towards the easy-to-use manual tensioning ratchet. Retighten and adjust strap tension for best result. Retighten if necessary. The strap must pass through each eyelet and over the root ball to stabilize the tree root ball at three points, as shown on the drawings. Position the strap so as to avoid strangling the trunk and so that it lies flat on top of the root ball. Use the ratchet to tension and secure the strap, with the flat side of the ratchet facing the root ball. Insert the anti-strangling clamps into the root ball, avoiding the root ball's major roots, to prevent the strap from moving towards the trunk.

3.9 PROTECTION

- .1 Contractor to protect hardwood tree trunks from rodents. Place trunk protector per manufacturer's specifications at base of tree collar. Staple the trunk protector with black self-locking ties (Tie Wrap) every 30 cm from the ground to the finished height of the protector. The height of the trunk protector must be at least 800mm.

3.11 PRUNING

- .1 Plants require little pruning at the time of planting, provided they are transported properly. Cut back dead, dried-out or damaged branches or parts of branches. Remove dead, desiccated or damaged stems, stem portions or branches, or those that do not respect the shape of the species and cultivar. Cut back healthy stems or branches that are very long and thin at the base, according to the specific needs of the species or cultivar. Follow the instructions of the specialized Contract Administrator.
- .2 Do not cut any branches without prior approval of the Contract Administrator. Follow specialized supervisor's instructions.
- .3 Contract Administrator reserves the right to request pruning of tree and shrub branches before or after substantial completion of work.

3.12 FERTILISATION

- .1 For trees, mix Mycorhize pro with the potting soil in the planting pit at the following rates:

MICORHIZE QUANTITY ACCORDING TO TREE SIZE	
SHAFT SIZE	QUANTITY OF MICORHIZE/TREE
2 to 2.5 cm	750 ml
2.5 to 3.8 cm	1000 ml
3.8 to 6.4 cm	2000 ml
6.4 to 8.9 cm	3000 ml
8.9 to 12.7 cm	4000 ml

- .2 Mycorrhizae must be in contact with plant roots.

3.13 MULCH

- .1 Mulch the surface of shrub, perennial and grass planting beds.
- .2 Before spreading mulch, ensure that soil terracing has been corrected and that no debris or weeds remain on the surface to be mulched.
- .3 Spread a uniform 75 mm thickness of mulch after compaction over tree and shrub planting beds.
- .4 Avoid mulching the last 15 cm of tree diameter.

3.13 MAINTENANCE DURING THE SET-UP PERIOD

- .1 Carry out the following maintenance work from planting to unconditional acceptance of work.
 - .1 Water the soil to maintain a level of humidity conducive to the establishment, growth and health of all plants, without causing erosion. Water trees as well as larger transplants. Each tree can require an average of 1,000 liters of water per watering. Frequency of watering should be such as to maintain trees in good condition.
 - .2 Watering should be such that the water penetrates the entire depth of the planting pits. Watering shall be uniform and sufficiently abundant to provide a favourable growing environment.
 - .3 Ensure adequate watering at all times. Soil moisture should be monitored throughout the growing season and watering frequency increased in periods of heat waves or prolonged drought.
 - .4 Equipment must be appropriate so as not to damage planted vegetation. The Contractor shall plan to use fine water jets to water the plants so as not to bed the plants or displace the mulch.
 - .5 For perennials and grasses, water at least once a day for the first two weeks.
 - .6 Water regularly (at least once a week) for eight weeks after planting, to keep plants in good growing condition.
 - .7 Adjust watering frequency according to weather conditions.
 - .8 Keep watering troughs in good condition. Reshape beading if necessary.
 - .9 Remove weeds once a month.

- .10 Replace disturbed mulch and add mulch as required.
- .11 In areas not covered with mulch, cultivate the soil as required to keep the top layer crumbly.
- .12 If it is necessary to control insects, fungi and diseases, use appropriate control methods in compliance with federal, provincial and municipal regulations. Submit products to Customer's Representative for review prior to application.
- .13 Cut back dead or broken branches.
- .14 Maintain trunk guards and guy wires in good condition; adjust as necessary.
- .15 Remove and replace dead or diseased vegetation in the manner prescribed for first plantings.

3.14 STOCKING

- .1 Storage areas located on the site covered by this contract must be cleaned and restored to the satisfaction of the Contract Administrator.

3.15 NETTOYAGE

- .1 Perform clean-up work in accordance with section [01 74 11 - Clean-up].
- .2 Contractor to clean up excess topsoil to avoid staining adjacent surfaces.
- .3 Perform clean-up throughout process and at conclusion of work. Keep site free of soil, sediment, trash and debris. Remove excess soil material, debris and equipment when work in this section is complete.
- .4 Remove burlap, wire and containers from site.
- .5 Repair any damage to installations and adjacent surfaces that may have been caused by the execution of this work, using qualified personnel for the repair work required.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.
 - .2 The City of Winnipeg Standard Construction Specification in effect on the date of closing shall apply.
 - .3 City of Winnipeg Standard Construction Specifications – Division 3 – CW 2030 and CW 2110.
 - .4 All referenced standard construction specifications found within CW 2030 and CW 2110.
 - .5 All referenced standard details found within CW 2030 and CW 2110.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 2030 and CW 2110.
- .2 Hydrostatic leakage testing, disinfection, and disinfection testing are incidental to the installation of Site Water Utility Distribution Piping.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 2030, CW 2110, or as indicated on the plans.

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Refer to Section 31 23 33.01 for backfill requirements.

3.2 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 2030 and CW 2110.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.
 - .2 The City of Winnipeg Standard Construction Specification in effect on the date of closing shall apply.
 - .3 City of Winnipeg Standard Construction Specifications – Division 3 – CW 2030 and CW 2130.
 - .4 All referenced standard construction specifications found within CW 2030 and CW 2130.
 - .5 All referenced standard details found within CW 2030 and CW 2130.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 2030 and CW 2130.
- .2 Sewer Televising is incidental to the installation of Public Sanitary Sewerage Gravity Piping.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 2030, CW 2130, or as indicated on the plans.

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Refer to Section 31 23 33.01 for backfill requirements.

3.2 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 2030 and CW 2130.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.
 - .2 The City of Winnipeg Standard Construction Specification in effect on the date of closing shall apply.
 - .3 City of Winnipeg Standard Construction Specifications – Division 3 – CW 2030 and CW 2130.
 - .4 All referenced standard construction specifications found within CW 2030 and CW 2130.
 - .5 All referenced standard details found within CW 2030 and CW 2130.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 2030 and CW 2130.
- .2 Sewer Televising is incidental to the installation of Storm Utility Drains.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 2030, CW 2130, or as indicated on the plans.

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Refer to Section 31 23 33.01 for backfill requirements.

3.2 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 2030 and CW 2130.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 The City of Winnipeg Standard Construction Specifications
 - .1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.
 - .2 The City of Winnipeg Standard Construction Specification in effect on the date of closing shall apply.
 - .3 City of Winnipeg Standard Construction Specifications – Division 4 – CW 3120.
 - .4 All referenced standard construction specifications found within CW 3120.
 - .5 All referenced standard details found within CW 3120.

1.2 MEASUREMENT AND PAYMENT

- .1 As per specification CW 3120.

Part 2 Products

2.1 MATERIALS

- .1 Use only those products meeting the specifications listed under CW 3120 or as indicated on the plans.

Part 3 Execution

3.1 EXAMINATION

- .1 All work to be in accordance with the latest revisions of the City of Winnipeg Standard Construction Specifications found within CW 3120.

END OF SECTION