

PART 1 General

1.1 SECTION INCLUDES

- .1 Samples.
- .2 Certificates and transcripts.

1.2 ADMINISTRATIVE

- .1 Submit to Contract Administrator submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work is coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review.
- .10 Keep one reviewed copy of each submission on Site.

1.3 SHOP DRAWING AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Manitoba, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 5 Working days for Contract Administrator's review of each submission.
- .5 Adjustments made on shop drawings by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

- .6 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of any revisions other than those requested.
- .7 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent Work.
- .9 After Contract Administrator's review, distribute copies.
- .10 Submit 2 prints or electronic copy of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.
- .11 Submit 2 prints or electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Contract Administrator.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 2 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Contract Administrator.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Contract Administrator.

- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Contract Administrator.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Contract Administrator.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.4 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Contract Administrator's business address.
- .3 Notify Contract Administrator in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .6 Make changes in samples which Contract Administrator may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of Workmanship and material against which installed Work will be verified.

1.5 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

PART 2 Products

2.1 NOT USED

- .1 Not Used

PART 3 Execution

3.1 NOT USED

- .1 Not Used

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

- .1 Section 01330 – Submittals.

1.3 INSPECTION

- .1 Refer also to The City of Winnipeg General Conditions for Construction, Clause C11.
- .2 Allow Contract Administrator access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Contract Administrator instructions, or law of Place of Work. A minimum of 24 hours notice is required.
- .4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .5 Contract Administrator may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such Work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.4 REJECTED WORK

- .1 Refer also to The City of Winnipeg General Conditions for Construction, Clause C11.
- .2 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.
- .3 Make good other Contractor's Work damaged by such removals or replacements promptly.
- .4 If in opinion of Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, City of Winnipeg may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Contract Administrator.

1.5 INDEPENDENT INSPECTION AGENCIES

- .1 Examination and testing shall be carried out by independent examining, testing companies, as appointed by the Contractor and acceptable to the Contract Administrator, except for the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

- .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Mill tests and certificates of compliance.
 - .4 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .5 Tests specified to be carried out by Contractor as part of Commissioning procedures.
- .2 Pay all costs for specified examination, testing Work performed by independent examining and testing companies, from cash allowance specified.
 - .3 Where tests or examinations by designated testing laboratory reveal Work not in accordance with contract requirements, Contractor shall pay costs for additional tests or examinations as Contract Administrator may require to verify acceptability of corrected Work making good Work that is covered before required examination or testing is completed and approved by Contract Administrator.
 - .4 Submit mix design, test reports to Contract Administrator.

1.6 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off Site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

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

1.8 REPORTS

- .1 Submit copies of inspection and test reports to City of Winnipeg and Contract Administrator.
- .2 Provide copies to Subcontractor of Work being inspected or tested and manufacturer or fabricator of material being inspected or tested.
- .3 Provide copies of concrete test results to Concrete Supplier.

1.9 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 shall be appraised by Contract Administrator and may be authorized as recoverable by the Contractor.

1.10 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Contract Administrator as specified in specific Section.

- .3 Prepare mock-ups for Contract Administrator's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Contract Administrator will assist in preparing a schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Contract Administrator.
- .7 Mock-ups may remain as part of Work when approved by Contract Administrator.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.11 MILL TESTS

- .1 Submit mill test certificates as requested and required of specification sections.

1.12 EQUIPMENT AND SYSTEMS

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

PART 2 Products

2.1 NOT USED

- .1 Not Used.

PART 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.
- .4 Existing facilities.

1.2 RELATED SECTIONS

- .1 Section 01450 - Quality Control.

1.3 REFERENCE STANDARDS

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

1.4 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Contract Administrator based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.5 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Contract Administrator of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify 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.

1.6 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber, protection board, on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Contract Administrator.
- .9 Touch-up damaged factory finished surfaces to Contract Administrator's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.7 TRANSPORTATION

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

1.8 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that Contract Administrator may establish course of action. Where conflicts exist, the most stringent instructions will be enforced.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Contract Administrator to require removal and re-installation at no increase in Contract Price or Contract Time.

1.9 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by Workers experienced and skilled in respective duties for which they are employed. Immediately notify 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, Workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Contract Administrator, whose decision is final.

1.10 CONCEALMENT

- .1 In finished areas conceal pipes and wiring in shrub beds and under paving, except where indicated otherwise.
- .2 Before installation inform Contract Administrator if there is interference. Install as directed by Contract Administrator.

1.11 CO-ORDINATION

- .1 Ensure cooperation of Workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.12 REMEDIAL WORK

- .1 Perform remedial Work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial Work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of parts of Site. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Contract Administrator.

1.14 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.
- .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

- .1 Not Used.

PART 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 This Specification shall cover the protection of existing trees within the limits of the Site with temporary barriers, and trunk strapping. Due to the size and quality of the trees on the Site, special care is required to protect the foliage, branches, trunk and roots from damage that could result from construction operations.
- .2 The Contractor shall furnish all labour, materials, equipment and services necessary to complete the Work as specified herein and
- .3 The Contractor shall be responsible for preventing the following types of damage.
 - .1 Compaction in root zone caused by foot and vehicular traffic or material storage.
 - .2 Trunk damage and branch damage caused by equipment operations, material storage, or nailing and bolting.
 - .3 Trunk and branch damage caused by ropes or guy wires.
 - .4 Root poisoning from spilled solvents, gasoline, paint, and other noxious materials.
 - .5 Branch damage due to improper pruning or trimming.
 - .6 Damage from lack of water due to.
 - .1 Cutting or altering natural water migration patterns near the root zones.
 - .2 Failure to provide adequate water.
 - .7 Damage from alteration of soil pH factor caused by depositing lime, concrete, plaster, or other vase materials near roots.

1.2 RELATED SECTIONS

- .1 Section 02232 – Tree Pruning.
- .2 Section 02906 – Trees, Shrubs and Groundcover Planting.

1.3 DAMAGE ASSESSMENT

- .1 Trees Below 100 mm Calliper.
 - .1 Trees below 100 mm calliper destroyed or badly damaged as a result of construction operations shall be removed and replaced with trees of the same size, species, and variety. Replacement trees are to be reviewed and approved by the Contract Administrator prior to installation.
- .2 Trees Over 100 mm Calliper.
 - .1 Trees over 100 mm calliper badly damaged or destroyed by construction operations will be appraised according to the current International Society of Arboriculture evaluation procedure presently in use by the City of Winnipeg Forestry Branch. It will be at the Contract Administrator's discretion to apply this appraised value toward the landscape development or to deduct it from the Contract amount.

PART 2 Products

2.1 MATERIALS

- .1 Barrier material: new, sturdy, water and tear resistant material, 1200 mm height, such as PVC snow fence.
- .2 Snow fence supports: rolled steel T-bar fence posts.
- .3 Burlap fabric.

- .4 Dimension lumber for strapping: 19 x 140 x 2400 mm.
- .5 Steel wire, 9 to 12 gauge.

PART 3 Execution

3.1 GENERAL

- .1 All tree protection is to be in place prior to start of the Work and stay in place until construction completion.
- .2 All trees within the project area are to remain and be protected from damage, except for trees shown on the Drawings to be removed.
- .3 Obtain approval from Contract Administrator of all proposed protection materials, methods and locations prior to construction commencement.
- .4 Prior to erection of protective enclosures, trees may be pruned under the direction of a certified arborist and as specified in Section 02232 Tree Pruning.
- .5 Ensure all trees receive necessary care, water and fertilizing during the construction period and as specified in Section 02202 Tree Preservation.
- .6 Ensure that all construction activity, including but not limited to, the storage of materials and equipment, disposal of debris and the parking, maintenance and re-fuelling of all vehicles shall not be carried out within the drip line of all trees not designated for removal or inside of any barrier erected for the protection of vegetation.
- .7 Where damage to a tree does occur, the Contractor shall notify the Contract Administrator and arrange for a certified arborist to prune and dress the wound(s). More substantial damage to trees not designated for removal will invoke the conditions under Item 1.2 Damage Assessment.

3.2 TEMPORARY BARRIERS

- .1 For trees and plant material designated to remain, provide temporary barriers consisting of snow fence c/w T-bar fence posts . Where posts cannot be driven into the ground, the Contractor may suggest an alternative method of stabilizing the posts to ensure adequate support, subject to the approval of the Contract Administrator. Barriers shall be sturdy and resistant to sagging, tearing, water and wind damage.
- .2 Obtain approval of proposed barrier locations prior to installation. Barriers shall be as large as practical, extending beyond the drip line (edge of canopy) where space allows. In a tight locations, a minimum 2m radius around the tree trunk is recommended by the Contract Administrator.

3.3 STRAPPING

- .1 Apply timber strapping to trees in close proximity to moving equipment and construction work. Timber strapping may be required for trees protected only by temporary barriers as directed by Contract Administrator.
- .2 Wrap trunk with a layer of burlap.
- .3 Install 1 x 6 or approved alternate dimensioned lumber, placed vertically, spaced 50 to 75 mm apart around the circumference of the mature tree trunks. Smaller trees shall be strapped with appropriately sized lumber.
- .4 Secure with steel wire.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 This section shall include materials and installation for fertilizing and preserving root systems of plants affected by changing grades or adjacent excavation.

1.2 RELATED SECTIONS

- .1 Section 02232 - Tree Pruning.
- .2 Section 02906 - Trees, Shrubs and Groundcover Planting.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA G30.5- M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .2 Fertilizers Act (R.S. 1985, c. F-10).
 - .3 Fertilizers Regulations (C.R.C., c. 666).
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .3 Health Canada - Pest Management Regulatory Agency (PMRA)
 - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.4 SCHEDULING

- .1 Obtain approval from Contract Administrator of schedule indicating beginning of Work.

1.5 MAINTENANCE DURING LANDSCAPE CONSTRUCTION PERIOD

- .1 From time of landscape construction commencement to date of construction completion, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of existing plant material without causing erosion.
 - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Contract Administrator prior to application.
 - .3 Apply fertilizer in early spring at manufacturer's suggested rate.
 - .4 Remove dead, broken or hazardous branches from plant material.

PART 2 Products

2.1 MATERIALS

- .1 Fill:
 - .1 Type A: clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
 - .2 Type B: excavated soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Contract Administrator before use as fill.

- .3 Planting Medium: Black Topsoil and Soil Amendments as specified in Section 02911- Planting Medium and Finish Grading.
- .2 Coarse washed stones: 35-50 mm diameter free from deleterious materials.
- .3 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous.
 - .3 Free of wood and deleterious material that could prohibit growth.
 - .4 Shredded minimum particle size: 5 to 10 mm.
- .4 Fertilizer:
 - .1 To Canada Fertilizer Act and Fertilizers Regulations.
 - .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.
- .5 Anti-desiccant: commercial, wax-like emulsion.
- .6 Filter Cloth:
 - .1 Type 1: 100% non-woven needle punched polyester, 2.75 mm thick, 240 g/m2 mass.
- .7 Welded Wire Fabric
 - .1 (WWF) 100 x 100 mm, tp CSAG30.5.
- .8 Wood Stakes
 - .1 38 x 89 x 2400 mm length untreated wood.
- .9 Compost: A mixture of soil and decomposing organic matter used as a fertilizer, mulch, or soil conditioner. Compost is processed organic matter containing 40% or more organic matter as determined by the Walkley-Black or LOI test. Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C : N ratio below (25) and contain no toxic or growth inhibiting contaminants. Composed bio-solids must meet the requirements of the Guidelines for Compost Quality, Category A or B produced by the Canadian Council of the Ministers of the Environment (CCME), January 1996.

PART 3 Execution

3.1 IDENTIFICATION AND PROTECTION

- .1 Identify trees and limits of root systems to be preserved as approved by Contract Administrator.
- .2 Protect root systems from damage, compaction and contamination resulting from construction as approved by Contract Administrator.
- .3 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Contract Administrator.

3.2 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

- .1 Centre line location and limits of trench/tunnel excavation to be approved by Contract Administrator prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .3 Do not install lines directly under tree trunks.

- .4 Backfill for trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .5 Complete tunneling and backfilling at tree, within 2 weeks of beginning of Work.

3.3 LOWERING GRADE AROUND EXISTING TREE

- .1 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system, and slightly loosen topsoil surface. Avoid damage to root system.
- .2 Begin Work in accordance with schedule, approved by Contract Administrator.
- .3 Cut slope not less than 2.0 m from tree trunk to new grade level.
- .4 Excavate to depths as indicated by hand. Protect root zone from damage.
- .5 When severing roots at excavation level, cut roots with sharp tools from damage.
- .6 Obtain Contract Administrator's approval of excavated and pruned root zone.
- .7 Cultivate excavated surface manually to 150 mm depth.
- .8 Prepare homogeneous soil mixture consisting by volume of:
 - .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
 - .2 25% coarse, clean sterile sand.
 - .3 15% organic matter.
- .9 Install granular base, concrete, wall footing or shrub bed as indicated on the drawing. Compact to specified densities.
- .10 Water entire root zone to optimum soil moisture level.

3.4 PRUNING

- .1 Prune in accordance with Section 02232 - Tree Pruning.
- .2 Prune crown to compensate for root loss while maintaining general form and character of the tree. Dispose of debris through mulching.

3.5 ANTI-DESICCANT

- .1 Apply anti-desiccant to foliage where applicable and as directed by Contract Administrator.

3.6 RAISING GRADE AROUND EXISTING TREES

- .1 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system, and slightly loosen topsoil surface. Avoid damage to root system.
- .2 Place 1219 mm \emptyset metal culvert around the tree trunk as shown on the Drawings.
- .3 Allow minimum of 150 mm between the trunk and culvert.
- .4 Ensure culvert is deep enough to retain grade change.
- .5 Protect culvert openings from blockage during construction.
- .6 Place topsoil and plant on surface of original ground to limits and depths as shown on the Drawing.
- .7 Complete surface treatment over the area as shown on the Drawing and within one week of placing fill.

3.7 AERATION, VERTICAL FERTILIZATION AND MULCHING

- .1 Aerate and fertilize existing trees.
 - .1 Drill holes around existing trees in a pattern of concentric rings. Locate the first ring approx. 1.2 m from the tree trunk. Continue each consecutive ring of holes, 600 mm further out. Space holes (30 mm \varnothing , 300 mm depth) in the ring 600 mm o.c. Place approx. 2 tablespoons of slow release granular fertilizer of 10-6-4 ratio (or equivalent) into each hole.
 - .2 Fill each hole with mulch consisting of well screened compost.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Pruning of all existing trees on Site.

1.2 RELATED SECTIONS

- .1 Section 02202 – Trees Preservation.

1.3 REFERENCES

- .1 Canadian Nursery Landscape Association (CNLA).
- .2 International Society of Arboriculture (ISA)
- .3 Ontario Ministry of Agriculture, Food and Rural Affairs.
 - .1 Pruning Ornamentals (#483)-1992.

1.4 QUALIFICATIONS

- .1 Staff to possess International Society of Arboriculture and /or Canadian Nursery Landscape Association certification.
- .2 Staff to possess safety certificate or equivalent as approved by local hydro utility.

1.5 FIELD SAMPLE

- .1 Do sample pruning acceptable to Contract Administrator to identify:
 - .1 Knowledge of target areas including branch bark ridge and branch collars.
 - .2 Technique for selection process and pruning used to establish desired form and shape for each species.
- .2 Acceptance of Work will be determined by Contract Administrator from field sample.

1.6 MAINTENANCE

- .1 Tool maintenance:
 - .1 Ensure that tools are clean and sharp throughout pruning operation. Do not use tools, which crush or tear bark.
 - .2 Disinfect tools before each tree is pruned.
 - .3 On diseased plant material disinfect tools before each cut.

PART 2 Products

2.1 DISINFECTANT

- .1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

PART 3 Execution

3.1 GENERAL

- .1 Prune in accordance with Pruning Ornamentals, and as directed by Contract Administrator. Where discrepancies occur between standard and specifications, specifications govern.

- .2 Notify Contract Administrator immediately regarding conditions detrimental to health of plant material or operations. Set a date on Site to discuss areas to be pruned and extent of pruning. Do not complete pruning prior to this discussion.
- .3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation or at time of leaf fall.
- .4 Retain natural form and shape of plant species.
- .5 Do not:
 - .1 Flush cut branches.
 - .2 Crush or tear bark.
 - .3 Cut behind branch bark ridge.
 - .4 Damage branch collars.
 - .5 Damage branches to remain.

3.2 PRUNING

- .1 Remove dead, dying, diseased and weak growth from plant material designated by Contract Administrator in order to promote healthy growth.
- .2 Remove live branches that:
 - .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
 - .2 Are of weak structure including narrow crotches.
 - .3 Obstruct development of more important branches.
 - .4 Are broken.
- .3 Remove live branches to re-establish natural species form including:
 - .1 One or more developing leaders.
 - .2 Multiple growth due to previous topping.
 - .3 Branches extending outward from natural form.
 - .4 Undesirable sucker growth.
- .4 Remove loose branches, twigs and other debris lodged in tree.
- .5 Remove vines climbing on tree trunks.
- .6 For branches under 50 mm in diameter:
 - .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
 - .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
 - .3 Do not cut lead branches unless directed by Contract Administrator.
- .7 For branches greater than 50 mm in diameter:
 - .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.
 - .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
 - .3 Make final cut adjacent to and outside branch collar.
- .8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal. Repair areas, which are damaged, or remove damaged area back to next branch collar.
- .9 Remove additional growth designated by Contract Administrator.

3.3 ROOT GIRDLING

- .1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.
- .2 Remove exposed portion of girdling root as directed by Contract Administrator after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.4 CARE OF WOUNDS

- .1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.5 CLEAN-UP

- .1 Collect and dispose of pruned material and remove from Site.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 This Section specifies fill materials used for backfilling, and grading overtop and around the perimeter of the plaza structure. All earthwork for streetscapes to be completed in accordance with City of Winnipeg specifications.

1.2 RELATED SECTIONS

- .1 Section 03300 – Cast-in-Place Concrete.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft lbf/ft³) (600kN m/m³).
- .2 City of Winnipeg Standard Construction Specifications
 - .1 CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.

1.4 MEASUREMENT PROCEDURES

- .1 No measurement will be made for Work under this Section.

1.5 SUBMITTALS

- .1 Provide submittals as required by Contract Administrator.
 - .1 Submit to designated testing agency, 23 kg sample of backfill for fill material proposed for use, no later than two (2) weeks before backfilling or filling Work.

1.6 EXISTING CONDITIONS

- .1 Examine soil report available at the Contract Administrators office.

PART 2 Products

2.1 MATERIALS

- .1 Base Course Material: to CW3110-Sub-Grade, Sub-Base and Base Course Construction.
 - .1 Base course material will be approved by Contract Administrator.
 - .2 Base course material will consist of sound, hard, crushed rock or crushed gravel and will be free from organic or soft material that would disintegrate through decay or weathering.
 - .3 The base course material will be well graded and conform to the following grading requirements:

Base Course Material Grading Requirements

Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve	
	Granular	Crushed Limestone
25 000	100%	
20 000	80% - 100%	100%
5 000	40% - 70%	40% - 70%
2 500	25% - 55%	25% - 60%
315	13% - 30%	8% - 25%
80	5% - 15%	6% - 17%

PART 3 Execution

3.1 PREPARATION/PROTECTION

- .1 Protect excavations from freezing.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Protect buried services that are required to remain undisturbed.
- .4 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Contract Administrator approval.
- .5 Protect natural and manmade features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .6 Protect benchmarks and existing structures, roads, sidewalks, paving, and curbs against damage from construction traffic.
- .7 Notify Contract Administrator of any unexpected subsurface conditions. Discontinue Work in the area until Contract Administrator provides notification to resume Work.
- .8 Utilities and Buried services:
 - .1 Before commencing Work verify location of buried services on and adjacent to Site.
 - .2 Arrange with Contract Administrator for relocation of buried services that interfere with execution of Work: pay costs of relocating services.
 - .3 Notify Contract Administrator to remove and/or relocate lines which are in the way of earthwork.
 - .4 Protect utility services uncovered by excavation

3.2 CLEARING AND GRUBBING

- .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
- .2 Remove stumps and tree roots below footings, slabs, and paving, and to minimum 600 mm below finished grade elsewhere.
- .3 Dispose of cleared and grubbed material from Site daily to disposal areas acceptable to authority having jurisdiction.

3.3 EXCAVATION

- .1 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .1 Stockpile topsoil on Site for later use.
- .2 Excavate as required to carry out Work.
 - .1 Excavate in accordance with lines and levels required to erect formwork.
 - .2 Do not disturb soil or rock below bearing surfaces.
 - .3 Notify Contract Administrator when excavations are complete.
 - .4 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional Work. Excavation taken below depths shown without Contract Administrator written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
 - .5 Excavations are not to interfere with normal 45 degree bearing splay of any foundation.
 - .6 Remove excess or unsuitable excavated subsoil from Site.

- .7 Removal of boulders or buried rock in excess of 0.5 cu.m. will be authorized in writing and paid for as additional Work. All other Work is deemed to be within the scope of this Section.
- .3 Excavate for slabs and paving to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 DEWATERING

- .1 Keep excavations dry at all times. Provide necessary equipment including pumps, piping and temporary drains and trenches.
- .2 Discharge drainage water lines in manner and location acceptable to Contract Administrator
- .3 Direct surface drainage away from excavated areas.
- .4 Control the grading in and adjacent to excavations to prevent water running into excavated areas.
- .5 Furnish and operate suitable pumps on a 24 hour basis to keep excavations free of water until foundations have been placed.

3.5 BACKFILLING

- .1 Inspection: Do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Contract Administrator.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Compaction of subgrade: compact existing subgrade under slabs-on-grade, to same compaction as specified for fill.
 - .1 Fill excavated areas with selected subgrade material compacted as specified for fill.
- .4 Placing: Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
- .5 Backfill areas to grades, contours, levels and elevations indicated on Drawings.
- .6 Perform backfilling operations systematically and as early as possible to allow maximum time for natural settlement and compaction.
- .7 Compaction: compact each layer of material to following densities for material to ASTM D698: 100% Modified Proctor Density.

3.6 GRADING

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Contract Administrator.
- .2 Grade to be gradual between finished spot elevations shown on drawings.

3.7 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Contract Administrator.
- .2 Not later than two (2) weeks before backfilling or filling, provide to designated testing agency, samples of backfill as described in Part 1 - Submittals.

- .3 Do not begin backfilling or filling operations until material has been approved for use by Contract Administrator.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Contract Administrator so that compaction tests can be carried out by designated testing agency.

3.8 SHORTAGE AND SURPLUS

- .1 Supply necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off Site.

3.9 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Unit pavers in concrete blockouts on aggregated base.

1.2 RELATED SECTIONS

- .1 Section 02300 – Earthwork.
- .2 Section 03300 – Cast In Place Concrete.

1.3 REFERENCES

- .1 City of Winnipeg Standard Construction Specifications
 - .1 CW 3330-R3 – Installation of Interlocking Pavement Stones

1.4 SAMPLES

- .1 Submit samples in accordance with Section 01330 - Submittal Procedures.

PART 2 Products

2.1 MATERIALS

- .1 Materials to conform to City of Winnipeg Standard Specification CW 3330-R3.
- .2 Unit pavers: fired clay brick, unit pavers, shapes, colours and patterns as shown on drawings, uniform in material, colour, and size and from one supplier. Acceptable products: Endicott Danish Hand Mold Pavers as supplied by Alsips Ltd., Winnipeg, Manitoba .
- .3 Bedding Sand: to the requirements of Specification CW 3330-R3.
- .4 Joint Sand: to the requirements of Specification CW 3330-R3.
- .5 Joint Sand Stabilizer: polymeric sand or approved alternate.

PART 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions are ready to receive Work.
- .2 Verify substrate surfaces are clean, dimensionally stable, at proper grade, cured and free of contaminants such as oil.
- .3 Verify that concrete substrate has been allowed to cure for minimum of 28 days **and drainage holes have been installed as noted on the drawings.**
- .4 Verify pre-cast concrete block outs scheduled to receive pavers are accurately formed to accept pavers with joints, and have been finished with maximum permissible variation of 3 mm in 3049 mm from required plane and not more than 1.5 mm in 300 mm when measured from high points in surface.
- .5 Beginning of installation implies acceptance of existing conditions.
- .6 Report in writing unsuitable conditions to Contract administrator. Proceed with Work only after written instruction is received from Contract administrator.

3.2 LAYOUT OF WORK

- .1 Accurately layout paving Work to patterns and conditions shown on drawings and encountered on Site, and specified for installation. Provide additional control points and stakeouts as required to effect correct alignments and grade elevations. Advise Contract administrator of discrepancies and on Site conditions detrimental to critical layouts and obtain approved correction.

3.3 PREPARATION OF SAND BASE

- .1 Install bedding sand in formed recesses or over aggregate base, depth as indicated. Sand layer shall be spread and leveled so that pavers when installed are 5 mm higher than finished grade. No more sand shall be spread than can be covered in one day with pavers. Bedding sand layer shall not be compacted prior to installation of pavers.
- .2 No pavers shall be placed until construction of underlying layers has been approved by Contract Administrator.

3.4 INSTALLATION OF UNIT PAVERS

- .1 Pavers shall be installed to Specification CW 3330-R3, set in locations and patterns as indicated. Spaces between joints shall not exceed 3 mm, and shall be uniform and consistent while maintaining true patterns as indicated.
- .2 If cutting of pavers is required, sawn edges shall be true, even and undamaged. Cuts shall occur at end of rows and intersections of lines of paving only.
- .3 Compact into bedding sand layer using approved vibratory compactors until pavers are at proper grade, uniformly level and free of movement.

3.5 DETECTABLE WARNING PAVERS

- .1 Detectable warning pavers shall be installed at curb ramps as indicated. Extent and location to be confirmed with Contract Administrator and the City's accessibility consult on Site prior to installation.

3.6 SAND JOINTS

- .1 Fill paver joints with joint sand.
- .2 Ensure paving surface is dry and free of dirt or other debris.
- .3 Sweep joint sand into joints until full, using a soft brush at a 45° angle to the joint lines.

3.7 JOINT SAND STABILIZER

- .1 Where indicated on the drawings, and over all reinforced concrete slabs, install joint sand stabilizer to reduce water infiltration.
- .2 Install and clean up in accordance with manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- .1 Inspect completed work and replace broken, cracked, or damaged pavers.

3.9 CLEANING

- .1 Remove excess sand and cutting debris with broom.

3.10 PROTECTION

- .1 Protect pavers from damage resulting from subsequent construction operations.
- .2 Remove protection materials upon Substantial Performance of Work, or when risk of damage is no longer present.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Performance requirements for irrigation system serving entrance garden planting of shrubs, perennials, grasses, groundcover and trees.

1.2 RELATED SECTIONS

- .1 Section 02906 – Trees, Shrubs and Groundcover Planting.
- .2 Section 02911 – Planting Medium and Finish Grading.
- .3 Section 02933 – Landscape Maintenance.

1.3 PROTECTION

- .1 Prevent damage to benchmarks, existing buildings, surface or underground utility lines which are to remain. Make good any damage.
- .2 Existing Buried Utilities and Structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing any work, notify Contract Administrator and utility company, establish location and state of use of buried locations to prevent disturbance during work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures as indicated. Obtain direction of Contract Administrator before moving or otherwise disturbing utilities or structures.
 - .5 Advise Contract Administrator and utility company prior to excavation of new trench.

1.4 COORDINATION

- .1 Connect new entry system to existing system on the roof deck. Work with parking authority, library staff, and city to locate tie-ins and electrical/mechanical distribution points in the parkade. Roof deck irrigation system installed by Superb Irrigation fall of 2012. Contact # 204-956-9510.

1.5 MAINTENANCE DATA AND DEMONSTRATION PROCEDURES

- .1 Provide maintenance data for operation and maintenance of irrigation system and equipment.
- .2 The maintenance manual shall include all original manufacturers' warranty certificates, controller operation and programming instructions, servicing and replacement procedures for all sprinklers and valves, and procedures for blowing out the system in the fall and charging the system in the spring.
- .3 Demonstrate procedures for The City as directed by the Contract Administrator.

1.6 AS-BUILT PLAN

- .1 Upon completion of the work, submit an as-built plan showing exact location of all components of system.
- .2 Provide a control schedule, which balances system hydraulics and watering requirements.

1.7 LAYOUT WORK & INSPECTION

- .1 Provide detailed shop drawing layout plan showing zoning, pipe layout and valve locations for approval by Contract Administrator as per Section 01330 Submittal Procedures.
- .2 All work shall be laid out by the Contractor in conformance to the layout shown on their approved plan. The Contractor shall be fully responsible for the accuracy thereof.
- .3 Stake locations of heads and valves and receive approval from the Contract Administrator prior to installation.
- .4 Install main lines and laterals and receive approval from Contract Administrator prior to backfilling.
- .5 Upon completion of the irrigation system, the entire system shall be tested and balanced. The Contractor shall notify the Contract Administrator for a final test to allow the Contract Administrator to be on Site to consult. All components shall then be checked for proper operation, and the system shall not be accepted by the Contract Administrator, until all portions are operating as intended and until all deficiencies have been corrected. Contractor shall provide all pumps, gauges and fittings required for testing.
- .6 Notify Contract Administrator a minimum of 24 hours prior to inspection. Do not proceed to subsequent work without the approval of Contract Administrator.

1.8 WARRANTY

- .1 All irrigation system equipment and installation shall be guaranteed for 2 years following the latter of the: date of acceptance by the Contract Administrator or the date of Substantial Performance. Provide manufacturer's warranty certificates for all products.
- .2 End of warranty inspection will be conducted.

1.9 SYSTEM REQUIREMENTS

- .1 Automatic Drip Irrigation System Performance Criteria:
 - .1 Submit proposed piping and zoning plan for automatic drip irrigation system for approval by Contract Administrator.
 - .2 Design automatic drip irrigation system to provide 25mm (1") of actual precipitation per week within a 5 hour per day watering window.
 - .3 Apply all of the weekly water requirement to each zone on the same day.

Water Source:

- .4 Connection from existing valve boxes to existing water service as indicated on drawing. Connect both irrigation systems to valve boxes and as shown on the irrigation drawing. Seal to prevent leakage. Provide complete hydraulic calculations indicating flow and pressure loss at representative zones around the Site.
- .2 Control System:
 - .1 Tie into existing system if possible; add new zone as indicated. If not possible provide separate controls per following 2.2 – 2.4.
 - .2 Locate controller as indicated on the irrigation drawing.
 - .3 Electronic or hybrid type. Dual program and water budget features.
 - .4 Provide a rain switch to interrupt irrigation during and immediately following a rainstorm.
- .3 Distribution:
 - .1 Use HDPE pipe for all mains and laterals, 50mm (2") \varnothing and larger.
 - .2 Use LDPE pipe for all smaller laterals.
 - .3 Provide sleeves at all driveways and walkways as required.

- .4 Provide isolation valves at each valve cluster.
- .4 Loose Equipment:
 - .1 Provide two (2) quick coupling key with swivel ells as loose equipment.

PART 2 Products

2.1 MATERIALS

- .1 HDPE Pipe: Type 3, Series 100 or better, high density polyethylene to CGSB 41, Gp-25M. Join by thermal butt fusion in strict accordance with manufacturer's written instructions.
- .2 Fittings for HDPE Pipe: approved saddle fittings at head connections. Socket fusion fittings at pipe connections. Fittings to be approved by pipe manufacturer for fusion with pipe.
- .3 LDPE Pipe: 75 psi low density polyethylene to CSA B137.0 and B137.1.
- .4 Fittings for LDPE Pipe: approved brass saddle fittings at head connections. Nylon insert fittings with double stainless steel clamp at pipe connection.
- .5 Swing Joints: pre-manufactured by Lasco, Hunter, Rainbird.
- .6 Risers: galvanized steel pipe and fittings.
- .7 Sleeves: Series 160 PVC pipe of sufficient diameter to allow clear passage of irrigation pipe and control wires.
- .8 Backflow Preventer: N/A – existing
- .9 Manual Control valves: minimum 200 psi rated, WOG, level type ball or butterfly valves of approved manufacturer's quality. Sizes as indicated or as required to suit application.
- .10 Automatic Zone Control Valves: 200 psi (1100 KPa) rated, normally closed, 24 VAC electric solenoid valve with manual operation capability and flow control adjustment. Glass reinforced nylon body and bonnet or other approved durable material. Valve serviceable from top without removal from line. Match valves to selected controller and to zone flow requirements. Maximum pressure loss of 4 psi at design flow.
- .11 Valve Boxes: high density polyethylene or fibreglass reinforced prefabricated plastic boxes complete with locking cover and stainless steel bolt. Size to suit valve clusters as indicated. Note: some valve boxes are existing and are to be reused.
- .12 Automatic Controllers: wall mounted solid state I.C. controller with fully independently programmable stations and total manual override. Single switch control to reduce or expand watering schedule a minimum of 50%. Rechargeable battery backup and fail-safe program timing. Controller size to suit number of zones.
- .13 Quick Coupling Valve: 3/4" (19 mm) one piece brass valves of approved manufacturer's quality.
- .14 Quick Coupling Key: to match valve.
- .15 Swivel Ell: to match key and with 3/4" (19 mm) male hose thread.
- .16 Rain Switch: to measure rainfall and interrupt controller cycle. Rainbird Raincheck, Toro Rainswitch or Hunter Miniclik.

2.2 DRIP LINE

- .1 Acceptable Systems: Toro DL 2000 or Neta-Fim Techline.
- .2 Filters: 120 mesh to suit filtration and flow requirements as recommended by the system manufacturer.

PART 3 Execution

3.1 EXCAVATION

- .1 Provide 450 mm depth of cover over main line pipe outside of parkade deck and 300 mm depth of cover over the main line pipe within the parkade deck, 300 mm depth cover over lateral pipes and the control lines. Notify Contract Administrator if depth of cover is impeded in any location.
- .2 Backfill with material free from rocks, large stones and other unsuitable substances that could damage the pipe or create unusual settling problems. Backfill in 150 mm lifts, each compacted to prevent excessive settling. Repair trenching sod with new sod.
- .3 Backfill trenches containing plastic pipe when pipe is cool to avoid excessive contraction in cold weather. Such backfilling can be done in early morning hours or the pipe may be water cooled prior to backfilling procedures.
- .4 Avoid damage to any and all underground utilities and structures. The Contractor shall notify the The City and Contract Administrator of all underground utilities including electrical power, gas and telephone lines and have the locations staked prior to commencing excavations.

3.2 INSTALLATION OF PIPE

- .1 Coordinate installation with landscape trade. Take care not to damage parkade drainage system and deck waterproofing.
- .2 Install pipe and fittings in accordance with manufacturer's instructions, from point of supply connection.
- .3 Stake out and obtain approval of contract administrator prior to installing pipe.
- .4 Polyethylene pipe may be installed by standard trenching techniques or by "pulling in" pipe. If the pull-in method is used, the pipe "plow" shall be a vibratory type. The "Mole" or "Bullet", which precedes the pipe is used to form the opening for the pipe, shall not be less than 25 mm larger in diameter than the outside diameter of the pipe.
- .5 Make connections to the pipe for sprinkler with approved saddle fittings.
- .6 Install sleeves where pipe will run under all walks, walls, stairways, pool and other hard surfaces. Coordinate with other trades.
- .7 Route irrigation mains at the edge of planting beds.

3.3 VALVES

- .1 Install valves according to manufacturer's instructions, in valve box set plumb and flush with the finished grade. Locate valves in shrub beds.
- .2 Provide 150 mm depth of pea gravel sump below the valve.
- .3 Provide Q.C. valve for line blow out.

3.4 DRIP LINE

- .1 Install dripline to provide uniform coverage to areas indicated.
- .2 Provide header pipes and drain valves as required to facilitate line blowout .

3.5 WATER SERVICE CONNECTIONS

- .1 Connect to existing valve boxes as indicated on irrigation plan.

- .2 Perform all work in a neat and workmanlike manner and in accordance with City of Winnipeg standards.
- .3 Use di-electric fittings at connection of galvanized pipe or fittings to copper irrigation mains as required.

3.6 CONTROL LINES

- .1 Install lines in a neat and orderly fashion in the pipe trenches or in separate trenches. Bundle wires together and tape every 2 m.
- .2 Minimize splicing. Make splices where required in valve boxes. Make waterproof with the use of approved waterproof kits.
- .3 Install all wiring in accordance with existing codes.
- .4 Control lines within building to be run in EMT conduit.

3.7 AUTOMATIC CONTROLLER

- .1 Connect to existing controller Provide identifying label on service panel circuit breaker as necessary.
- .2 All wiring shall be done in a neat workmanlike manner and in compliance with local codes. Run 24 volt control lines to the outside in electrical conduit and seal to prevent leakage.

3.8 COORDINATION

- .1 Coordinate work with other trades, to ensure a proper sequence of installation and minimal disruption.

3.9 TESTING

- .1 Upon completion, test irrigation system for proper operation Leave all joints and fittings exposed and pressure test in presence of the Contract Administrator.
- .2 Provide all pumps and gauges as required for testing and as instructed by Contract Administrator.

3.10 BALANCING AND ADJUSTMENT

- .1 Balance and adjust the various components of the irrigation system so the overall operation is most efficient and coverage is uniform to the satisfaction of the Contract Administrator.

3.11 MAINTENANCE

- .1 Blow- out all irrigation water lines prior to freeze-up and reconnect the irrigation system in the spring of the following year.
- .2 Emergency repairs may be required to protect property or permit operation of the work. The The City shall notify the Contract Administrator immediately, who shall make all necessary repairs. The cost of such emergency repairs shall be paid by the Contractor. Maintenance not of an emergency nature shall be brought to the attention of Contract Administrator in writing who shall take the necessary action to correct the problem.
- .3 The Contractor shall provide on Site orientation as directed by the Contract Administrator to familiarize the City's maintenance personnel with the proper operation and maintenance of the irrigation system and locations of control equipment.

3.12 CLEAN-UP

- .1 Promptly remove materials and debris from excavation and dispose of in locations and manner designated by the Contract Administrator.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 All prefabricated commercially sold site furniture to be installed on Site.
- .2 For custom built-in refer to site carpentry and metal fabrication sections.

1.2 RELATED SECTIONS

- .1 Section 03300 – Cast-in-Place Concrete.
- .2 Section 06101 – Site Carpentry.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01330 - Submittal Procedures.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings.
- .2 Indicate dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual.

PART 2 Products

2.1 SKATE DETERRENT- CIP CONCRETE

- .1 Finish: Clear anodized aluminum
- .2 Acceptable product: Skatestoppers FA135 for 45° chamfer, or approved equal in accordance with B7.
- .3 Available from: 1547 N Cuyamaca St. El Cajon, CA 92020 USA, Ph. 619-447-6374, Fax. 619-447-6396.

2.2 SKATE DETERRENT- PEDRA BENCH SEAT

- .1 Finish: Clear anodized aluminum
- .2 Acceptable product: Skatestoppers FR0.12BC for wood planks, or approved equal in accordance with B7.
- .3 Available from: 1547 N Cuyamaca St. El Cajon, CA 92020 USA, Ph. 619-447-6374, Fax. 619-447-6396.

PART 3 Execution

3.1 INSTALLATION

- .1 Assemble and install in accordance with written manufacturer's instructions.
- .2 Install with epoxy adhesive and tamper resistant fasteners (Smart Pins Plus).
- .3 Install true, plumb, anchored and firmly supported, as directed by Contract administrator.
- .4 Touch-up damaged finishes to approval of Contract administrator.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Section includes materials and installation of plant material; accessories, mulch, planting, mulching and maintenance.

1.2 RELATED SECTIONS

- .1 Section 02300 - Earthwork.
- .2 Section 02911 – Planting Medium and Finish Grading.

1.3 REFERENCES

- .1 Agriculture and Agri-Food Canada (AAFC)
 - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA)
 - .1 Canadian Standards for Nursery Stock-2001.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .2 Transportation of Dangerous Goods Act (TDGA), 1992, c.34.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.4 SUBMITTALS

- .1 Submit product data for:
 - .1 Fertilizer.
 - .2 Anti-desiccant.
 - .3 Wood mulch.

1.5 STORAGE AND PROTECTION

- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
- .2 Immediately store and protect plant material which will not be installed within 2 hours after arrival at Site in storage location approved by Contract Administrator.
- .3 Protect plant material from damage during transportation:
 - .1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
 - .2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
 - .3 Protect foliage and rootballs using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .4 Protect stored plant material from frost, wind and sun and as follows:
 - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in Planting Medium and watering to full depth of root zone.
 - .2 For pots and containers, maintain moisture level in containers.
 - .3 For balled and burlapped and wire basket rootballs, place to protect branches from damage. Maintain moisture level in root zones.

1.6 SCHEDULING

- .1 Obtain approval from Contract Administrator of schedule 7 days in advance of shipment of plant material.

- .2 Schedule to include:
 - .1 Quantity and type of plant material.
 - .2 Shipping dates.
 - .3 Arrival dates on Site.
 - .4 Planting Dates.

1.7 SOURCE QUALITY CONTROL AND GUARANTEE OF NURSERY STOCK

- .1 Obtain approval from Contract Administrator of plant material prior to planting.
- .2 Imported plant material must be accompanied with necessary permits and import licences. Conform to federal, provincial regulations.
- .3 Provide a written guarantee, stating that the plant material as itemized on plant specification list is guaranteed against defects for a period of two (2) years from the date of Final Certificate of Completion for all nursery stock.
- .4 The Contractor agrees and guarantees to replace and replant any nursery stock found dead and/or in poor condition two (2) years from the recognized substantial completion date, without cost to the The City. "Poor Condition" shall be interpreted as meaning nursery stock on which branches are dead or dying, or have not shown satisfactory growth in leaves. Exempted is nursery stock damaged by accidental causes or vandalism, which stock shall be replaced at the cost of the The City.
- .5 End of warranty inspection will be conducted and scheduled by Contract Administrator.
- .6 Contract Administrator reserves the right to extend Contractor's warranty responsibilities for an additional one (1) year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials. Remove from Site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on Site bins for recycling in accordance with Waste Management Plan.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Contract Administrator.
- .5 Fold up metal banding, flatten and place in designated area for recycling.
- .6 Divert discarded plastic plant containers materials from landfill to plastic recycling facility approved by Contract Administrator.
- .7 Dispose of unused fertilizer at official hazardous material collection site approved by Contract Administrator.
- .8 Dispose of unused anti-desiccant at official hazardous material collections site approved by Contract Administrator.
- .9 Divert unused wood and mulch materials from landfill to recycling or composting facility approved by Contract Administrator.

PART 2 Products

2.1 PLANT MATERIAL

- .1 Type of root preparation, sizing, grading and quality: comply with Metric Guide Specification for Nursery Stock, latest edition of Canadian Nursery Trades Association. Measure plant material and rootball. Measure plants when branches are in their natural position. Height and spread dimensions refer to main body of plant and not from branch tip to branch tip.
- .2 Source of plant material: grown in Zone 2b in accordance with Agriculture Canada Plant Hardiness Zone Map.
- .3 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .4 Plant material: root pruned regularly, but not later than one growing season prior to arrival on Site.
- .5 Cold storage: approval required for plant material which has been held in cold storage.
- .6 Container grown stock: acceptable if containers large enough for root development. Trees must have grown in container for minimum of one growing season but not longer than two. Root system must be able to “hold” soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.
- .7 Substitutions to plant material as indicated on planting plan not permitted unless written approval has been obtained as to type, variety and size. Plant substitutions must be of similar species and of equal size as those originally specified.
- .8 Refer to Plant Specification List on drawing for species/quantity and size of plant.

2.2 WATER

- .1 Free of impurities that would inhibit plant growth.

2.3 MULCH

- .1 Woodchip mulch: chips from hardwood trees, free of bark branches and leaves, varying in size from 50 to 70 mm by 6 to 20 mm thick.

2.4 FERTILIZER

- .1 Synthetic commercial type as recommended by soil test report.
- .2 Horticultural bonemeal, raw bonemeal finely ground with minimum analysis of 3% nitrogen and 20% phosphoric acid.

2.5 ANTI-DESICCANT

- .1 Wax-like emulsion.

PART 3 Execution

3.1 PRE-PLANTING PREPARATION

- .1 Layout plants in containers in beds. Ensure plant material and locations are acceptable to Contract Administrator.
- .2 Remove damaged roots and branches from plant material.

- .3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

3.2 PLANTING

- .1 For container stock in non-degradable wrapping, remove entire container without damaging rootball.
- .2 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- .3 For shrubs and perennials:
 - .1 Backfill soil in 150 mm lifts. Tamp each lift to eliminate air pockets. When two thirds of depth of planting vault has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.
 - .2 Form watering saucer as indicated.
- .4 For groundcovers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .5 Water plant material thoroughly.
- .6 After planting medium settlement has occurred, fill to finish grade.
- .7 Dispose of container material off Site.

3.3 MULCHING

- .1 Ensure soil settlement has been corrected prior to applying wood chip mulch as per drawings.

3.4 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following maintenance operations from time of planting to certification of Substantial Completion.
 - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
 - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
 - .2 Remove weeds bi-weekly.
 - .3 Replace or respread damaged, missing or disturbed rip-rap.
 - .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
 - .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Contract Administrator prior to application.
 - .6 Remove dead or broken branches from plant material.
 - .7 Keep trunk protection and guy wires in proper repair and adjustment.
 - .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Planting medium for shrub beds.

1.2 RELATED SECTIONS

- .1 Section 02201 - Tree Protection.
- .2 Section 02202 - Tree Preservation.
- .3 Section 02300 - Earthwork.
- .4 Section 02906 - Trees, Shrubs and Groundcover Planting.

1.3 REFERENCES

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Quality control submittals:
 - .2 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in Item 1.4.4 below.
 - .3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³/600kN-m/m³).

1.4 QUALITY ASSURANCE

- .1 Obtain approval of proposed product sources.
- .2 Testing of planting media and base materials to be carried out and paid for by Contractor. Prepare and ship samples to approved laboratory in accordance with provincial regulations and laboratory requirements, indicating intended use on each sample.
- .3 Test for clay, sand and silt content, NPK, Mg, soluble salt content, pH value, growth inhibitors and soil sterilants.
- .4 Fertility: major soil nutrients present in following amounts:
 - .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .2 Phosphorus (P): 40 - 50 micrograms of phosphate per gram of topsoil.
 - .3 Potassium (K): 75 to 100 micrograms of potassium per gram of topsoil.
 - .4 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
- .5 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

- .6 Test requirements for planting medium:
- | Test | Acceptable Range |
|-------------------------------------|--|
| 1. Conductivity | Moderate salinity |
| 2. pH | 6.0 to 8.0 |
| 3. Fertility analysis | lab to determine amendment rate |
| 4. Saturated conductivity | Min. 150 mm per hour |
| 5. Total porosity | 33% to 55% |
| • Air filled porosity | 15% to 30% |
| • Capillary porosity | 15% to 25% (at 40 cm tension) |
| 6. Organic matter content | 1% to 5% (2% to 4% optimum) by weight |
| 7. Visual analysis of sand fraction | Rounded to subrounded |
| 8. Bulk density | 1.2 - 1.6 gm/cm ³ (1.45 - 1.5 gm/cm ³ optimal) |
- .7 Submit two (2) copies of analysis and recommendations for corrections to Contract administrator.
- .8 Acceptance is subject to inspection and confirmation of test results. Do not commence work until products have been accepted by Contract administrator.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store fertilizer in waterproof bags labeled with weight, analysis and name of manufacturer.
- .2 Store materials in a dry area, protected from freezing, sedimentation and contamination.

PART 2 Products

2.1 MATERIALS

- .1 Black Topsoil
- .1 Screened clay-textured virgin source black topsoil, a fertile, friable material neither of heavy clay nor of very light sandy nature containing by volume, 6-10% organic matter and capable of sustaining vigorous tree growth.
 - .2 Topsoil shall be free of contamination, roots, stones over 25 mm in diameter and other extraneous matter. Topsoil shall not contain quack grass rhizomes, Canada thistle roots or other noxious weeds.
 - .3 Salinity rating shall be maximum 2.5 dS/m or less on a saturated paste basis.
 - .4 pH range shall be between 6.0 and 8.0.
 - .5 Soil shall not be blow-in dirt taken from wind-erosion sites and shall not be taken from fields abandoned to corn production where such soils may contain soil incorporated herbicides with lasting residual effects such as eradicane and atrazine.
 - .6 Inform Contract administrator of proposed source for black topsoil. The Contract administrator shall reject topsoil not conforming to this Specification.
- .2 Peatmoss
- .1 Derived from partially decomposed fibrous or cellular stems and leaves of species of sphagnum mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material that could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.
- .3 Compost
- .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost shall be dark brown in colour, and no objectionable odour.
 - .3 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.

- .4 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 25:1) and contain no toxic or growth inhibiting contaminants.
 - .5 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.
 - .6 Provide a two litre sample with manufacturers literature and material certification that the product meets the CCME guidelines.
- .4 Sand
- .1 Coarse sand: Clean, hard fine silica sand, well washed and free of impurities, chemical or organic matter. Coarse texture.
 - .2 Medium sand: non calcareous, sub rounded to rounded shape, particle size distribution:

Particle Size	% Allowable
> 3.4 mm	0%
2 to 3.4 mm	0% preferable, up to 3% allowable
1 to 2 mm	Less than 10% (including all larger sizes)
0.25 to 1 mm	60% minimum
0.15 to 0.25 mm	20% maximum
0.05 to 0.15 mm	Less than 5%
Silt 0.002 to 0.05 mm	Less than 5%
Clay <0.002 mm	Less than 3%
Total fine sand, silt and clay	Less than 10%
- .5 Fertilizer
- .1 Synthetic slow release starter fertilizer with a N-P-K analysis of 12-36-15 ratio at a rate of 4 kg / 100 m² (8 lb / 100 ft.²).
- .6 Planting Mixes
- .1 All planting media shall be thoroughly blended.
 - .2 Keep all materials moist during blending stage to facilitate uniform mixing and to minimize peat, soil and sand separation.
 - .3 Provide a two gallon sample of each planting mix type with the required soil test results.
- .7 Planting Medium For Planting Beds
- .1 Planting mix for planting beds shall be a blend of black topsoil, compost, and course sand mixed to the following proportion:

Material	% by volume
Black Topsoil	40%
Peatmoss	40%
Compost	10%
Coarse Sand	10%

PART 3 Execution

3.1 PREPARATION OF EXISTING GRADE

- .1 Verify that Site grading has been completed, inspected and approved by Contract Administrator prior to topsoil installation. If any discrepancies occur, notify Contract Administrator and do not commence work until instructed by Contract Administrator.
- .2 Coordinate installation with electrical, irrigation, paving and mechanical trades to ensure necessary drains, pipes, paving sub structures and conduit are in place prior to placing clay base.
- .3 Grade soil eliminating uneven and low spots ensuring positive drainage.
- .4 Remove debris, roots, branches, stones in excess of 50 mm ø and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum

products. Remove debris protruding more than 75 mm above surface. Dispose of removed material off Site.

- .5 Cultivate areas which are to receive planting medium to minimum depth of 100 mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.
- .6 Ensure mix is moist while spreading to assist in firming.

3.2 PLACING AND SPREADING OF PLANTING MEDIUM

- .1 Place planting medium after Contract Administrator has accepted sub-grade.
- .2 Spread planting medium in uniform layers not exceeding 150 mm.
- .3 Spread planting medium to following minimum depths after settlement.
 - .1 Shrub beds 300mm depth.
 - .2 Manually spread planting medium around trees, shrubs and obstacles.

3.3 APPLICATION OF FERTILIZER

- .1 Spread fertilizer over entire area of planting medium at rate determined by soil testing.
- .2 Mix fertilizer thoroughly into upper 50 mm of planting medium.

3.4 FINISH GRADING

- .1 Fine grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate planting medium to required bulk density using equipment approved by Contract Administrator. Leave surfaces smooth, uniform and firm against deep foot-printing.

3.5 ACCEPTANCE

- .1 Contract Administrator will inspect planting medium in place and determine acceptance of material, depth of topsoil and finish grading.

3.6 SURPLUS MATERIAL

- .1 Dispose of materials not required as directed by Contract Administrator.

3.7 CLEANING

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

END OF SECTION

PART 1 General

1.1 DESCRIPTION

- .1 This section shall include material and labour for two (2) years of maintenance of the following: shrubs, perennial and shrub beds.
- .2 In general, Work shall include:
 - .1 Spring cleaning
 - .2 Watering / Irrigation
 - .3 Fertilizing
 - .4 Weed control
 - .5 Pest and disease control
 - .6 Pruning of trees and shrubs
 - .7 Deadheading and dividing of perennials and grasses
 - .8 Winter preparation

PART 2 Products

2.1 MATERIALS

- .1 All material in maintenance procedures is to be of same size and quality as per original installation and approved by The City prior to use.

2.2 EQUIPMENT

- .1 Provide all equipment to properly execute work and maintain such equipment in a workable, safe condition during use.

PART 3 Execution

3.1 GENERAL

- .1 Program timing of operations to growth, weather conditions and use of Site.
- .2 Do each operation continuously and complete within reasonable time period.
- .3 Store equipment and materials off Site.
- .4 Collect and dispose of debris on Site on daily basis.

3.2 SPRING CLEANING

- .1 Planting Beds:
 - .1 Clean shrub and perennial beds and planters of debris, leaves and dead branches. Remove above ground portion of perennials and perennial grasses. Ensure roots of all plants remain undisturbed.
 - .2 Replenish beds with new bark nugget mulch as required.

3.3 WATERING

- .1 Apply water as required to supplement rainfall and to maintain optimum growing conditions. In general, water once a week to achieve rates as indicated. Allow soil to adequately dry between watering to prevent over saturation without creating water stress.
- .2 Apply water in soft spray to avoid packing of soil. Adjust irrigation system as required to avoid running of water and return to those areas until moisture penetration has been reached. Do not impede use of sidewalk and other paved areas.

- .3 Sweep and pick up debris deposited on pavement in all areas and specifically in areas of drainage discharge. Clean up on regular basis and particularly after irrigation application or rain. Power wash as required where lack of maintenance contributed to green scum to accumulate.
- .4 Shrub and Perennial Beds:
 - .1 Ensure moisture penetration of 12" (300 mm) per application.
 - .2 Provide supplemental water for trees as required.

3.4 FERTILIZING

- .1 Apply slow release synthetic fertilizer in ratio of 32-4-8 in the spring to lawn areas.
- .2 Broadcast fertilizer with approved and properly calibrated mechanical spreader in quantities of 3 lb/1000 sq.ft. (1.46 kg/100 sq.m.) on lawn.
- .3 Apply water soluble 20-20-20 to individual shrubs and trees as per manufacturers written instructions.

3.5 WEED CONTROL

- .1 Maintain Site free of weeds. Do not allow weeds to establish for a period longer than one (1) week.
- .2 Shrub Beds:
 - .1 DO NOT apply herbicides around trees, shrubs, and all perennials.
 - .2 DO NOT apply herbicides near planting beds. DO NOT cultivate areas where wood chip mulch has been used. Clean, by hand, areas that are covered with mulch. Use small hand tools and take care not to damage roots of the perennials and shrub material. Remove weeds including their roots. Collect and dispose of paper and refuse. Dispose of weeds and debris off Site.

3.6 PEST AND DISEASE CONTROL

- .1 Control pests and disease through pruning or application of pesticides. Use species-specific pesticides where possible. Use only pesticides of low mammalian toxicity. Strictly follow manufacturer's written instructions.
- .2 Submit copies of Pesticide Applicator's License and a Pesticide Use Permit to the The City prior to any pesticide application.

3.7 PRUNING OF TREES AND SHRUBS

- .1 Retain qualified personnel with International Society of Arboriculture or Canadian Nursery Landscape Association Certification on annual basis.

3.8 DEADHEADING AND DIVIDING OF PERENNIALS AND GRASSES

- .1 Deadheading:
 - .1 Deadhead perennials after bloom is finished:
 - .2 Leave seed pods on perennials and ornamental grasses untouched over the winter period. Cut down and clean up the following spring.
- .2 Perennial Plants Dividing:
 - .1 Retain qualified personnel with International Society of Arboriculture or Canadian Nursery Landscape Association Certification on a four (4) year basis for perennials and grasses divisions.

3.9 WINTER PREPARATION

- .1 Rake and assemble shed leaves. Remove from Site.
- .2 Clean leaf litter and other debris from shrub beds and planters. Remove debris from Site.
- .3 Ensure adequate moisture in root zones of plant material prior to freeze-up.
- .4 Blow out irrigation system and wetland garden and water wall plumbing prior to freeze-up.
- .5 Apply anti-desiccant to evergreen trees and shrubs susceptible to winter desiccation.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 This section covers supply, fabrication, and placement of concrete formwork and falsework. Work in this section consists of furnishing all labour, materials, equipment, supervision, and incidentals necessary to install the concrete formwork and falsework.

1.2 RELATED SECTIONS

- .1 Section 03200 – Concrete Reinforcement.
- .2 Section 03300 – Cast-in-Place Concrete.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA A23.1-04, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CAN/CSA-S269.1-1975 (R2003), Falsework for Construction Purposes.
 - .4 CAN/CSA-S269.3-M92 (R2003), Concrete Formwork.

1.4 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this Section. Include costs in items of Work for which concrete formwork and falsework is required.

1.5 COORDINATION

- .1 Coordinate this section with other sections of Work which require attachment of components to formwork.
- .2 If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Contract Administrator.

PART 2 Products

2.1 MATERIALS

- .1 Formwork materials: to CSA S269.1.
- .2 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .3 Form release agent: non toxic, biodegradable, low VOC. Form release agents shall be a colourless, non staining, and shall not absorb moisture. The amount of material used shall be kept to a minimum. Form release agent which has come into contact with reinforcing steel shall be removed prior to casting.
- .4 When the concrete surface is to receive a permanent finish coating, the release agent shall be compatible with the coating.
- .5 Form stripping agent: colourless mineral oil, non toxic, biodegradable, low VOC, free of kerosene.
- .6 Falsework materials: to CSA S269.1.

PART 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 Refer to drawings for concrete members requiring architectural exposed finishes.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide Site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA A23.1.
- .7 Align form joints and make watertight. Keep form joints to minimum.
- .8 Use 20 mm chamfer strips on external corners, and 20 mm fillets at interior corners , joints, unless specified otherwise.
- .9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .10 Construct forms for architectural concrete, and place ties as indicated and/or as directed.
 - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .12 Clean formwork in accordance with CAN/CSA A23.1, before placing concrete.

3.2 REMOVAL

- .1 Remove formwork when structural concrete members has reached 70% of its design strength or minimum period required by CAN/CSA A23.1.
- .2 Re use formwork and falsework subject to requirements of CAN/CSA A23.1.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 This section covers supply, fabrication, and placement of embedded reinforcing steel in all concrete sections, particularly curbs, gutters, pavement, pads, repair areas, etc.

1.2 RELATED SECTIONS

- .1 Section 03100 – Concrete Forms and Accessories.
- .2 Section 03300 – Cast-in-Place Concrete.

1.3 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this section for concrete reinforcing shown on Drawings. Include reinforcement costs in items of concrete or applicable items.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
 - .2 CSA-A23.3-09, Design of Concrete Structures.
 - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.
 - .5 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- .3 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.5 SUBMITTALS

- .1 Submit shop drawings including placing of reinforcement in accordance with Section – 01330 – Submittals.
- .2 Submit shop drawings including placing of reinforcement and indicate:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Contract Administrator, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .3 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .4 Detail lap lengths and bar development lengths to CSA A23.3, unless otherwise indicated. Provide Class B tension lap splices unless otherwise indicated.

PART 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Contract Administrator.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.
- .5 Welded steel wire fabric: to ASTM A185/A185M.
 - .1 Provide in flat sheets only.
- .6 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .7 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2. All bar supports to be non corroding.
- .8 Mechanical splices: subject to approval of Contract Administrator.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1.
- .2 Obtain Contract Administrator's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 2 weeks prior to beginning reinforcing Work.
- .2 Upon request inform Contract Administrator of proposed source of material to be supplied.

PART 3 Execution

3.1 FIELD BENDING

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

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA A23.1.
- .2 Prior to placing concrete, obtain Contract Administrator's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

3.3 DOWELLING PROCEDURES

- .1 For bars that are indicated by the Contract Administrator as being dowelled, drill in and epoxy grout bars into slab as follows:
 - .1 10M bars - 150 mm.
 - .2 15M bars - 200 mm.
 - .3 20M bars - 300 mm.

- .2 Use only approved epoxy bonding gel to manufacturer's instructions. Acceptable product:
 - .1 HY200 by Hilti Canada Inc.

- .3 Clean hole thoroughly prior to application of epoxy. Use injection or caulking gun to ensure that the epoxy fills the bottom of the hole prior to embedment of bar.

END OF SECTION

PART 1 General

1.1 WORK COVERED BY THIS SECTION

- .1 This section covers the manufacture, transport, placement, finishing, curing, and all related aspects of the supply and installation of a cast-in-place concrete.

1.2 RELATED SECTIONS

- .1 Section 03100 – Concrete Forms and Accessories.
- .2 Section 03200 – Concrete Reinforcement.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
 - .2 CSA-A23.2-09, Methods of Test for Concrete.
 - .3 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
 - .4 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
- .2 American Concrete Institute (ACI)
 - .1 ACI 302.1R-04, Guide for Concrete Floor and Slab Construction.
 - .2 ACI 308R-01, Guide to Curing Concrete.
 - .3 ACI 309R-05, Guide for the Consolidation of Concrete
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM C260-01, Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-07, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-05a, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM A820/A820M-06 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
 - .5 ASTM C1017/C1017M-7, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

1.4 CERTIFICATES

- .1 Submit certificates in accordance with Section 01330 - Submittals.
- .2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1. Certification letter to be sealed by an engineer registered in the Province of Manitoba.
- .3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1. Certification letter to be sealed by an engineer registered in the Province of Manitoba.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to Site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Modifications to maximum time limit must be agreed to Contract Administrator and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Contract Administrator.

- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

PART 2 Products

2.1 MATERIALS

- .1 The concrete constituents shall comply with the following standards:
 - .1 Hydraulic cement: to CAN/CSA-A3001
 - .2 Blended Hydraulic cement: to CAN/CSA-A3001.
 - .3 Supplementary cementing materials: to CAN/CSA-A3001.
 - .4 Water: To CSA-A23.1.
 - .5 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.
 - .6 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494.
 - .3 The use of chloride containing admixtures is strictly forbidden.

2.2 MIXES

- .1 Proportion normal density concrete in accordance with CSA-A23.1, Table 5, Alternative 1 to give following properties for all concrete.
 - .1 Type 1: Piles – Refer to Structural Drawing
 - .2 Type 2: Pile Caps – Refer to Structural Drawing
 - .3 Type 3: Non structural exterior slabs, including main paving field, stairs, retaining walls, seat walls, etc..
 - .1 Class of exposure: C-2
 - .2 Minimum compressive strength at 28 days: 32 MPa.
 - .3 Air category: 1 (5% to 8%)
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Proportion of SCMs: maximum 20% replacement.

2.3 ACCESSORIES

- .1 Evaporation retardant: Spray-applied mono-molecular film. Acceptable Product:
 - .1 Confilm by BASF Building Systems at a minimum application rate of 4.9 m²/L.
- .2 Cure and sealing compound: to ASTM C309, Type 1. Acceptable product(s):
 - .1 Florseal WB by Sika Canada Inc. at a minimum application rate of 4.9 m²/L.
 - .2 Kure-N-Seal by BASF Building Systems at a minimum application rate of 4.9 m²/L.

PART 3 Execution

3.1 PREPARATION

- .1 Obtain Contract Administrator's approval before placing concrete.
 - .1 Provide 24 hours notice prior to placing of concrete.
- .2 Provide formwork and falsework to Section 03100 - Concrete Forms and Accessories.
- .3 Place concrete reinforcing in accordance with Section 03200 - Concrete Reinforcing.
- .4 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.

- .6 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete for placing and curing during hot and cold weather concreting.
 - .1 Protection and curing must comply with the hot weather and cold weather requirements of CSA-A23.1.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing Work, drill holes in existing concrete.
 - .1 Drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and epoxy grout to anchor and hold dowels in positions as indicated. Refer to Section 03200.
- .11 Do not place load upon new concrete until authorized by Contract Administrator.
- .12 Provide temporary bridging as required to permit access to all areas during placement, finishing and curing.
- .13 Do not place concrete until screed rails for hand operated strike-off devices are in place and firmly secured.
 - .1 Rails to be of type, and so installed, that no springing or deflection will occur due to weight of finishing equipment.
 - .2 Set rails or headers to elevations to produce deck true to required grade and cross section.
 - .3 Use polyethylene film or plastic coated tape if necessary to prevent concrete from bonding to rails.
 - .4 Do not treat rails with release agents or parting compounds.
 - .5 Subject to approval of the Contract Administrator, screed rail anchors which remain in the concrete may be used provided they are non-corroding and sit a minimum of 30 mm below the finished surface of the concrete.

3.2 MIX PRODUCTION

- .1 Concrete to be mixed, delivered and placed in accordance with CSA A23.1.
- .2 Concrete to be batched and mixed at a ready mix plant and delivered to Site in ready to place form.
- .3 Control of slump at the Site to be in accordance with CSA-A23.1.
- .4 The addition of water to the concrete to increase slump and aid in pumping is strictly forbidden

3.3 PLACEMENT

- .1 Place concrete Work in accordance with CSA-A23.1.
- .2 When concrete is placed by pump, the initial slurry used to prime the pump shall not be incorporated into the topping. The slurry shall be trapped and disposed off Site.
- .3 Ensure high points and slopes to drains as shown on drawings are maintained.
- .4 Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur. Install a construction dam or bulkhead in case of a delay longer than 60 minutes. During delays between 5 and 60 minutes, protect the end of the placement with damp burlap.
- .5 Protect freshly placed concrete from exposure to dust, debris and precipitation.

- .6 Sleeves and inserts.
 - .1 No sleeves, ducts, pipes or other openings shall pass through concrete members except where indicated or approved by Contract Administrator.
 - .2 Electrical conduits, junction and fixture boxes shall not be embedded within concrete members.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Contract Administrator.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Contract Administrator before placing of concrete.
 - .5 Check locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

3.4 FINISHING

- .1 Finish concrete in accordance with CSA-A23.1.
- .2 Consolidate concrete in accordance with CSA A23.1 and ACI 309.
- .3 Immediately after final finishing apply approved evaporation retardant at indicated coverage rate. Evaporation retardant is not to be applied during finishing operations nor should it be worked into the surface.
- .4 Unless otherwise indicated round edges of formed joints in pavements with a 10 mm radius edging tool.
- .5 Flatwork:
 - .1 Continuously consolidate and finish to specified elevations, ensuring thickness and required elevations are maintained.
 - .2 Use of a floating vibratory screed to consolidate the top surface of the concrete.
 - .3 Immediately after concrete has been placed and consolidated, bull-float slab surface to a smooth uniform surface.
 - .4 Use of hand trowels will be required to hand finish areas the finishing machine cannot reach.
 - .5 Surface free of all trowel marks and ridges.
- .6 Vertical Formed Surface
 - .1 Where applicable finishing of formed surfaces shall commence immediately after stripping the forms.
 - .2 All form ties and other metal items shall be removed or cut back to a depth of at least 20 mm from the surface of the concrete.
 - .3 Patch surface defects as directed by Contract Administrator.
 - .4 Unless otherwise indicated in the Schedule of Finishes all formed surfaces shall receive a smooth-form finish in accordance with CSA-A23.1.
 - .5 Vertical surfaces of curbs, walls, upstands, etc. shall receive a smooth-rubbed finish in accordance with CSA A23.1.
 - .6 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .7 Schedule of finishes:
 - .1 Refer also to paving plan shown on landscape drawings.

Description of Work	Finish (to CSA-A23.1)	Texture
Concrete field	Class A	Non-slip broom to match finish in main park.
Concrete bands	Class A	Non-slip broom to match finish in main park.
Retaining walls	Smooth formed finish	Sandblast to ICRI-CSP-4 profile
Seat walls (top)	Class A	None. Surface finish to match existing seat walls

		in main park.
Exposed walls	Smooth formed finish	None

3.5 JOINTS

- .1 Install control joints at locations shown on the drawings. Joints shall correspond to location of slip dowels.
- .2 Location of control and construction joints:
 - .1 Paving slabs: Refer to paving plan on Landscape Drawings.
 - .2 Other flatwork not shown on drawings: not more than 4500 mm or 25 times the slab thickness on-centre and matching joints in adjacent Work.
 - .3 Control joints in upstand walls to be formed in at not more that 4500 mm on-centre and matching joints in adjacent Work using a 12 mm x 12 mm form strip on each face of wall. Tool in joints along top surface corresponding to form strips.
- .3 Control joints and construction joints shall be formed or tooled at locations shown. Refer to Drawings for paving patterns and joint locations.
 - .1 Sawcutting via specialized dry-process cutting will be permitted on a limited basis at locations approved by the Contract Administrator.
 - .1 Where approved sawcut to a minimum of one 40 mm or one-quarter of the depth of the slab, which ever is greater, following initial set of concrete.
 - .2 Timing of the saw cutting will vary with weather conditions however are typically completed within 1 to 4 hours after final finishing. Timing of the saw cutting will be the responsibility of the Contractor. Sawcutting 24 hours following placement will not be permitted.
- .4 Where paving abuts curbs, walls and other vertical surfaces use 12 mm asphalt impregnated fibre board.

3.6 CURING

- .1 Cure and protect concrete in accordance with requirements CSA A23.1.
- .2 Concrete surfaces to be cured at a minimum temperature of 10°C for the entire curing period.
- .3 Curing methods shall be in accordance with CSA A23.1.
 - .1 Basic curing methods shall consist of one of the following:
 - .1 polyethylene sheet;
 - .2 forms in contact with concrete surface; or
 - .3 curing compounds to ASTM C309 at manufacturer's specified applications rates, when approved by Contract Administrator.
 - .2 Requirements for wet-curing:
 - .1 Immediately after final finishing, protect exposed surface against plastic shrinkage by means of a fog spray and/or evaporation reducer, until the concrete has enough strength to support the placement of the wetted burlap. When an evaporation reducer is used, intermittent reapplication may be required if the film evaporates before initiation of the wet cure.
 - .2 Burlap to be thoroughly presoaked by immersing it in water for a period of at least 24 hours immediately prior to placement.
 - .3 Commence wet curing with burlap and water as soon as the surface will support the weight of the wetted burlap without deformation. Burlap to be applied in one layer with strips overlapping at least 75 mm and be securely held in place without marring the concrete surface.
 - .4 Wet curing with burlap and water must be maintained for the periods indicated. Periodic rewetting by means of a soaker hoses, sprinklers, or

other suitable methods approved by the Contract Administrator may be necessary.

.4 Curing Schedule:

Class of Exposure	Exposure Condition	Curing
C-2	Non-structural exterior flatwork including sidewalks, curbs, misc. concrete paving.	7d at $\geq 10^{\circ}\text{C}$ and for time necessary to attain 70% of the specified strength with a wet-curing period of not less than 3d.
S-2	N/A	7d at $\geq 10^{\circ}\text{C}$ and for time necessary to attain 70% of the specified strength

.5 Unless noted otherwise the curing regime shall be consistent with the Class of Exposure. Refer to related sections for curing of concrete repair materials.

3.7 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Contract Administrator in accordance with CSA-A23.1.

.1 Testing laboratory to be certified in accordance with CSA A283.

.2 The Contractor will pay for costs of tests via pre-established unit prices.

.3 Frequency and Number of Tests:

Class of Exposure	Frequency	Additional Requirements
C-2, S-2	Not less than one strength test per 50 m ³ of concrete placed and not less than one test for each class of concrete placed on any one day.	Slump and air measurements will be completed on each of the initial 3 loads of concrete per day of casting to ensure satisfactory control of the air content is established. If adequate control of air content is not established within the first 3 loads of concrete or if a test falls outside the specified limits, the testing frequency shall revert to one test per load until satisfactory control is re-established. Costs for additional testing will be the responsibility of the concrete supplier.

.4 Contract Administrator may take additional test cylinders during cold weather concreting or when concrete quality is suspect. Cure cylinders on job Site under same conditions as concrete which they represent.

.5 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.2.

.6 Inspection or testing by Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

3.8 DEFECTIVE CONCRETE

.1 Defective concrete: cracking, spalling, scaling and concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.

.3 Do not patch, fill, touch-up, repair or replace exposed concrete except upon express direction of Contract Administrator for each individual use.

PART 1 General

1.1 SECTION INCLUDES

- .1 Handrails, entry signage and lattice as shown on drawings.

1.2 RELATED SECTIONS

- .1 Section 01330 - Submittal Procedures.
- .2 Section 03300 - Cast-in-Place Concrete.
- .3 Section 06101 – Site Carpentry.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
 - .4 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-1989 (R2001), Welded Steel Construction (Metal Arc Welding) (Imperial Version).
- .4 The Environmental Choice Program
 - .1 CCD-047a-98, Paints, Surface Coatings.
 - .2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01330 - Submittal Procedures.

PART 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade as specified by Structural.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316.
- .5 Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to CSA Aluminum Alloy and Temper HA.5 SG 11R-T6 (ASTM B221M-83 Alloy 6351-T6), or HA.7 GA 11M-T6 (ASTM B221 M-83 Alloy 6061-T6).
- .6 Aluminum sheet, bar, support pin, angle, and plate shall conform to ASTM B221-M-83 Alloy 5083, ATM B209M-83 Alloy 6061-T6 or Alloy 6351-T6.
- .7 Bituminous Paint: alkali-resistant coating and conform to CGSB 31-GP-3M. Supply of bituminous paint shall be considered incidental to the supply of metal fabrications.
- .8 Aluminum Shims: to ASTM Standard B221, Alloy 6061-T6, supplied as required to facilitate the installation of the rail posts as shown on the Drawings. Supply of shims will be considered incidental to the supply of aluminum pedestrian handrail.
- .9 Aluminum Filler Alloys for Welded Construction: ER4043, ER5183, ER5356, ER5554, ER5556, or ER5654
- .10 Repair: On Site repairs to damaged edging components and field-cut surfaces shall be done with Galvalloy or approved alternate cold galvanizing process. Zinc paint is not acceptable.

2.2 FABRICATION

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

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600g/m² to CAN/CSA-G164.

2.4 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.

2.5 HANDRAILS

- .1 Fabricate from steel sections as shown on the Drawings, including all mounting holes.
- .2 Galvanize railing members after fabrication.

2.6 LATTICE

- .1 Fabricate from steel sections as shown on the Drawings, including all mounting holes.
- .2 Galvanize railing members after fabrication.

2.7 ENTRY SIGNAGE

- .1 Fabricate signage frame from steel sections as shown on the Drawings, including all mounting holes.
- .2 Galvanize frame members after fabrication.
- .3 Laser cut literary graphic panels from sheet stock as indicated on drawings. Brushed clear coat finish. Graphics to be provided by Contract Administrator.
- .4 Fabricate signage panels at the shop and pre-drill for hardware. Obtain Contract Administrator's approval prior to shipping panels to Site.
- .5 Install panels in locations indicated on the drawings.
- .6 Laser cut decorative metal panels from graphic files provided by Contract Administrator. Obtain approval of panels prior to proceeding with installation.
- .7 Meet with Contract Administrator on Site to determine final decorative panel locations on the sign. Install panels as directed on Site and shown on the drawings.

PART 3

3.1 ERECTION OF ALL METAL FABRICATIONS

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 HANDRAILS

- .1 Field measure stairs and walls to receive railings prior to shop drawing submission. Submit and obtain shop drawing approval.
- .2 Obtain approval of one railing section at the shop prior to completing railing fabrication and delivery.

- .3 Install handrails and in locations indicated on the drawings. Locate and layout mounting plates for at least 1 handrail for Contract Administrator's approval of process and location, prior to securing rails permanently.

3.3 LATTICE

- .1 Field measure walls to receive lattice prior to shop drawing submission. Submit and obtain shop drawing approval.
- .2 Obtain approval of one sample section of lattice at the shop prior to completing lattice fabrication and delivery.
- .3 Install lattice in locations indicated on the drawings. Locate and layout mounting plates for at least 1 lattice section for Contract Administrator's approval of process and location, prior to securing lattice permanently.

3.4 ENTRY SIGNAGE

- .1 Field measure signage location to verify pile and structural frame location prior to shop drawing submission. Submit and obtain shop drawing approval.
- .2 Fabricate signage panels at the shop and pre-drill for hardware. Obtain Contract Administrator's approval prior to shipping panels to Site.
- .3 Install panels in locations indicated on the drawings.
- .4 Laser cut decorative metal panels from graphic files provided by Contract Administrator. Obtain approval of panels prior to proceeding with installation.

3.5 CLEANING

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

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Benches.
- .2 Handrails.
- .3 Lattice.

1.2 QUALITY ASSURANCE

- .1 Identify lumber by official grade mark continuing symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which grade and conditions of seasoning at time of manufacture.
- .2 For products treated with preservative by pressure impregnation, submit following information certified by authorized signing officer of treatment plant:
 - .1 Information listed in AWPA.M2 and revisions specified in CAN/CSA-080 Series, Supplementary Requirement to AWPA Standard M2 applicable to specified treatment.
 - .2 Moisture content after drying following treatment with water-borne preservative.
 - .3 Acceptable types of paint, stain and clear finishes that may be used over treated materials to be finished after treatment.

1.3 ENVIRONMENTAL PROTECTION

- .1 Collect and remove from Site all waste pieces and sawdust from pressure treated wood materials.

PART 2 Products

2.1 MATERIALS

- .1 **Angelim pedra hardwood (for boardwalk, trench cover and benches):** to CSA080, to NLGA Standard Grading Rules for Canadian Lumber, Select grade 2 and better, kiln dry to 10% maximum moisture content, red chestnut colour.
- .2 **All wood products:** to be free of defects, any warped, checked or bent materials will be rejected.
- .3 **Hardware:** bolts, nuts, washers, lag screws, to be galvanized or stainless steel, as noted on the drawings. Sizes to suit application, all holes to be predrilled.

2.2 PREPARATION

- .1 Obtain Contract Administrator's approval of layout prior to construction.

2.3 HANDLING AND USE OF PRESSURE TREATED TIMBER

- .1 Handle and use treated material in a manner which will avoid damage or field fabrication causing alteration in original treatment.
- .2 Treat in field, cuts and damages to surface of treated material with an appropriate, clear preservative as described in CSA 080.1974. Ensure that damaged areas such as abrasions, nail and spike holes, are thoroughly saturated with field treatment solutions as per CSA 080.1974.

2.4 HANDLING AND USE OF ANGELIM PEDRA HARDWOOD

- .1 Handle and use hardwood material in a manner which will avoid damage or field fabrication causing alteration in original treatment.
- .2 Treat in field, cuts and damages to surface of treated material with Redwood Empire Anchorseal, immediately after a cut is made.
- .3 Apply two coats of high quality oil (Danish Oil) with UV inhibitors on all four sides.

2.5 WORKMANSHIP

- .1 Construct all work to details, using adequate fastening methods to ensure solid durable finished work suitable for the purpose intended.
- .2 Do all nailing and fastening neatly, evenly and thoroughly.
- .3 Install all members true to line, levels and elevations. Set plumb and space uniformly.
- .4 Use timbers of the longest possible length to minimize joints.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 This Section covers items common to Sections of Division 16. This section supplements requirements of Division 1.
- .2 All Drawings and all sections of the Specifications shall apply to and form an integral part of this section.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3No.1 except where specified otherwise.
- .3 Abbreviations for electrical terms: to CSA Z85.
- .4 The electrical installation shall comply with the requirements of the Electrical Supply Authority, the latest edition of the Canadian Electrical Code, with all Provincial and Municipal Laws, Rules and Ordinances, and to the satisfaction of those persons having jurisdiction over same.
- .5 Notify the Contract Administrator any discrepancies or conflicts with any regulation in accordance with B5.
- .6 In no instance shall the standard established by these Specifications and Drawings be reduced by any of the codes, rules or ordinances.

1.3 CARE, OPERATION AND START-UP

- .1 Upon completion of the project, demonstrate the operation of all equipment in the presence of The City, or his representative, and the Contract Administrator. Obtain signed certification from The City that such equipment was shown to be fully operational and that all necessary operating instructions have been provided.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance, calibrate, test and commission components as specified in subsequent sections.
- .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.
- .4 Carefully examine all plans and Specifications pertaining to this Contract and become familiar with all details. Visit the Site and determine all factors affecting this section of the Work and include all costs for same in Bid Opportunity.

1.4 COORDINATION

- .1 The Contractor is responsible for installing a complete, fully functional and fully operational system, and is responsible for reviewing all other trades' Drawings to ensure all electrical requirements are included in the Bid Opportunity price. Inform the Contract

Administrator of any discrepancies during the Bid Opportunity process. Any discrepancies not identified, shall be incorporated by the Contractor at no cost during construction.

- .2 The Contractor is responsible for coordination with all other trades and Subcontractors on Site.
- .3 Through the Contractor, coordination shall include regular meetings, exchange of Shop Drawings and other technical information. Compile working combined systems Drawings, where parts of the installation are complex or require input of several trades. Ensure the Contractor is in attendance and is aware of all coordination. Obtain and exchange schedules with all other trades and Subcontractors to ensure Work which impacts another trade or Contract is completed in sufficient time.
- .4 All Work is to be properly phased to enhance coordination. Where it is evident that Work outside of phase has inhibited the Work of another Contractor, the Contract Administrator shall reserve the right to instruct the Contractor to remove said Work at the cost of the Contractor.

1.5 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235.
- .2 Distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.6 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of Drawings and Specifications for examination and approval prior to commencement of Work.
- .2 Pay all associated fees for inspection of the Work by authorities having jurisdiction.
- .3 Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.
- .4 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of Work to Contract Administrator. Copies to be included in Maintenance Manuals.

1.7 MATERIALS AND EQUIPMENT

- .1 Provide Materials and equipment in accordance with Div. 16.
- .2 Equipment and Material to be CSA certified or certified by an equivalent recognized certifying agency to meet Canadian Standards. Electrical equipment consisting of individual certified components must also have a CSA or equivalent certification for the entire assembly. Where there is no alternative to supplying equipment which is certified, obtain special approval from local Electrical Inspection Department or authority having jurisdiction.
- .3 Factory assemble control panels and component assemblies.
- .4 Submit for Contract Administrator's approval, a duplicate list of makes and types of all equipment and Materials for this project, prior to placing of orders for same. This shall be done within fourteen (14) days of the award of the project Contract to the Contractor in order to avoid delays in delivery and completion.

- .5 Any Material or equipment ordered or installed without the Contract Administrator's prior approval shall, if so directed by the Contract Administrator, be removed and replaced with approved Material or equipment without a change in the Contract price.

1.8 RESPONSIBILITY

- .1 Be responsible for any damage caused The City, or their Subcontractors due to improperly carrying out this Work.
- .2 Install all components of this Work promptly and where applicable, in advance of concrete pouring, or similar construction. Provide and set in the proper sequence of construction, all sleeves, hangers, inserts, etc. and arrange for all necessary openings, where required to accommodate the electrical installation.
- .3 Work shall be arranged in co-operation with other divisions of this Specification in such a manner that it doesn't interfere with the progress of the project. In areas where ducts or pipes must be installed along with conduit or cable, co-operate with other divisions so that the finished job will represent the most efficient use of the space.
- .4 In no case proceed with any Work in uncertainty. Obtain, from the Contract Administrator, any clarification necessary and thoroughly understand all portions of the Work to be performed.

1.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks, and fastenings to prevent rusting.

1.10 WORKMANSHIP AND MATERIALS

- .1 The installation shall consist of Material and equipment specified unless as provided herein. Electrical equipment provided under this Contract shall be built in accordance with EEMAC standards and shall be C.S.A. certified (or certified by an equivalent recognized certifying agency to meet Canadian Standards) and/or locally approved. All equipment supplied under this Contract shall be new and the best of its respective kind and of uniform pattern throughout.
- .2 Any Material or equipment ordered or installed without the Contract Administrator's prior approval shall, if so directed by the Contract Administrator, be removed and replaced with approved Material or equipment without a change to the Contract.
- .3 Replace inferior Work if so ordered by Contract Administrator without a change to the Contract.
- .4 Retain same foreman or superintendent on the job until completed, unless otherwise directed by the Contract Administrator.

- .5 All tradesmen shall carry all tools on their person at all times. Any tool not in use shall be under lock and key in an area authorized by the building supervisor.

1.11 CLEANLINESS AND CLEANING

- .1 This division shall maintain a clean tidy job Site. All boxes, crates, and construction debris due to this portion of the Work shall be neatly piled outside the construction area and shall be removed at least weekly during the construction period. All construction areas shall be kept clear of debris.
- .2 Before the project will be accepted by The City, all lighting fixtures, lamps, lens, panelboards, switches, receptacles, cover plates, and other electrical equipment shall be clean and free of dust, plaster, paint, etc. Any equipment which is scratched or damaged shall be refinished or replaced if so designated by the Contract Administrator.

1.12 MODIFICATIONS

- .1 Locations of all light fixtures, convenience receptacles, outlets, switches, telephone or similar outlets, fire alarm stations, bells, etc. are subject to modification by the Contract Administrator, who reserves the right to move these up to 3000 mm from the position shown, without change to the Contract price, provided notice is given before the related Work has commenced.

1.13 REQUEST FOR EQUAL

- .1 Applications for approval of equal, or alternate Materials, or methods, as substitutions for those specified or shown, shall be done in accordance with B7.
- .2 Costs for any required additional Material, wiring and labour due to the granted equal or approved alternate shall be included in the Bid Opportunity price or alternate price. This shall include costs which are incurred by other Divisions of this Specification.
- .3 Any request for equal shall include the following:
 - .1 Catalogue information, all technical data, full detail and size of the proposed equipment and all components.
 - .2 Any information requested in the related Specification section.
 - .3 Photometric Data for light fixtures.
 - .4 Provide block and riser diagram showing wiring and conduits required, power requirements, etc. with any requests. Maintain maximum allowable conduit sizes.
 - .5 Provide comply/non-comply list addressing each item of the Specifications and Drawings with each request for equal. This shall include a photocopy of all applicable Specification sections showing a complete compliance / non-compliance listing. Refer to spec detail sheet "Shop Drawing Compliance List Sample", for example, (this detail sheet applies to Requests for Equal as well).

1.14 ENGINEERING OBSERVATIONS

- .1 Contractor's Work will be observed periodically by The City, and/or Contract Administrator or their representatives, solely for purpose of determining general quality of Work, and not for any other purpose. Guidance will be offered to Contractor in interpretation of plans and Specifications to assist him to carry out Work. Observation and directives given to Contractor does not relieve Contractor and his agents, servants and employees of their responsibility to erect and install Work in all its parts in a safe and Workmanlike manner, and in accordance with plans and Specifications, nor impose upon The City, and/or Contract Administrator or their representatives, any responsibility to supervise or oversee erection or installation of any Work.

- .2 Contractor shall notify Contract Administrator for a final distribution review prior to energizing distribution system. All distribution equipment shall be left with covers removed to allow for an internal review of distribution.

1.15 GUARANTEE

- .1 Guarantee the satisfactory operation of all Work and equipment supplied and installed as a part of this section of the Specifications.
- .2 Replace forthwith, at no additional Material or labour cost, any part which may fail, or prove defective within a period of twelve (12) calendar months after the final acceptance of the complete installation, provided that such failure is not due to improper usage, or ordinary wear and tear.
- .3 No certificate given, payment made, partial or entire use of the equipment by The City or his representative shall be construed as acceptance of defective Workmanship or Materials.
- .4 This general guarantee shall not act as a waiver of any specified guarantee or special equipment guarantees covering a greater length of time.

1.16 IDENTIFICATION OF EQUIPMENT

- .1 Identify electrical equipment with nameplates and labels as follows and as indicated in other Specification sections.
- .2 Nameplates:
 - .1 Lamacoid 3mm thick plastic engraving sheet, shall be black face with white letters (black with white letters) or as directed, mechanically attached with self tapping screws.
 - .2 Nameplates for equipment fed from emergency power or from emergency UPS power (increase nameplate size as required to suit wording) shall be red with white letters (red with white letters).

NAMEPLATE SIZES

Size 1	10 x 50mm	1 line	3mm high letters
Size 2	12 x 70mm	1 lines	5mm high letters
Size 3	12 x 70mm	2 lines	3mm high letters
Size 4	20 x 90mm	1 line	8mm high letters
Size 5	20 x 90mm	2 lines	5mm high letters
Size 6	25 x 100mm	1 line	12mm high letters
Size 7	25 x 100mm	2 lines	6mm high letters

- .3 Labels:
 - .1 Embossed plastic labels with 6mm high letters unless specified otherwise.
- .4 Fabrication details of all nameplates labels and wording on nameplates and labels to be approved by Contract Administrator prior to manufacture.
- .5 Allow an average of twenty-five (25) letters per nameplate and label.
- .6 Room names and numbers used shall be actual room names and numbers that will be used on the project. Division 16 to co-ordinate and confirm with trades involved.
- .7 Identification to be English.

- .8 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .9 Nameplates for disconnects, starters and contactors: Indicate equipment being controlled and voltage.
- .10 Nameplates for terminal cabinets and pull boxes: Indicate system and voltage.
- .11 Nameplates for transformers: Indicate capacity, primary and secondary voltages.
- .12 Nameplates for control devices: indicate equipment controlled.
- .13 To match existing where applicable.
- .14 All convenience receptacles shall have a lamacoid size 1 plate on which the panel and circuit number from which it is fed, is indicated. The identification shall be mechanically secured to the coverplate on the appropriate outlet. Pressure indented adhesive strip nameplates are not acceptable and shall not be used.

1.17 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings on both ends of phase conductors of feeders (coloured plastic tapes) and branch circuit wiring (numbered wire markers). Conductor marker identification shall correspond with panel or terminal board directory information.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour Code: To CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system. Colour coding used shall be documented by individual systems in Maintenance Manuals.
- .5 Insulated grounding conductors shall have a green finish and shall be used only as a grounding conductor.

1.18 CONDUIT, OUTLET BOXES AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cable.
- .2 Colour coding to match existing where applicable.
- .3 Confirm colour coding with The City and Contract Administrator prior to start of Work.
- .4 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.
- .5 Colours: 25mm wide prime colour and 20mm wide auxiliary colour.

	Prime	Auxiliary
Up to 250V (normal power)	yellow	
- .6 Other conduit systems as directed on Site; all conduit systems shall be identified.
- .7 Colour outlet box covers to colour designated and show circuit numbers in black felt marker on inside of covers.

1.19 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.20 MANUFACTURERS AND CSA CERTIFICATION LABELS (OR EQUIVALENT)

- .1 Visible and legible after equipment is installed.

1.21 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: Schedule 40 steel pipe, sized for free passage of conduit, and protruding 50mm each side.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduit and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .4 Arrange for holes through exterior wall and roof to be flashed and made weatherproof.

1.22 FIELD QUALITY CONTROL

- .1 Load balance
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance.
 - .2 Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .3 Measure phase voltage at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .4 Submit, at completion of Work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test. Provide copy of report in all maintenance manuals.

1.23 DRAWINGS

- .1 Drawings are intended to communicate the general design intent. They are not to be interpreted as a description of means and methods of construction. The Contractor is responsible for reviewing the Drawings and Specifications of this and all other trades on the project to ensure that they deliver a fully coordinated, complete and fully operational system. Any component or service not described, but reasonably obvious as required for completion shall be included by the Contractor at no cost.
- .2 Carefully examine all Drawings and Specifications relating to all Work, and all electrical Work indicated thereon shall be considered as a part of the Work by this section unless indicated otherwise. Prior to the date of the last addendum report at once to the Contract Administrator, any defect, discrepancy, omission or interference affecting the Work of this section, or the guarantee of same.
- .3 Install all equipment as shown or as specified and in accordance with manufacturer's approved Shop Drawings.
- .4 The Drawings accompanying these Specifications are intended to show the general arrangement and extent of the Work to be carried out, but the exact location and

arrangement of all parts shall be determined as the Work progresses. The location of equipment, outlets, etc., as given on the Drawings are approximately correct, but it shall be understood that they are subject to such modifications as may be found necessary or desirable at the time of installation to meet any structural or architectural requirements. Such changes shall be implemented as directed by the Contract Administrator, without additional charge.

- .5 Electrical Drawings do not show all structural and other details. Architectural and structural conditions shall govern, and this Section shall make without charge, changes or additions to accommodate these conditions. Check all architectural plans, elevations and details for location of electrical devices, equipment and equipment to be connected.
- .6 Where Drawings indicate the general location and route to be followed by conduit, cable, etc., these locations must be governed by job conditions. Where the required conduit, cable, and boxes are not shown on Drawings or only shown diagrammatically, they shall be installed to conserve maximum head room and interfere as little as possible with free use of space through which they pass. Maximum clearance above floor shall be maintained under all suspended conduit and equipment, unless otherwise shown on the Drawings, or approved by the Contract Administrator.
- .7 Submit a complete set of Drawings for the proposed installation to the Inspection Department having jurisdiction and receive written approval before installation or fabrication of any equipment. No extra compensation will be allowed for any changes or rearrangement of any electrical apparatus or Materials necessary due to failure to receive this approval.

1.24 REQUEST FOR INTERPRETATION PROCESS

- .1 General:
 - .1 Immediately on discovery of the need for interpretation of the Contract Documents, Contractor shall prepare and submit an RFI to the Contract Administrator in the form specified.
 - .2 Contract Administrator will return RFIs submitted to Contract Administrator by other entities controlled by Contractor with no response. The RFI will then be considered closed.
 - .3 Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's Work.
 - .4 For RFIs submitted electronically, include project name and RFI number in subject line of email.
- .2 Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - .1 Project name (including building number).
 - .2 Project number.
 - .3 Date.
 - .4 Name of Contractor.
 - .5 Name of Contract Administrator.
 - .6 RFI number, numbered sequentially. (eg: RFI-001)
 - .7 RFI subject.
 - .8 Specification Section number, title and related paragraphs, as appropriate.
 - .9 Drawing number and detail references, as appropriate.
 - .10 Field dimensions and conditions, as appropriate.

- .11 Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Price, Contractor shall state impact in the RFI.
- .12 Contractor's signature.
- .13 Attachments: Include sketches, descriptions, measurements, photos, product data, Shop Drawings, coordination Drawings, and other information necessary to fully describe items needing interpretation.
 - .1 Include dimensions, thicknesses, structural grid references, and details of affected Materials, assemblies, and attachments on attached sketches.
- .3 RFI Forms: Contractor generated form including all content indicated in this Section.
 - .1 Form and attachments shall be electronic files in Adobe Acrobat PDF format.
- .4 Contract Administrator's Action: Contract Administrator will review each RFI, determine action required, and respond. Allow 10 Working days for Contract Administrator's response for each RFI. RFIs received by Contract Administrator after 1:00 p.m. will be considered as received the following Working day.
 - .1 The following Contractor-generated RFIs will be returned without action:
 - .1 Requests for approval of submittals.
 - .2 Requests for approval of substitutions.
 - .3 Requests for approval of Contractor's means and methods.
 - .4 Requests for approval of corrective actions for deficient Work.
 - .5 Requests for coordination information already indicated in the Contract Documents.
 - .6 Requests for adjustments in the Contract Time or the Contract Sum.
 - .7 Requests for interpretation of Contract Administrator's actions on submittals.
 - .8 Incomplete RFIs or inaccurately prepared RFIs.
 - .2 Contract Administrator's action may include a request for additional information, in which case Contract Administrator's time for response will date from time of receipt of additional information.
 - .3 If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Contract Administrator in writing within 10 days of receipt of the RFI response. Failure to notify will result in the Work being included as part of the Contract.
- .5 RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log with progress meeting minutes. Include the following:
 - .1 Project name.
 - .2 Name and address of Contractor.
 - .3 Name and address of Contract Administrator.
 - .4 RFI number including RFIs that were returned without action or withdrawn.
 - .5 RFI description.
 - .6 Date the RFI was submitted.
 - .7 Date Contract Administrator's response was received.
- .6 On receipt of Contract Administrator action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Contract Administrator within 10 days if Contractor disagrees with response.

1.25 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- .1 Submit Shop Drawings, produce detailed data and samples in accordance with previous sections, as specified herein, and to Contract Administrator's satisfaction.
- .2 Shop Drawings submitted electronically (e.g. by email) shall comply with the following:
 - .1 Shop Drawings larger than 11 x 17 shall include a hard copy delivered separately by messenger the same day as the email copies.
 - .2 All necessary transmittals shall be included with the email Bid Submission.
 - .3 Emailed Shop Drawings shall comply in all respects with this section of the Specifications.
- .3 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or Material.
- .4 Where applicable, include actual wiring, single line and schematic diagrams. Include all technical data and full details of each component.
- .5 Include wiring Drawings or diagrams showing interconnection with Work of other sections.
- .6 Shop Drawings must reflect actual equipment being provided. Generic Shop Drawings are not acceptable and will be returned for re-submittal without Contract Administrator's review.
- .7 Shop Drawings of all equipment must be submitted to the Contract Administrator for review in sufficient time to enable him to retain them for at least ten (10) Working days.
- .8 Each applicable device to be highlighted or identified with an arrow.
- .9 Each applicable device to be tagged (e.g. light fixture type, motor tag, etc.).
- .10 Shop Drawing submission shall include a photocopy of all applicable Specification sections showing a complete compliance/ non-compliance listing. Refer to spec. detail sheet "Shop Drawing Compliance List Sample" for example.
- .11 Division 16 shall check all Shop Drawings and make necessary changes, or cause the supplier to make necessary changes, prior to submission to the Contract Administrator. Shop Drawings will be reviewed by the Contract Administrator and if re-submission is required, Division 16 shall ensure that the supplier's Drawings have been changed to comply before returning them to the Contract Administrator for review again.
- .12 Review of the Shop Drawings by the Contract Administrator shall not relieve the Contractor from responsibility for errors and omissions therein.
- .13 Each Drawing submission to bear the following signed stamp, and shall include name of project, equipment supplier, and clause number equipment is specified under.

CONTRACTOR'S CERTIFICATION

This Drawing has been reviewed by
(firm name) .

All dimensions have been checked and found compatible with the Contract Drawings and all capacities, quantities, sizes, and other data contained in the Contract documents have been listed by the supplier on this Drawing and have been checked by the undersigned and found correct.

- | Date | Per: | |
|------|------|--|
| .14 | | Clearly show division of responsibility. No item, equipment or description of Work shall be indicated to be supplied or Work to be done "By Others" or "By Purchaser". Any item, equipment or description of Work shown on Shop Drawings shall form part of Contract, unless specifically noted to the contrary. |
| .15 | | Provide field dimensions required by electrical suppliers and Subcontractors. In cases where fabrication is required prior to field dimensions being available, check all related Drawings and obtain clarification from Contract Administrator if necessary. |
| .16 | | Main distribution and utility metering Shop Drawings must be approved by local utility prior to submission to Contract Administrator. |
| .17 | | Incomplete submissions will be returned for updating and re-submittal without Contract Administrator's review. |

1.26 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centre line 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 Wall receptacles:
 - .1 Coordinate with Landscape Architect.
 - .2 Panelboards, etc.: 2000mm to top.
 - .3 As per Landscape Architectural elevations.
 - .4 Heights as above or at bottom of nearest block or brick course except where required to comply with Manitoba Building Code, other applicable codes, authorities having jurisdiction, etc.
 - .5 Heights to match existing where applicable except where required to comply with Manitoba Building Code, other applicable codes, authorities having jurisdiction, etc.

1.27 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into operation and maintenance manuals specified.
- .2 Provide one copy of Operation and Maintenance manuals to Contract Administrator for review. Operation and Maintenance manuals will be reviewed by the Contract Administrator and if re-submission is required, Division 16 shall ensure that the manuals have been changed to comply before returning them to the Contract Administrator for review again.
- .3 Include in operations and maintenance data:
 - .1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension, and expansion of any portion or feature of the electrical installation.

- .2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature alone is not acceptable.
 - .3 Wiring and schematic diagrams and performance curves.
 - .4 Names and addresses of local suppliers.
 - .5 Copy of reviewed Shop Drawings.
- .4 Provide four (4) complete, hard-backed, D-ring loose leaf Maintenance Manuals. These shall consist of typewritten or printed instructions for operating and maintaining all systems and equipment provided under this section of the Specification. Manuals shall also contain Shop Drawings, wiring diagrams, test results and manufacturer's brochures on all equipment, together with typed index tab sheets. Manuals shall also contain a DVD with PDF files of the contents of the manuals.
 - .5 As Work progresses, record on one (1) set of Contract Drawings, installed conduit layout as well as any approved changes and deviations from the original Contract and/or Working Drawings, including outlets, equipment and panel locations. Have these Drawings available for reference and observation at all times. At completion of Work, submit to the Contract Administrator, AutoCAD files of the Record Drawings and one hardcopy set of Record Drawings. The Contract shall not be considered complete and no final payment shall be made until these Drawings are accepted by the Contract Administrator. Provide separate Drawings for each system in order not to "crowd" Drawings.

1.28 TEMPORARY LIGHTING AND POWER

- .1 All temporary and construction lighting and power Work and costs for same are not included as part of the scope of the Work of this section. Refer to such clauses in other sections of the Specification.

1.29 TESTING

- .1 Test all circuits and wires for continuity, insulation resistance and high impedance grounds. Those circuits which test non-continuous, with an insulation resistance less than 2 Megohms or with high impedance grounds shall be replaced.
- .2 All empty conduits shall be left with an insulated #14 AWG fish wire.
- .3 Test all panels under full load and make necessary reconnection of single phase loads from one leg or phase to another to balance the load on legs or phases as nearly as possible. Test results, test values measured, date of each measurement, company name and signature of person making each measurement shall be neatly recorded. Record all changes on Record Drawings.
- .4 Test all required ground rods for ground resistance, with standard test equipment.
- .5 Keep a record of all final tests, bind, and turn over typewritten results to the Contract Administrator as a part of the maintenance manual. All final test values measured, date of each measurement, company name and signature of person making each measurement shall be neatly recorded. After all tests have been successfully completed, each test report shall contain a summary which clearly states that all results were satisfactory.
- .6 Upon completion of the Work and adjustments of all equipment, all systems shall be tested in the presence of the Contract Administrator to demonstrate that all equipment furnished and installed or connected as a part of this section of the Contract shall function electrically in the required manner as determined by the Contract Administrator.

- .7 All circuits shall be tested to ensure that the circuit numbers are correct and that the proper neutral conductors have been provided and installed.
- .8 Voltage tests shall be conducted and transformer taps adjusted or other corrective measures carried out as directed by the Contract Administrator.
- .9 Refer to other Sections for details.
- .10 Submit a report that includes test results, observations, summary, etc. Test report to clearly state that all results are acceptable.
- .11 Carry out on Site testing and commissioning of all high voltage and low voltage switchgear including:
 - .1 Visual observation
 - .2 Operational tests
 - .3 Meggar tests
 - .4 Phasing checks

1.30 CUTTING AND PATCHING

- .1 Cutting, patching and repairs to existing surfaces required as a result of the removal and/or relocation of existing equipment and piping, and/or installation of new equipment and piping in existing building(s) to be included by Div. 16 - Electrical in Bid Opportunity price. Division 16 - Electrical to employ and pay appropriate Subcontractor whose Work is involved, for carrying out Work described above.
- .2 Division 16 shall retain services of Subcontractors to carry out actual Work involved in cutting wall openings, floor openings and the like, and in patching up after installation has been completed.
- .3 Division 16 shall mark all openings required for conduits, cables, ducts, and the like.
- .4 Cutting to be 'neat' sizes. Patch all edges such as cover plates, etc. Hide cut edges.
- .5 If, in the opinion of Contract Administrator, cutting of holes has been improperly performed (i.e. too large for conduits or cables) Division 16 - Electrical to do all patching as per original Specifications and all costs will be borne by him.

1.31 EXCAVATION AND BACKFILLING

- .1 Excavate and backfill as required for underground electrical services as indicated. Provide protective Materials around and over services and be present at all times during excavation and backfilling to supervise Work. Backfilling shall restore the excavated area to the original condition and shall include sodding or asphalt repair where required.
- .2 Work to be in accordance with the current CSA Bulletin.
- .3 Include all costs for excavation and backfilling, for any underground electrical installation unless otherwise indicated.
- .4 Ensure adequate compaction to 95% proctor, in 6" lifts. Do not use frozen Materials.

1.32 FIREPROOFING

- .1 Where cables or conduits pass through floors, block or concrete walls and fire rated walls, seal openings with 3 M Brand Fire Barrier Products or equivalent, to maintain fire rating.
- .2 Seal all holes resulting from removal of cables, conduits and equipment.
- .3 Fireproofing of electrical cables, conduits, trays, etc. passing through fire barriers shall conform to local codes and inspection authorities.
- .4 Refer to following table for 3M brand products.

Penetrating Item	3M Brand Fire Barrier Product Options	Range of Applications			Concrete Walls and Assemblies		Gypsum Wall Assemblies	
		Penetrating Items	Annular Space	Maximum Opening Size	F Ratings (Hrs)	T Ratings (Hrs)	F Ratings (Hrs)	T Ratings (Hrs)
1. Plastic Pipe/ Conduit & Cast-in Coupling	FS-195+ Wrap Strip, CP 25WB+ Caulk or MP Moldable Putty+	PVC: 8 in. Nominal Diameter 4 Wraps/Application	0.2 in.	9 in. Diameter	2	2	2	1-1/2
		PVC: 4 in. Nominal Diameter 3 Wraps/Application	0.75 in.	6 in. Diameter	3	2	2	2
		ABS: 4 in. Nominal Diameter 3 Wraps/Application	0.75 in.	6 in. Diameter	2	2	1-1/2	1-1/2
	PSS 7904 Penetration Sealing System with CP 25 WB+ Caulk	PVC: 4 in. Nominal Diameter	3.0 in.	10 in. Diameter	3	1/2	--	--
		ABS: 4 in. Nominal Diameter	3.0 in.	10 in. Diameter	3 (in wall) 1 (in floor)	3 (in wall) 0 (in floor)	--	--
		PB: 2 in. Nominal Diameter	3.0 in.	8 in. Diameter	1/2	--	--	--
2. Metal Pipe and Conduit	CP 25WB+ Caulk	1 in. Depth of Caulk: 20 in. Diameter	2.5 in.	22.5 in. Diameter	3	0	2	0
	FS-195+ Wrap Strip, CP 25WB+ Caulk or MP Moldable Putty+	4 in. Nominal Metal Pipe	1.75 in.	8 in. Diameter	2	0	2	2
	CS-195+ Composite Sheet with FS-195+ Wrap Strip and CP 25WB+ Caulk or MP Moldable Putty+	4 in. Nominal Metal Pipe (Multiple Pipes)	45.0 in.*	30 x 50 in.	4 (both sides) 3 (one side)	3/4 0	--	--

	PSS 7902 Penetration Sealing System CP 25 WB+ Caulk or MP Moldable Putty+	10 in. Nominal Diameter Pipe and 8x16 in Rectangular Cover Plate if fill is less than 10%	9.0 in.	10 x 20 in.	3	0	--	--
	CP 25WB+ Caulk	1/2 in. Diameter Depth of CP-25WB 12 in. Nominal Diameter Pipe	1.2 in.	14 in. Diameter	3	0	--	--
	FD 150 FireDam Caulk	2 in. Depth of FireDam 150 Chaulk 6 in. Nominal Diameter Pipe	2.0 in.	8-1/4 in. Diameter	3	0	--	--
	MP Moldable Putty+	1 in. Depth of Putty: 10 in. Nominal Diameter Pipe	0.75 in.*	12-1/4 in. Diameter	2 (1/2 in. Depth) 3 (1 in. Depth)	0	--	--
3. Insulated Electrical and Communications Cable	CP 25WB+ Caulk	1 in. Depth of Caulk; 43% of Area Filled, 350 MCM Cable and 100 Pair Telephone Cable	0.75 in.	6 in. Diameter	3	0	2	1-1/2
		1 in. Depth of Caulk; 37% of Area Filled, 3/0 350MCM Cable and 100 Pair Telephone Cable	0.75 in.					
		2-12 in. Depth of Caulk; 59% of Area Filled, 7C/12 AWG Cable, 100 Pair Telephone Cable	0.75 in.					
	FS-195+ Wrap Strip with CP 25WB+ Caulk or MP Moldable Putty+	4 in. Depth of Caulk with FS-195 Wrap; 59% Area Filled, 350 MCM Cable	0.75 in.	6 in. Diameter	2	0	--	--
	CS-195+ Composite Sheet with FS-195+ Wrap Strip and CP 25WB+ Caulk or MP Moldable Putty+	Multiconductor 12 AWG Cable, 100 Pair PVC Telephone Cable, Cable Bundle 3 in. Diameter	47.0 in.*	30 x 50 in.	4	1	--	--

	PSS 7904 Penetration Sealing System with CP 25 WB+ Caulk	350 MCM Cable; 30% of Area Filled. Cover Plate required if Fill is less than 10%	11.0 in.	8 x 16 in.	3	1/2	--	--
	MP Moldable Putty+	Telephone Cable; 100 Pair, 40% or Area Filled	0.75 in.	6-1/4 in. Diameter	2	0	--	--
4. Cable Tray	CS-195+ Composite Sheet with CP 25WB+ Caulk	Nominal Size Cable Tray 4 x 24 in.; 39% Area Filled in Tray; Cable Size: 300 MCM 4 in. Depth of Chaulk	14.64 in.	12 x 24 in.	3	0	--	--
	PSS 7904-R Penetration Sealing System with CP 25 WB+ Caulk	Nominal Size Cable Tray 4 x 18 in.; 52% Area Filled in Tray; 25 Pair No. 22 AWG Telephone Cable	9.0 in.	10 x 20 in.	3	3/4	--	--
5. Blank Openings and Construction Joints and Expansion Trenches		1/2 to 1 in. Depth	--	Joint Width	3	3	--	--
	CP 25WB+ Caulk	2 in. Depth Cover Plate required when joint width exceeds 2 in.	--	4 in. Diameter Opening 4 in. Joint Width	3	2	--	--
	MP Moldable Putty+	1 in. Depth	--	1 in. Joint Width	2	2	--	--
	PSS 7904 Penetration Sealing System with CP 25 WB+ Caulk	4 in. Depth of Kit. Cover Plate Required.	--	8 x 16 in.	3	1	--	--

* Distance Measured from the outer edge of the pentrant to the furthest edge of the opening

1.33 SECURITY FASTENERS AND HARDWARE

- .1 Refer to other sections of the Specifications for Security Fasteners. Division 16 to install security fasteners required for Division 16 Work.
- .2 This shall also include security tamperproof screws that are exposed such as in light fixtures, coverplates, system devices, outlet covers, etc.
- .3 Refer to other sections of the Specifications for security hardware.

1.34 PROTECTION

- .1 Provide mechanical protection for underground conductors coming out of the ground in accordance with authorities having jurisdiction.

- .2 Protect exposed live equipment during construction for personnel safety.
- .3 Shield and mark live parts "LIVE 120 VOLTS", or with an appropriate voltage in English.
- .4 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.35 SCHEDULING OF WORK

- .1 Existing buildings will remain in use during construction. Arrange Work so that interruption of services is kept to a minimum. Obtain permission from The City prior to cutting into electrical services. Where deemed necessary by Contract Administrator, temporary electrical shall be installed and/or Work shall be carried out at night and on weekends.
- .2 Contractor to maintain continuous and adequate all existing electrical systems and other services during entire time of this Contract. Provide temporary conduit, wire, equipment, etc. where necessary to meet this requirement.

1.36 EXAMINATION OF DOCUMENTS AND SITE

- .1 Carefully examine all plans and Specifications pertaining to this Contract and become familiar with all details. Visit the Site and determine all factors affecting this section of the Work; include all costs for same in Bid Opportunity.

1.37 DEMOLITION OF EXISTING ELECTRICAL

- .1 Remove all unnecessary existing electrical equipment, wiring, fixtures, in those portions of the existing building which are being remodelled or demolished. All devices/fixtures, etc. are not necessarily shown on the plans. The City shall select from the Materials and/or equipment remaining that which he wishes to retain, and the remainder shall be removed from the Site. Any electrical equipment in remodelled sections or in structures removed or altered, adjacent to new Work, necessary for the operation of existing building, shall be relocated as necessary. All existing equipment re-used shall be made good and guaranteed. Power interruptions to be kept to a minimum and shall be at a time suitable to the building occupant. Refer to Architectural plans for demolition areas/phasing.
- .2 Drawings do not show all electrical requiring removal to accommodate renovations such as receptacles, switches, lights, starters, motors, nurse call systems, components, heaters, etc. Division 16 shall visit Site, refer to architectural and electrical Drawings and include all costs for demolition.
- .3 Refer to Specification Section 16195 - Work in Existing Building.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16107 Direct Buried Underground Cable Ducts
- .3 Section 16108 Cable and Duct Seals
- .4 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .5 Section 16122 Wires and Cables (0-100 V).

Part 2 Products

2.1 PREPARATION OF GRADE MATERIALS

- .1 Ensure cables/ducts are installed on unfrozen, undisturbed or adequately compacted ground. Compact to at least 95% proctor in 6" lifts if ground is disturbed or if ground appears to be inadequately compacted.
- .2 Install at least 6" of clean, unfrozen sand under, around and above all cables/ducts.
- .3 Do not install ducts or cables in waterlogged ground.
- .4 Ensure all backfilling Materials are unfrozen and screened to remove rocks and boulders.

Part 3 Execution

3.1 DIRECT BURIAL OF CABLES

- .1 After sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Underground cable splices not acceptable.
- .4 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .5 Maintain 150mm minimum separation between cables of different circuits. Maintain 300 mm horizontal separation between low and high voltage cables. When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position. At crossover, maintain 75mm minimum vertical separation between low voltage cables and 150mm between high voltage cables. Maintain 300mm minimum lateral and vertical separation for fire alarm and control cables when crossing other

cables, with fire alarm and control cables in upper position. Install treated planks on lower cables 0.6 m in each direction at crossings.

- .6 After sand protective cover specified is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

3.2 CABLE INSTALLATION IN DUCTS

- .1 Install duct bell end before cables are installed in ducts.
- .2 Install cables as indicated in ducts.
- .3 Do not pull spliced cables inside ducts.
- .4 Install multiple cables in duct simultaneously.
- .5 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .6 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .7 Before pulling cable into ducts and until cables properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .8 After installation of cables, seal duct ends in accordance with Specification Section 16108.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests.
 - .1 After installing cable but before terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests
 - .1 Test cables as described in other Sections.
- .7 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test and include copies in Maintenance Manuals.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 02300 Earthwork
- .2 Section 16010 Electrical General Requirements
- .3 Section 16106 Installation of Cables in Trenches and in Ducts
- .4 Section 16108 Cable and Duct Seals
- .5 Section 16122 Wire and Cables (0-1000V)
- .6 Section 16151 Wire and Box Connectors 0-1000V

Part 2 Products

2.1 PVC DUCTS AND FITTINGS

- .1 Rigid PVC ducts for direct burial: with expanded flange ends, with minimum wall thickness at any point of 3.0 mm. Nominal length: 3 m plus or minus 12 mm.
- .2 Rigid PVC split ducts.
- .3 Rigid PVC couplings, reducers, caps, adaptors as required to make complete installation.
- .4 Bell ends on all ducts, at each end.
- .5 Duct plugs on all empty ducts, at each end.
- .6 Rigid PVC 90 deg. and 45 deg. bends as required.
- .7 Rigid PVC 5 deg. angle couplings as required.
- .8 Expansion joints every 100 m and as required.

2.2 SOLVENT WELD COMPOUND

- .1 Solvent weld compound for PVC duct joints.

2.3 CABLE PULLING EQUIPMENT

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

Part 3 Execution

3.1 INSTALLATION

- .1 Install duct in accordance with manufacturer's instructions.

- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support every 1.5 m throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 Install ducts on undisturbed ground. If disturbed, excavate back to undisturbed and backfill with $\frac{3}{4}$ " engineered backfill, compacted to 95% proctor in 450mm lifts.
- .6 Ensure trenches are dry and not frozen before installation.
- .7 Backfill under and over ducts with clean, screened, non frozen sand (150mm minimum).
- .8 During construction, cap ends of ducts to prevent entrance of foreign Materials.
- .9 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .10 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .11 Install markers as required.
- .12 Clearly show locations on Record Drawings c/w dimensions from building, curbs, property lines, etc.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 - Electrical General Requirements
- .2 Section 16106 - Installation Of Cables In Trenches And In Ducts
- .3 Section 16107 - Direct Buried Underground Cable Ducts
- .4 Section 16131 - Splitters, Junction, Pull Boxes, Cabinets, and Enclosures
- .5 Section 16195 - Work in Existing Building

1.2 REFERENCES

- .1 ASTM E84: Surface Burning Characteristics of Building Materials
- .2 ASTM E119: Fire Tests of Building Construction and Materials
- .3 ASTM E814: Fire Tests of Through-Penetration Firestops
- .4 NEMA Standard 1-10-79 For Type 1-6p and 11-13 Enclosures
- .5 Underwriters Laboratories of Canada (ULC)
- .6 Underwriters Laboratories Products Certified for Canada (CUL)
- .7 ULC-S115: Fire Test of Through-Penetration Firestops

1.3 SYSTEM REQUIREMENTS

- .1 Technical Considerations:
 - .1 Designs should have a L Rating(CF/FT2) of <1 at Ambient and <1 at 4000
 - .2 Sealing system should be water-tight 1 bar/IP67.
 - .3 Sealing system must be Halogen free.
 - .4 Design should provide cable/pipe retention support of 170 lbs or more per cable or pipe.

1.4 SHOP DRAWINGS

- .1 Submit Shop Drawings in accordance with Section 16010 - Electrical General Requirements
 - .1 Provide dimensioned Drawing indicating all selected model numbers of the selected seals for the proposed installation. Include all required seals, parts and accessories.

Part 2 Products

2.1 ROXTEC R AND RS SEALS

- .1 For sealing cables and ducts in round openings, utilizing peelable modules that are compressed to form a water, gas and dust tight seal.

2.2 ACCEPTABLE MANUFACTURER

- .1 Roxtec Inc., 10127 E Admiral Place, Tulsa, Oklahoma. 918-760-0354.
- .2 Regional Sales Representative (Ontario and Manitoba):
Jude Leiman, 27 Fawndale Crescent, Wasaga Beach, ON, L9Z 2B3, phone: 705-352-0209, fax: 705-429-9883, email: jude.leiman@us.roxtec.com

Part 3 Execution

3.1 GENERAL

- .1 Provide cable and duct seals to prevent the passage of water, gasses, and rodents.
- .2 Provide seals at all below grade cable, conductor and duct penetrations as follows:
 - .1 Provide inside the duct, to seal around cables and conductors and
 - .2 Provide around duct to seal gap between duct and hole wall.
- .3 Core drill hole or provide sleeve thru exterior wall or floor, size suitable for the sealing system.
- .4 Install sealing system on the inside of the exterior wall or floor.
- .5 After installation of duct and seal, apply grout around duct on outside of wall or floor.
- .6 Installations shall be performed in accordance with manufacturer's detailed installation procedures.
- .7 When conductors enter into the building thru underground ducts, provide pull box inside the building to transition to EMT conduit.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements

1.2 LOCATION OF CONDUIT

- .1 Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.
- .2 Produce layout sketches of conduit runs through mechanical and electrical service areas in order to pre-avoid any conflict with other construction elements and to determine the most efficient route to run conduit.

Part 2 Products

2.1 CONDUITS

- .1 Electrical metallic tubing (EMT): with couplings. Minimum size shall be 19mm.
- .2 Rigid PVC conduit.
- .3 Flexible metal conduit and liquid-tight flexible metal conduit.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 U channel type supports for two or more conduits at 1500 mm oc. (Surface mounted or suspended).
- .4 Six mm dia. galv. threaded rods to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings for raceways: to CSA C22.2 No. 18.
- .2 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .3 Factory "ells" where 90 deg. bends are required for 25 mm and larger conduits.
- .4 Steel set screw connectors and couplings. Insulated throat liners on connectors.
- .5 Raintight connectors and fittings c/w O-rings for use on weatherproof or sprinklerproof enclosures.
- .6 Raintight couplings to be used for surface conduit installations exposed to moisture or sprinkler heads.

2.4 ANTI-SHORT BUSHING

- .1 Provide anti-short bushing at each conduit end.

2.5 FISH CORD

- .1 Polypropylene c/w 3m spare length at each conduit end.

Part 3 Execution

3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Use electrical metallic tubing (EMT) except where specified otherwise.
- .4 Use rigid PVC conduit duct for underground installations.
- .5 Conduit stubs from floor slabs where exposed to damage to be rigid galv. steel.
- .6 The conduit sizes as shown or indicated are the minimum acceptable and shall not be reduced without the approval of the Contract Administrator.
- .7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .8 Mechanically bend steel conduit over 19 mm dia.
- .9 Install fish cord in empty conduits.
- .10 Run a minimum of 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .11 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
- .12 Dry conduits out before installing wire.
- .13 Conduit to be sized as per Canadian Electrical Code or as shown on Drawings. Note that the sizes of branch circuit conductors scheduled and/or specified on the Drawings are minimum sizes and must be increased as required to suit length of run and voltage drop in accordance with Canadian Electrical Code. Where conductor sizes are increased to suit voltage drop requirements, increase the conduit size to suit.
- .14 Running threads will not be permitted; proper couplings shall be used.
- .15 Not less than 900mm (3'-0") of flexible conduit (and of sufficient length to allow the lighting fixture to be relocated to any location within a 6 ft. (1.8m) radius) shall be used for the connection of recessed lighting fixtures. A separate drop to be used for each fixture unless fixtures are mounted in continuous rows.

- .16 Liquid tight flexible conduit runs shall not exceed 1.5m.
- .17 All conduit runs passing across expansion joints of the building shall be installed utilizing approved expansion fittings, and bonding devices.
- .18 Refer to 16010 for identification requirements.
- .19 All conduit systems in hazardous areas to be rigid galvanized steel to meet the requirements of the authorities having jurisdiction.

3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 150 mm parallel to steam or hot water lines with minimum of 75 mm at crossovers.
- .7 No power driven pins (Ramset) shall be utilized to secure any portion of the conduit.

3.3 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 16010 – Electrical General Requirements.
- .2 Section 16151 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

- .1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 16010 – Electrical General Requirements.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Size as indicated. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with minimum 600 V insulation of chemically cross-linked thermosetting polyethylene Material rated RW90 and RWU90.

2.2 TECK CABLE

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors:
 - .1 Grounding conductor: copper. (FT4 insulation where exposed).
 - .2 Circuit conductors: copper, size as indicated. Minimum size 12 AWG and larger.
- .3 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene rated type RW90, minimum 1000 V.
 - .2 Colour code: Black, red, blue and white in 4C cable.
- .4 Inner jacket: polyvinyl chloride Material.
- .5 Armour: interlocking aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride Material meeting requirements of vertical tray test to CSA C22.2 No. 0.3 with maximum flame travel of 1.2M.
- .7 Fastenings:
 - .1 One hole straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

- .2 Channel type supports for two or more cables.
- .3 Threaded rods: Minimum 6 mm dia. to support suspended channels.
- .8 Connectors:
 - .1 To be approved for TECK cable.

2.3 CONTROL CABLES

- .1 Type LVT: soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket, and armour of closely wound aluminum wire.

Part 3 Execution

3.1 GENERAL

- .1 To Minimize Voltage Drop
 - .1 There shall be no joints in branch circuits feeding patient care receptacles.
 - .2 All branch circuits feeding patient care receptacles shall be minimum #10 AWG.
 - .3 All branch circuits feeding patient care receptacles shall be minimum #8 AWG for all circuits longer than 60 feet.
 - .4 Branch circuits including lighting circuits shall be minimum #10 AWG for all circuits longer than 21 metres and shall be minimum #8 for all circuits longer than 35 metres.
 - .5 All branch circuit wiring and conduit shall be installed to minimize voltage drop. Install additional conduit runs as required to take the most direct and shortest route to outlets, light fixtures, etc.

3.2 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems.
 - .2 In underground ducts.
 - .3 In trenches.
 - .4 In wireways and auxiliary gutters.

3.3 INSTALLATION OF TECK CABLE 0 -1000 V

- .1 Group cables wherever possible on channels.
- .2 Single conductor cables shall be installed one cable diam. apart on suspended cable tray or channel supports and shall be clamped with aluminum cable clamps. Cables shall be terminated using non-magnetic connectors. Cable armor shall be grounded via an aluminum plate at the supply end and isolated via an insulating plate, at the load end of the cable. A #3/0 AWG bare (unless otherwise noted) copper ground wire shall be installed with each feeder. Cable bending radius shall be at least twelve times the overall cable diam. and bends shall not damage or distort the outer sheath.
- .3 Do not install PVC jacketed cables in circulating air plenums.

- .4 Single conductor cables installed underground shall be installed in the installation configuration outlined in Appendix B of the Canadian Electrical Code to provide the allowable ampacity required for the feeder.

3.4 INSTALLATION IN EQUIPMENT

- .1 Group and lace-in neatly wire and cable installed in switchboards, panelboards, cabinets, wireways and other such enclosures.

3.5 TERMINATIONS

- .1 Terminate wires and cables with appropriate connectors in an approved manner.
- .2 Compression adapters intended to terminate larger feeders on small lugs are not acceptable. All lugs, including breaker lugs, are to be sized to accommodate the cable being terminated.

3.6 IDENTIFICATION

- .1 Wire in conduit #2 AWG and smaller shall have solid coloured insulation, colour coded as listed below.
- .2 Wire in conduit 1/0 AWG and larger and single conductor cables for normal power feeders shall be identified at each outlet box and termination with a 150 mm band of coloured vinyl tape of the appropriate colour. Emergency power feeders shall be provided with an additional 75 mm band of red vinyl tape installed adjacent to the 150 mm band of the coloured phase identification tape, as listed below. Neutral and ground conductors shall be identified. Paint or other means of colouring the insulation shall not be used.
- .3 Colour code wire in conduit and single conductor cables as follows:

Phase A - red
Phase B - black
Phase C - blue
Neutral - white
Ground - green
- .4 Maintain phase sequence and colour coding throughout project.
- .5 Use colour coded wires in communication cables, matched throughout system.
- .6 Identify control conductors in motor control equipment, contactors, fire alarm panels, etc. with mylar/cloth wire markers.
- .7 Refer to 16010 for additional requirements.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16108 Cable and Duct Seals
- .3 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .4 Section 16191 Fastenings & Supports

Part 2 Products

2.1 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.2 CABINETS

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm G1S fir plywood backboard. Cabinets to be flush or surface mounted as indicated.
- .3 Provide other systems cabinets as specified and located on Drawings.

Part 3 Execution

3.1 JUNCTION, PULL BOXES, CABINETS AND ENCLOSURE INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Install terminal block as indicated.
- .4 Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.
- .5 Install junction and pull boxes clear of all mechanical ductwork and piping.
- .6 Install underground enclosures so as not to exceed 150m of cable or underground duct run between enclosures.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Identify splitters with size 7 nameplates.
- .3 Identify junction and pull boxes with size 3 nameplates.
- .4 Identify cabinets with size 5 nameplates.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 Sectional boxes shall not be used without specific approval of the Contract Administrator.
- .3 Blank cover plates for boxes without wiring devices.
- .4 Combination boxes with barriers where outlets for more than one system are grouped.
- .5 In moist or dusty areas, gasketed watertight or dust tight boxes and covers shall be provided.

2.2 CONDUIT BOXES

- .1 Cast FS or FD ferrous alloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle where exposed to moisture.

2.3 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 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved Material to prevent entry of debris during construction. Remove upon completion of Work.
- .3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

- .4 Maintain continuity of vapor barrier where boxes are installed in exterior walls and ceilings. Use air/vapor barrier boxes for outlets installed in walls or ceilings with a vapor barrier.
- .5 Boxes to be mounted plumb and square with building lines.
- .6 Install pull boxes, or fittings, in conduit runs where more than four bends are necessary.
- .7 Install pull boxes where run exceeds 23.0 (75 feet) in length.
- .8 All junction, outlets and pull boxes shall be so installed that they are always readily accessible.
- .9 No power driven pins (Ramset) shall be utilized to secure boxes without specific approval from Contract Administrator.
- .10 Check opening provided for each recessed outlet box and if it is not completely covered by cover plate, report discrepancy to the division responsible and ensure that it is rectified.
- .11 All concealed junction boxes, conduit fittings, etc. to be c/w galv. steel covers, secured with two bolts.
- .12 Apply acoustic sealant to and seal wires penetrating moulded vapour barrier boxes.
- .13 Verify exact location of boxes with Landscape Architect. Adjust boxes level with finished floor.
- .14 Verify exact location of service fittings with Drawings and/or Landscape Architect. Service fittings to be installed parallel and perpendicular to building lines.
- .15 No more than two extension rings shall be used in sequence.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16132 Outlet Boxes, Conduit Boxes and Fittings

1.2 SUBMITTALS

- .1 Submit Shop Drawings and product data in accordance with Section 16010.

Part 2 Products

2.1 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 Vac, 15 A, U ground, with following features:
 - .1 Nylon face, brown or ivory for normal power, red for emergency power.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Double wipe contacts and rivetted grounding contacts.
- .2 Receptacles of one manufacturer throughout project.
- .3 Acceptable manufacturers: Hubbell, Arrow Hart, Bryant, Pass & Seymour, Slater. Catalogue No. 5262 for all manufacturers.
- .4 Acceptable manufacturers for ground fault receptacles shall be:
 - .1 Arrow Hart - GF 5242
 - .2 Bryant - GFR 52FT
 - .3 Hubbell - GF 5252
 - .4 Pass & Seymour - 1591-R

2.2 COVER PLATES

- .1 Cover plates from one manufacturer throughout project.
- .2 Receptacles of configurations 5-15R, 5-20R, 5-20RA, 6-15K, 6-20R and 6-20RA where exposed to weather, shall be provided with cover plates suitable for wet locations whether or not a plug is inserted into receptacle.
- .3 Weatherproof in-use cover for outdoor GFI with gaskets as indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Receptacles:

- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles horizontally at height specified in Section 16010 or as indicated.
- .3 Horizontally mounted receptacles shall have the hot line terminal on the bottom. This shall include car park receptacles.
- .4 Suitably ground all receptacles with #12 green insulated wire to outlet box. Provide additional separate ground conductor to isolated ground receptacles.

3.2 IDENTIFICATION

- .1 Identify receptacles with size 1 nameplate indicating panel and circuit number. Nameplates to be mechanically fastened. Refer to Section 16010.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.2No.65 Wire Connectors.
- .2 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit, as required.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install pressure type wire connectors and tighten.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .3 Section 16122 Wires and Cables (0-1000 V)

Part 2 Product

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings or as required.
 - .1 Manufacturers: B-Line, Burndy, Electrovert, Unistrut, Pilgrim, Pursley.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with cast in or expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation. Provide additional support as required.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel Work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 1500 mm oc spacing.

- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .14 Threaded rod to be minimum 6 mm diam. galv. or nickel plated. Black steel rod is not acceptable.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .3 Section 16131 Splitters, Junction, Pull Boxes and Cabinets
- .4 Section 16132 Outlet Boxes, Conduit Boxes and Fittings
- .5 Section 16141 Wiring Devices
- .6 Section 16191 Fastenings and Supports

1.2 COORDINATION

- .1 The building shall remain open and in normal operation during the construction period.
- .2 Where existing services such as electrical power, fire alarm system, sound system, etc. are required to be disrupted and/or shut down, coordinate the shut-downs with The City and carry out the Work at a time and in a manner acceptable to them. Carefully schedule all disruption and/or shut-downs and ensure that the duration of same is kept to the absolute minimum. Submit for approval a written, concise schedule of each disruption at least 120 hours in advance of performing Work and obtain The City's written consent prior to implementing.
- .3 Should any temporary connections be required to maintain services during Work in the existing building, supply and install all necessary Material and equipment and provide all labour at no extra cost. Should any existing system be damaged, make full repairs without extra cost, and to the satisfaction of The City and Contract Administrator.
- .4 If existing equipment shown on Drawings is defective it shall be brought to the Contract Administrator and The City's attention prior to Work completion.
- .5 Refer to General Conditions for phasing and staging of Work and adhere to that schedule. Comply with instructions regarding Working hours necessary to maintain the building in operation.
- .6 Coordinate complete installation of relocated utility services, if required, with Utilities to ensure minimum interruption of service. Coordinate the transfer of the existing hydro service point to the new service point with the Hydro utility in order to keep power interruptions to a minimum.

1.3 EXISTING DEVICES IN NEW CONSTRUCTION

- .1 Where existing devices (receptacles, switches, etc.) presently mounted on a wall which will be covered with a new finish, provide an extension ring, coverplate, etc. or relocate as required to mount the device to the new wall.
- .2 Where existing conduits pass vertically through a floor area, relocate those conduits to be installed concealed in a new wall or surface mounted in a service area. Extend conduit, wiring, etc. as required.

- .3 Existing junction boxes in walls and ceiling spaces required to maintain existing circuits shall remain accessible.
- .4 Where services are concealed within walls, floors or ceilings and cannot be visually identified, Contractor shall provide electronic scanning devices or other approved means to locate and identify concealed services prior to drilling.

1.4 SCHEDULE OF WORK

- .1 Carefully note and refer to the Contract Administrator's general schedule of Work and include for all requirements to conform to it.

Part 2 Products

2.1 MATERIALS

- .1 Provide all Materials required for the complete interface and reconnection installation as herein described and as indicated on the Drawings.
- .2 New fire alarm devices, speakers, starters, panelboards, etc. required to be tied in to existing systems shall match the existing devices.
- .3 New wiring required to interconnect new devices to existing systems shall be provided to suit the manufacturers requirements and instructions.

Part 3 Execution

3.1 INSTALLATION

- .1 Install boxes, conduit and wiring through existing areas as required for the new installation.
- .2 Add modules, switches, etc. in existing control panels, as required, to extend existing systems to new or renovated areas.
- .3 Patch and repair walls and ceilings in existing areas that have been damaged or cut open due to the new electrical installation.
- .4 Where new cables or conduits have been installed through existing fire rated walls, seal opening around cables and conduit to maintain fire rating.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16122 Wires and Cables
- .3 Section 16461 Dry Type Transformers up to 600V Primary

1.2 REFERENCES

- .1 Ground equipment to: CSA C22.2 No. 41.
- .2 Copper grounding conductors to: CSA G7.1.
- .3 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.
- .4 CSA C22.2No.0.4, Bonding and Grounding of Electrical Equipment (Protective Grounding).

1.3 SHOP DRAWINGS

- .1 Submit Shop Drawings in accordance with Section 16010 - Electrical General Requirements.

Part 2 Products

2.1 EQUIPMENT

- .1 Grounding conductors system, circuit and equipment, grounding to be bare (or green insulated if indicated/required) stranded copper sized in accordance with the Canadian Electrical Code.
- .2 Copper conductor minimum 6 m (20 feet) long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.
- .3 Insulated grounding conductors: green, type RW-90, FT-6 rated where installed in free air.
- .4 System and circuit, equipment, grounding conductors, bare stranded copper, size as indicated.
- .5 Insulated grounding conductors: green, type RW-90.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 The grounding of the electrical system shall conform to the requirements of the electrical code, the inspection authority having jurisdiction and shall be as indicated on the Drawings. Additional grounding requirements shall be as described in this Specification and as shown on the Drawings.
- .2 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, electrodes, conductors, connectors, accessories, as indicated, to conform to requirements of local authority having jurisdiction over installation.

- .3 Install connectors in accordance with manufacturer's instructions.
- .4 Protect exposed grounding conductors from mechanical injury.
- .5 All ground cables, bus, etc., in locations where subject to mechanical damage, shall be protected by rigid metal conduit, steel guards, or other suitable shields. In all cases where rigid metal conduit or other metallic encasement of ground conductors is required, the conductor shall be permanently and effectively grounded to the conduit/enclosure at both ends of its length. Use solderless lug, clamp or ground bushing at each end. This requirement applies to all such enclosures regardless of length.
- .6 Make buried connections, by cadweld process.
- .7 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .8 All compression connectors, lugs, etc., used in grounding circuits in outdoor locations, shall have bolts, nuts, etc., of silicon bronze alloy.
- .9 Install bonding wire for flexible conduit, connected at both ends to conduit by using grounding bushing, solderless lug or clamp.
- .10 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .11 All bonding jumpers shall be sized at least equal to their corresponding grounding conductors unless noted otherwise. Where attached to equipment, conduits, cabinets, etc., suitable approved solderless lugs, compression connectors or clamps shall be used.
- .12 No soldered connections shall be used on grounding circuits at any point.
- .13 Install separate ground conductor to outdoor lighting standards.
- .14 Where a ground cable is to be bonded to building steel, the location of such ground connections shall be at points where they will not be subject to mechanical damage, but if possible will be accessible for inspection.
- .15 Any bonds between dissimilar metals such as between copper and steel, must be thoroughly sealed or painted against moisture to minimize corrosion.
- .16 All surfaces to which grounding bus or cable is to be bolted shall be cleaned of all paint, rust, etc., and worked to a bright flat surface. Immediately before bolting to steel member, the contact surface of both shall be lightly coated with an oxide-preventing agent.
- .17 All connections to be buried and subsequently made inaccessible must be Cadwelded.
- .18 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .19 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .20 All switchgear and panelboards shall have a ground bus for connection of feeder and branch circuit ground conductors.
- .21 All transformer enclosures shall be connected to ground.
- .22 Where ground conductors pass through fire rated floor, or wall, etc., provide rigid metal conduit of the required size. Connect each conduit end to the grounding conductor with solderless lug, clamp or grounding bushing. Firestop penetration through fire rated walls and floors.

- .23 Where ground connections will be inaccessible after construction, connections shall be made by the cadweld process (Erico Products 'Cadweld' or Burndy 'Thermoweld'). Accessible connections shall be Cadweld, welded, brazed, bolted, or compression type.
- .24 All conduit runs containing feeders and branch circuits shall be complete with an insulated green ground wire bonded to all outlet boxes, junction boxes, pull boxes, equipment enclosures, etc. The conduit system shall be continuous but shall not be relied on to serve as the equipment grounding means. Ground conductors shall be sized according to the Canadian Electrical Code, but shall be minimum #12 AWG. For feeders to 600 Volt sub-distributions, the insulated ground wire shall be minimum #3/0 AWG (to allow the future grounding of transformer neutral points for transformers fed from the 600 Volt subdistribution). All locknuts and couplings shall be securely tightened.
- .25 A separate ground conductor shall be installed in all fibre, PVC or plastic duct runs and shall be connected to maintain the grounding of the system.
- .26 Conduit expansion joints and telescoping sections of metal raceways and cable trays not thoroughly bonded otherwise, shall be provided with approved bonding jumpers.

3.1 TRANSFORMER NEUTRAL GROUNDING

- .1 For Delta/Wye transformers:
 - .1 The primary bonding/grounding conductor, where present, shall be run in the same conduit as the primary feeder to the transformer.
 - .2 The primary bonding/grounding conductor, where present, shall be connected to transformer ground bus.
 - .3 The secondary neutral and the secondary bonding conductors, where present, shall be run in the same conduit as the secondary feeder from transformer.
 - .4 The secondary neutral and the secondary bonding conductor, where present, shall be connected to XO point of the transformer.
 - .5 Ground enclosure with continuous conductor from enclosure ground lug through connector on ground bus to XO point.

3.2 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral points of 600V and 208 V system.

3.3 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: service equipment, switchgear, panelboards, transformers, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevator distributions, panels, outdoor lighting, capacitor banks, harmonic filters, UPS's, etc.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 16010.
- .2 Perform tests before energizing electrical system.
- .3 Disconnect ground fault indicator, if provided, during tests.
- .4 Test ground resistance of each individual rod separately and the whole ground grid as a system. Record each reading.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .3 Section 16450 Grounding - Secondary

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 16010.
- .2 Dry-type transformers: to CSA C22.2 No. 47, CSA C9, CSA C802.

Part 2 Products

2.1 TRANSFORMERS - VENTILATED

- .1 Use transformers of one manufacturer throughout project.
- .2 Type: ANN. K rating to be minimum K-1 or as indicated on Drawings.
- .3 3 phase, 600V Delta primary, 120/208V wye, secondary, 60 Hz, copper windings.
- .4 Voltage taps: 4 @ 2 1/2 %; two FCAN; two FCBN.
- .5 Insulation: Class H; 150C temperature rise above 40C ambient.
- .6 Basic Impulse Level (BIL): standard
- .7 Hipot: standard
- .8 Average sound level: 50 db for up to 150 kVA & 55 db above 150 kVA.
- .9 Impedance at 170 deg. C: to be 3% to 5% for transformers up to 225kVA (minimum 3.75% for 225 kVA transformers and 5% for transformers 300 kVA and larger).
- .10 Removable metal front panel.
- .11 Enclosure shall be protected from spray from sprinkler heads as outlined in Canadian Electrical Code.
- .12 Mounting: wall.
- .13 Finish: in accordance with Section 16010 - Electrical General Requirements.

2.2 APPROVED MANUFACTURERS

- .1 Schneider, Hammond, Rex Manufacturing, Cutler Hammer, Delta, Siemens, B-Mag.
- .2 All transformers shall be of same manufacturer.

Part 3 Execution

3.1 MOUNTING

- .1 Mount dry-type transformers up to 75 kVA as indicated.
- .2 Ensure adequate clearance around transformer for ventilation.
- .3 Install transformers in level upright position.

- .4 Remove shipping supports only after transformer is installed and just before putting into service.
- .5 Loosen isolation pad bolts until no compression is visible.
- .6 Mount transformers with vibration isolation.

3.2 CONNECTIONS

- .1 Make primary and secondary connections indicated on wiring diagram.
- .2 Energize transformers immediately after installation is completed, where practicable.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .3 Section 16477 Moulded Case Circuit Breakers

1.2 SHOP DRAWINGS

- .1 Submit Shop Drawings in accordance with Section 16010.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.3 PLANT ASSEMBLY

- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

Part 2 Products

2.1 PANELBOARDS

- .1 Panelboards: to CSA C-22.2 No. 29.
- .2 Panelboards: product of one manufacturer.
- .3 Up to 250V branch circuit panelboards: bus and breakers interrupting capacity (RMS Symmetrical) as shown on Drawings, 10 ka minimum when not shown.
- .4 347/600V panelboards: bus and breakers interrupting capacity (RMS Symmetrical) as shown on Drawings, 14 ka minimum when not shown.
- .5 All devices must be fully rated. Series rated devices are not acceptable.
- .6 Sequence phase bussing such that circuit breakers will be numbered in consecutive order, with each breaker identified by permanent number identification as to circuit number and phase.
- .7 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .8 Provide keyed panel cover and supply two keys.
- .9 Aluminum bus with neutral of same ampere rating as mains.
- .10 Mains: suitable for bolt-on 25mm wide breakers.
- .11 Trim and door finish: baked grey enamel.
- .12 Enclosure shall be protected from spray from sprinkler heads as outlined in Canadian Electrical Code.

2.2 BREAKERS

- .1 Breakers: to Section 16477 - Moulded Case Circuit Breakers.

- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Lock-on devices for 5% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to The City.
- .4 Lock-on devices for fire alarm, emergency lighting, door supervisory, intercom, paging, stairway, exit, night light circuits and similar circuits.
- .5 Branch circuit breakers to be 15A single pole unless otherwise indicated on Drawings.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Nameplate for each panelboard size 5 engraved as indicated.
- .3 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 MANUFACTURERS

- .1 Acceptable Manufacturers: Eaton, Schneider, Square D and Siemens.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Except in public areas, install surface mounted panelboards on U-channels. Where practical, group panelboards on common U-channels.
- .3 Mount panelboards to height specified in Section 16010 - Electrical General Requirements or as indicated.
- .4 Connect loads to circuits.
- .5 Connect branch circuit neutral conductors to common neutral bus. Common neutrals shall be shared by vertically adjacent breakers except for GFI protected branch circuits and dimmer circuits which shall not share neutrals with other circuits. Neutral conductors shall be identified with mylar/cloth wire markers showing the circuit numbers of the circuits sharing the neutral.
- .6 Trims of recessed panelboards to be flush with wall. Coordinate installation with wall installer to ensure that walls with recessed equipment will be deep enough to accept the equipment.
- .7 Locate all panelboards as shown on the Drawings, an arrow indicating the front.
- .8 Wiring in panelboards shall be neat and set in as if laced. All neutral conductors shall be identified in the panel with their associated circuit numbers by means of Brady Markers.
- .9 All panelboards throughout the building shall be phased together such that the left-hand, centre and right-hand panelboard busses represent phases A, B and C respectively. All indicating meters shall be identified to this sequence.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 - Electrical General Requirements
- .2 Section 16471 - Panelboards Breaker Type

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 16010.
- .2 Include time-current coordination characteristic curves for breakers.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Moulded case circuit breakers: to CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg. C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 5-10 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 All devices must be fully rated. Series rated devices are not acceptable.
- .7 Interrupting ratings (RMS symmetrical) to match bus interrupting ratings shown on Drawings.
- .8 When interrupting ratings are not shown on Drawings shall be as follows:
 - .1 Up to 250 Volts - 10,000 Amps
 - .2 347/600 Volts - 14,000 Amps
- .9 Maximum breaker sizes, except for motors:
 - .1 20A for #12 copper conductor.
 - .2 30A for #10 copper conductor.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MANUFACTURERS

- .1 Acceptable manufacturers: Eaton, Schneider, Square D, Siemens.

Part 3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Electrical General Requirements Section 16010

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit Shop Drawings and product data in accordance with Section 16010 – Electrical General Requirements.

Part 2 Products

2.1 MATERIALS

- .1 Components comprising ground fault protective system to be of same manufacturer.

2.2 GROUND FAULT PROTECTOR UNIT

- .1 Self-contained with 15 A, 120 V circuit interrupter and duplex receptacle complete with:
 - .1 Solid state ground sensing device.
 - .2 Facility for testing and reset.
 - .3 Flush mounted with stainless steel face plate.

Part 3 Execution

3.1 INSTALLATION

- .1 Do not ground neutral on load side of ground fault relay.
- .2 Pass phase conductors including neutral through zero sequence transformers.
- .3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 16010 - Electrical - General Requirements.
- .2 Arrange and pay for field testing of ground fault equipment by independent testing laboratory before commissioning service.
- .3 Submit report of tests to Contract Administrator and a certificate that system as installed meets criteria specified herein. Include copies of report in maintenance manuals.
- .4 Demonstrate simulated ground fault tests.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit Shop Drawings in accordance with Section 16010.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Contract Administrator.
- .3 Submit list of replacement lamp data for each luminaire. Include lamp type, voltage, base type and order code.

1.3 GUARANTEE

- .1 Replace:
 - .1 Incandescent and tungsten halogen lamps burnt out within 3 months of takeover.
 - .2 Fluorescent and HID lamps burning out within 12 months of takeover.
 - .3 Ballasts that fail or exceed their labelled noise level rating within 12 months of takeover.

1.4 CO-ORDINATION

- .1 Co-ordinate luminaire locations with Work of other trades.
- .2 Co-ordinate luminaire types with ceiling finishes to ensure compatibility.
- .3 Luminaires to be c/w lamps, suspension devices, plaster rings and other attachments required for best appearance and proper mechanical installation.
- .4 Every light outlet in the building shall be provided with a suitable fixture. In the event that the fixture type is not designed for any particular outlet, supply a suitable fixture for the application, as approved by the Contract Administrator.

Part 2 Products

2.1 MATERIALS

- .1 Incandescent and electric discharge fixtures: to CSA C22.2 No. 9.
- .2 Socket screw-shell lampholders: to CSA C22.2 No. 43.
- .3 Electric discharge lampholders: to CSA C22.2 No. 74.
- .4 Incandescent lamps to: CSA C10 and CSA C22.2 No. 84.
- .5 Tungsten halogen lamps: to CSA C22.2 No. 84.
- .6 HID lamps: to ANSI C78 series.
- .7 Fluorescent lamps: to ANSI C78 series.
- .8 Ballasts: to CSA C22.2 No. 74.
- .9 Plastic lenses and diffusers ULC labelled.

2.2 LUMINAIRE DETAILS

- .1 Luminaires shall carry the CSA label.

- .2 Provide supporting devices, plaster frames, junction boxes and outlet boxes where required.
- .3 Provide lenses or diffusers of glass or acrylic Material as indicated.
- .4 Include finishes to Section 16010 and as indicated.
- .5 Provide gasketting, stops and barriers to prevent light leaks.
- .6 Recessed in-ground luminaires shall be suitable for mounting in the particular type of ground where the luminaires are to be mounted.

2.3 LAMPS

- .1 Light E Diode (LED).

2.4 BALLASTS AND ACCESSORIES

- .1 Provide drivers and accessories as indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Install luminaires at locations indicated, c/w lamps, all wiring, connections, fittings, hangers, aligners, box covers and accessories, as required.
- .2 Install luminaires and lens Materials in architectural details, as indicated.
- .3 Install luminaires parallel with building lines. Wall mounted luminaires to be installed plumb.
- .4 Co-ordinate the installation of luminaires with the Work of other trades, ensuring that the necessary depths and mounting spaces are provided. Luminaires which cannot be installed due to a conflict with structural members, pipes or ductwork shall be relocated to a more suitable location, as directed by the Contract Administrator.
- .5 Install post top, landscape and roadway luminaires plumb.

3.2 WIRING

- .1 Connect luminaires to lighting circuits as indicated.

3.3 TESTS

- .1 Perform tests in accordance with Section 16010.

3.4 CLEANING

- .1 Prior to take-over of the project, clean the lenses and reflectors of all luminaires with a damp cloth to remove dust, smudges and fingerprints.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .3 Section 16122 Wires and Cables
- .4 Section 16132 Outlet Boxes, Conduit Boxes and Fittings

1.2 DESCRIPTION OF SYSTEM

- .1 Low voltage control system designed to provide automatic or manual remote switching of lighting loads by use of:
 - .1 Low voltage momentary contact switches
 - .2 Low voltage relays.
 - .3 Control transformers
 - .4 Low voltage rectifiers
 - .5 Manual switch control.

1.3 SHOP DRAWINGS

- .1 Submit Shop Drawings in accordance with Section 16010.

Part 2 Products

2.1 LIGHTING CONTROL EQUIPMENT ENCLOSURE

- .1 Enclosure shall be protected from spray from sprinkler heads as outlined in Canadian Electrical Code.
- .2 Provide keyed panel cover and supply two keys.

2.2 RELAY CABINETS

- .1 Cabinets to be close coupled to breaker panel as indicated. Cabinets to be 17" (43mm) wide with height and depth to match panelboard. Cabinets to be complete with lockable door keyed alike with breaker panels.
- .2 Relay cabinet to accommodate 8 plug-in relays, one ON/OFF 8 point output scanner and one transformer.
- .3 Cabinet finish shall match that of adjacent power panel.
- .4 Provide steel barrier between high voltage terminals and low voltage terminals.

2.3 RELAYS

- .1 Low voltage relays for 120V lighting circuits as indicated.
- .2 Relays to be plug-in type, 20 Amp., 120V AC c/w base.
- .3 Relay to provide both 'ON' and 'OFF' operation.
- .4 Bases to be c/w built-in input/output identified wiring terminals.

2.4 CONTROL TRANSFORMER

- .1 Low voltage power Class 2, input 120 or 347V, ac, 60 Hz, output 35 VA at 24 V.

2.5 RECTIFIER

- .1 Rectifiers to be built into relays and switches.

2.6 SCANNER

- .1 Scanners shall operate on the control pulse principal requiring only one ON/OFF control wire per channel. A negative pulse shall initiate an 'ON' scan and a positive pulse shall initiate an 'OFF' scan. The discriminator shall prevent any control pulses from being received during an operate cycle.

2.7 SWITCHES

- .1 Single low voltage switches to be single-pole momentary action c/w internal diodes and 2 LED indicator lights (ON/OFF). Switches to have an injection moulded housing c/w mounting strap.
- .2 Coverplates to be stainless steel.

2.8 SWITCHBANKS

- .1 Remote control switchbanks to be c/w 9 switches as above and stainless steel coverplate.

2.9 WIRING

- .1 Low voltage wiring to switches shall be 2/c #18 AWG.

2.10 MANUFACTURERS

- .1 Acceptable manufacturers: Douglas lighting controls - WPAK33318.

Part 3 Execution

3.1 RELAY CABINETS

- .1 Install relays, transformers and scanner in relay cabinets as indicated.
- .2 Install relay cabinets close coupled to lighting panelboard as indicated. Cabinets to have lockable hinged doors keyed alike with panelboard doors.

3.2 SWITCHES

- .1 Install wire and connect system with maintained contact device as indicated.
- .2 Mounting height of switches to Section 16010.

3.3 AUTOMATIC CONTROL

- .1 Interconnect low voltage control system with maintained contact device as indicated.

3.4 WIRING

- .1 Install low voltage wiring in conduit. Splices and connections shall not be made except in switch boxes or in relay enclosures.
- .2 Maximum conduit fill shall be as follows:
 - 12mm (1/2") conduit: four #18/2.
 - 19mm (3/4") conduit: ten #18/2.

- 25mm (1") conduit: fifteen #18/2.
- .3 High voltage (120 or 347 volt) and low voltage (24 volts) connections between circuit breakers and relays shall be made on the H.V. terminals of the relay base. Low voltage (24 volt) connections between relays and remote control wiring shall be made on the L.V. terminals of the relay base.
- .4 High voltage (120 or 347 volt) and low voltage (24 volts) connections shall be numbered on the high and low voltage terminals using Brady wire markers. A typewritten directory shall be mounted on the inside of the relay cabinet door showing the circuit number and area controlled by each low voltage relay. Minimum size of directory shall be 5" x 10" (125 mm x 250 mm) with numbers in a vertical column.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 16010 Electrical General Requirements
- .2 Section 16111 Conduits, Conduit Fastenings and Conduit Fittings
- .3 Section 16122 Wires and Cables
- .4 Section 16505 Lighting Equipment

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 16010.

Part 2 Products

2.1 PHOTOELECTRIC LIGHTING CONTROL

- .1 Wall luminaire mounting.
- .2 Capable of switching 1800 W of lighting at 120V.
- .3 Voltage variation: plus or minus 10%.
- .4 Temperature range: minus 40 deg. C to 70 deg. C.
- .5 Switching on lights at 20 lx.
- .6 Switching off lights at 400 lx.
- .7 Rated for 5000 operations.
- .8 Options:
 - .1 Lightning arrester.
 - .2 Fail-safe circuit completed when relay de-energized.
 - .3 Terminal strip.
- .9 Switching time delay of 30 s.
- .10 Wall mounting bracket.
- .11 Colour coded leads: size 10 AWG, 460 mm long.

Part 3 Execution

3.1 INSTALLATION

- .1 Install photoelectric controls in accordance with manufacturer's instructions.

END OF SECTION

PANEL: **LP-1**
 FED FROM: SD6 (C)

LOCATION: P1 Parkade
 LOCATION: Level 1 electrical room

Designation	Load (VA)	Ckt. bkr.		Phase	Ckt. bkr.		Load (VA)	Designation
		Trip	No.		No.	Trip		
LIGHTING RECEPTACLE SOUTH EAST PLANTERS	500	15		1	A	13		
LIGHTING RECEPTACLE NORTH PLANTERS	500	15		2	B	14		
LIGHTING RECEPTACLE (POLE MOUNTED) WEST PLANTERS	500	15		3	C	15		
LIGHTBOX	500	15		4	A	16		
IN-GROUND LIGHTING	110	15		5	B	17		
SPARE		15		6	C	18		
				7	A	19		
				8	B	20		
				9	C	21		
				10	A	22		
				11	B	23		
				12	C	24		
VOLTAGE:		120/208V,3Ø,4W			LOADS -		PH.A	1000
CAPACITY:		100A					PH.B	610
MOUNTING:		SURFACE					PH.C	500
REMARKS:		10KA					TOTAL	2110



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PANEL SCHEDULE LP-1

PROJECT: Millenium Library Park phase 2
 FILE: 14-158-01
 DATE: 11-Jun-14

LUMINAIRE SCHEDULE

14-158-01



FIXT. TYPE	LAMPS	VOLTAGE	DESCRIPTION	NOTES	APPROVED MANUFACTURERS
AA	LED 10W	120	LANDSCAPE IN GROUND UP LIGHT C/W 120/12V INTEGRAL TRANSFORMER 2700K LED AND A 41 DEG BEAM SPREAD ADJUSTABLE MIN. +- 23DEG VERTICAL TILT STAINLESS STEEL FINISH TAMPER PROOF SCREWS		COOPER: 696-10LED2741-120/12-NSS