TENDER NO. T-721-25
VARIOUS SITE IMPROVEMENTS AT
254-360 BURLOAK DR. AND 1478-1494 ELM RD.

SPECIFICATION DOCUMENTS

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SPECIFICATIONS

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ARTICLE SC1 – Acceptance of Site

The Contractor shall accept the site as it exists at the time of the tender call.

The Contractor shall co-operate with Subcontractors on site, shall make all suitable arrangements to co-ordinate his activities with subcontractors, and shall not hinder the performance of their contracts.

The successful Bidder must make careful examination of existing site surface conditions and topography and advise the Regional Representative of unsatisfactory site surface conditions and topography prior to commencement of construction. Commencement of construction will mean that the successful Bidder has accepted the existing site surface conditions and topography and no allowance will be made later for any expenses incurred through failure to note unsatisfactory existing site surface conditions and topography.

ARTICLE SC2 – Limit of the Working Area

On the Region land, the Contractor shall limit his operations to within the road allowances, easements and property boundaries, unless otherwise approved by the Consultant.

The Contractor must obtain all necessary permits for the Work.

The Contractor must notify the Region and Consultant three (3) days prior to the start of construction activity.

ARTICLE SC3 – Existing Utilities and Services

The Contractor shall be responsible for locating and adequately protecting all existing utilities and services and for permanently supporting utilities which cross over the services to be constructed under this Contract.

The utility companies require that their own forces are employed to repair any damages to these utilities. The Contractor shall reimburse the utility companies for any cost associated with these repairs.

In situations where the Contractor will be connecting to existing live underground services as part at this Contract, he must expose all stubs, plugs, and connections to manholes to verify location and elevations prior to the start of construction.

ARTICLE SC4 – **Independent Testing**

The Region will retain independent specialized testing companies to provide the following services:

a) Compaction Tests

Provide Proctor and field density tests, certifying adequate bearing capacity and compaction of trench backfill, fill sub base and granular base as required in accordance with the applicable specifications.

b) Gradation Tests

Provide gradation tests for granular or stone aggregates, backfill material and granular or stone base material as required to verify conformance with the applicable specifications.

c) Topsoil Tests

Provide topsoil tests for N, P, K and minor element values, soluble salt content, organic matter, pH valve and toxic chemicals, in conformance with the applicable specifications.

d) Concrete Tests

Provide strength tests for concrete in conformity with the applicable specifications.

e) Asphalt Tests

Provide adequate testing as required to verify conformance with the applicable specifications and to determine the asphalt cement content.

ARTICLE SC5 – Progress Certificates

It is the Contractor's responsibility to prepare progress certificates and submit them to the Consultant for review. The Progress Certificate shall be based on the percentage completed, the quantity of work performed in the current period, the quantity of work previously performed, and the total quantity of work to date and the value of work both to date and for the current period.

ARTICLE SC6 – Measurement of Quantities

Payment for all items will be based on tendered plan quantities and will not be measured in the field unless design drawings for that item are altered.

ARTICLE SC7 – Regular Meetings

The successful Bidder shall be required to attend regular meetings on site to review the progress of the Work with Consultant and the Region. The dates and times for these meetings shall be determined at the first scheduled meeting for the Project.

ARTICLE SC8 – Licenses, Permits, Locates and Approvals

The successful Bidder shall comply with all applicable statutes, laws, by-laws, regulations, ordinances, notices and orders whether Federal, Provincial, Municipal or otherwise, at any time in effect during the execution of this Contract, and all rules and requirements of the Police and Fire departments, or other governmental authorities, and procure all C.S.A. approvals, as required. The successful Bidder shall obtain and pay for all necessary permits and licenses, and shall not do or suffer to be done anything in violation of any such laws, ordinances, rules or requirements. If the attention of the successful Bidder is called to any such violation on the part of the successful Bidder, or of any person employed or engaged by the successful Bidder, the successful Bidder shall immediately desist from and correct such violation.

---------- END OF SECTION ----------

PART 1 – GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 56 00 - Temporary Barriers and Enclosures.

2. WORK COVERED BY CONTRACT DOCUMENTS
   1. This Contract Includes scope on two (2) sites;
      a. 254-360 Burloak Dr., Burlington, ON
      b. 1478-1494 Elm Rd., Oakville ON
   2. Work of this Contract comprises all labour, material, and everything else necessary to complete removal, stabilization and general construction of a basketball court, concrete walkway and concrete unit paver replacement at Halton Community Housing 254-360 Burloak Dr., Burlignton, ON as specified on contract drawings and specifications herein including, but not limited to the following:

      a. Prepare construction accesses and staging areas as directed by Consultant and the Region;
      b. Excavation and removal from site existing asphalt, concrete walkway, concrete unit pavers, related hardscape and subgrade.
      c. Construct basketball court including asphalt surface, line paint and basketball hoop.
      d. Construct concrete, and unit paver walkways.
      e. Topsoil and Sodding;
      f. Restoration of all site disturbed areas, hard and soft landscape affected by project construction works, as per contract drawing requirements and specifications.
   3. Work of this Contract comprises all labour, material, and everything else necessary to complete removal, stabilization and general construction and adding lighting to a basketball court at 1478-1494 Elm Rd., Oakville ON, as specified on contract drawings and specifications herein including, but not limited to the following:

a. Implementation of erosion / sediment control measures;
b. Prepare construction accesses and staging areas as directed by the Consultant and the Region;
c. Excavation and removal from site existing chainlink fence, fence footings, asphalt, related hardscape and subgrade.
d. Construct basketball court including asphalt surface, line paint, fence and basketball hoop.
e. Light standards and all electrical connections
f. Topsoil and Sodding;
g. Restoration of all site disturbed areas, hard and soft landscape affected by project construction works, as per contract drawing requirements and specifications.

3. CONTRACT METHOD

1. Construct Work under single, stipulated price contract.

4. OWNER FURNISHED ITEMS

1. Owner/Contract Administrator Responsibilities:
    a. Review shop drawings, product data, samples, and other submittals. Submit to Consultant notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
    b. Inspect deliveries jointly with Contractor.
2. Contractor Responsibilities:
    a. Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to the Contract Administrator.
    b. Deliver supplier's bill of materials to the Contract Administrator.
    c. Arrange and pay for delivery to site in accordance with Progress Schedule.
    d. Designate submittals and delivery date for each product in progress schedule.
    e. Review shop drawings, product data, samples, and other submittals. Submit to Consultant notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.

f. Receive and unload products at site.
g. Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
h. Handle products at site, including uncrating and storage.
i. Protect products from damage, and from exposure to elements.
j. Assemble, install, connect, adjust, and finish products.
k. Provide installation inspections required by public authorities.
l. Repair or replace items damaged by Contractor or subcontractor on site (under Contractor's control).
m. Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to the Contract Administrator.

5. EXISTING SERVICES

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

2. Where Work involves breaking into or connecting to existing services, give Contract Administrator 72 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic.

3. Provide alternative routes for pedestrian and vehicular traffic.

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

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

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

7. Where unknown services are encountered, immediately

advise Contract Administrator and confirm findings in writing.

8. Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

9. Record locations of maintained, re-routed and abandoned service lines.

10. Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

6. DOCUMENTS REQUIRED

1. Maintain at job site, one copy each document as follows:
   a. Contract Drawings.
   b. Specifications.
   c. Addenda.
   d. Reviewed Shop Drawings.
   e. List of Outstanding Shop Drawings.
   f. Change Orders.
   g. Other Modifications to Contract.
   h. Field Test Reports.
   i. Copy of Approved Work Schedule.
   j. Health and Safety Plan and Other Safety Related Documents.
   k. Other documents as specified.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS	1. Section 01 56 00 - Temporary Barriers and Enclosures.
2. ACCESS AND EGRESS	1. Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
3. USE OF SITE AND FACILITIES	1. Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Consultant to facilitate work as stated. 2. Maintain existing services to building and provide for personnel and vehicle access. 3. Where security is reduced by work provide temporary means to maintain security. 4. Accept liability for damage, safety of equipment and overloading of existing equipment. 5. Closures: protect work temporarily until permanent enclosures are completed.
4. EXISTING SERVICES	1. Notify Consultant, Contract Administrator, and utility companies of intended interruption of services and obtain required permission. 2. Where Work involves breaking into or connecting to existing services, give Consultant and Contract Administrator 72 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends. 3. Provide for personnel, pedestrian and vehicular traffic. 4. Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
5. SPECIAL	5. Carry out noise generating Work Monday to Friday from 8:00am

REQUIREMENTS

to 5:00pm only.

6. Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
7. Keep within limits of work and avenues of ingress and egress.
8. Ingress and egress of Contractor vehicles at site is limited to one access point.
9. Deliver materials outside of peak traffic hours 8:00am to 9:00am and 3:30pm to 5:30pm unless otherwise approved by Consultant.

6. SECURITY
   1. Where security has been reduced by Work of Contract, provide temporary means to maintain security.

7. SMOKING ENVIRONMENT
   1. Comply with all municipal smoking restrictions. Smoking is not permitted in work areas or on public sidewalk/roadway.

PART 2 - PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. REFERENCES
   1. Canadian Construction Documents Committee (CCDC)
      a. CCDC 2-2020, Stipulated Price Contract.

2. CASH ALLOWANCE
   1. Refer to CCDC 2, GC 4.1.
   2. Include in Contract Price specified cash allowances.
   3. Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage installation and other authorized expenses incurred in performing Work.
   4. Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.
   5. Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance. Any works completed prior to written consent from the Region and Consultant will not be compensated and cost will be carried entirely by the contractor.
   6. Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents, upon written concept from the Region and the Consultant.
   7. Include progress payments on accounts of work authorized under cash allowances in Consultant’s regular certificate for payment.
   8. Prepare schedule jointly with the Consultant’s and Contractor to show when items called for under cash allowances must be authorized by the Consultant for ordering purposes so that progress of Work will not be delayed.
   9. Amount of each allowance for Work specified in respective specification and contract documents:
      a. An allowance of $5000 for 3rd party compaction and materials testing.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 33 00 - Submittal Procedures
   2. Section 01 56 00 - Temporary Barriers and Enclosures
   3. Section 01 78 00 - Closeout Submittals

2. ADMINISTRATIVE
   1. Schedule and administer project meetings throughout the progress of the work at the call of Consultant and The Region.
   2. Prepare agenda for meetings.
   3. Distribute written notice of each meeting five days in advance of meeting date to Contract Administrator and Regional Representative.
   4. Meetings to be held at 254-360 Burloak Dr. ,Burlington, ON, and at 1478-1494 Elm Rd, Oakville, ON when specified.
   5. Preside at meetings.
   6. Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
   7. Reproduce and distribute copies of minutes within five days after meetings and transmit to meeting participants and, affected parties not in attendance.
   8. Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

3. PRECONSTRUCTION MEETING
   1. Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
   2. Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
   3. Establish time and location of meeting and notify

parties concerned minimum 5 days before meeting.

4. Agenda to include:
   a. Appointment of official representative of participants in the Work.
   b. Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
   c. Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences as indicated by the Consultant
   d. Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
   e. Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
   f. Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
   g. Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
   h. Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
   i. Monthly progress claims, administrative procedures, photographs, hold backs.
   j. Appointment of inspection and testing agencies or firms.
   k. Insurances, transcript of policies.
   l. Health and safety

5. PROGRESS MEETINGS

1. During course of Work and 4 weeks prior to project completion, schedule progress meetings bi-weekly.

2. Contractor, major Subcontractors involved in Work and Contract Administrator are to be in attendance.

3. Notify parties minimum 7 days prior to meetings.

4. Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.

5. Agenda to include the following:
    a. Review, approval of minutes of previous meeting.
    b. Review of Work progress since previous meeting.
    c. Field observations, problems, conflicts.
    d. Problems which impede construction schedule.
    e. Review of off-site fabrication delivery schedules.
    f. Corrective measures and procedures to regain projected schedule.
    g. Revision to construction schedule.
    h. Progress schedule, during succeeding work period.
    i. Review submittal schedules: expedite as required.
    j. Maintenance of quality standards.
    k. Review proposed changes for affect on construction schedule and on completion date.
    l. Other business.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 45 00 – Quality Control.
2. REFERENCES
   1. Refer to the Contract Documents.
3. ADMINISTRATIVE
   1. Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
   2. Do not proceed with Work affected by submittal until review is complete.
   3. Present shop drawings, product data, samples and mock-ups in SI Metric units.
   4. Where items or information is not produced in SI Metric units converted values are acceptable.
   5. Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
   6. Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
   7. Verify field measurements and that affected adjacent work are co-ordinated.
   8. Contractor's responsibility for errors and omissions in submission is not relieved by Consultant’s review of submittals.
   9. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.

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

4. SHOP DRAWINGS AND PRODUCT DATA

1. Refer to Contract Documents

2. 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.

3. Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.

4. Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

5. Allow 5 days for Consultant’s review of each submission.

6. Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Regional Representative prior to proceeding with Work.

7. Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Regional Representative in writing of revisions other than those requested.

8. Accompany submissions with transmittal letter, in duplicate, containing:
    a. Date.
    b. Project title and number.
    c. Contractor's name and address.
    d. Identification and quantity of each shop drawing, product data and sample.
    e. Other pertinent data.

9. Submissions include:
    a. Date and revision dates.

b. Project title and number.
c. Name and address of:
    i. Subcontractor.
    ii. Supplier.
    iii. Manufacturer.
d. Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
e. Details of appropriate portions of Work as applicable:
    i. Fabrication.
    ii. Layout, showing dimensions, including identified field dimensions, and clearances.
    iii. Setting or erection details.
    iv. Capacities.
    v. Performance characteristics.
    vi. Standards.
    vii. Operating weight.
    viii. Wiring diagrams.
    ix. Single line and schematic diagrams.
    x. Relationship to adjacent work.

10. After Consultants review, distribute copies.

11. Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

12. Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

13. Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.
    a. 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.
    b. Testing must have been within 3 years of date of contract award for Project.

14. Submit electronic copies of certificates for requirements requested in specification Sections and as requested by

Consultant.

15. 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.

16. Certificates must be dated after award of project contract. Certificate to be complete with project name.

    a. Submit electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Consultant.

    b. Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

    c. Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.

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

18. Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.

19. Delete information not applicable to project.

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

21. If upon review by Consultant, 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.

5. SAMPLES

1. Submit for review samples in triplicate as requested in respective specification Sections. Label samples with origin and intended use.
2. Deliver samples prepaid to Consultant.
3. Notify the Regional Representative 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 Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
6. Make changes in samples which Consultant 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.

6. MOCK-UPS

1. Erect mock-ups in accordance with 01 45 00 - Quality Control.

7. PHOTOGRAPHIC DOCUMENTATION

1. Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement and as directed by Consultant.
2. Project identification: name and number of project and date of exposure indicated.
3. Number of viewpoints: 4 locations.
4. Viewpoints and their location as determined by Consultant.
5. Frequency of photographic documentation: weekly as directed by the Consultant.
    a. Upon completion of: excavation, foundation, services before concealment, and as directed by Consultant.

PART 2 - PRODUCTS

1. APPROVING EQUIVALENTS DURING BID PERIOD

1. Bidders may base their Bid Price on products supplied by the base-specified manufacturer or any manufacturer listed as “acceptable” in the specifications without, prior approval.

2. Where a bidder proposes to use a product from a manufacturer **not listed** as base or acceptable (i.e. where product is listed as “or approved equal”), the request must be initiated following the process identified in the Instructions to Bidders Section, 2- ANY COMMUNICATIONS, and a written application must then be submitted by email to the Designated Sourcing Representative for review by the Region and Consultant **no later than five (5) business days prior to the Bid Closing Date**. Written applications must include full technical details demonstrating equivalency in space, power, design, performance and other relevant criteria.

3. An Addendum will be issued prior to tender closing to confirm the Consultant’s acceptance or rejection of the proposed equivalent product. Failure to submit adequate information in a timely manner and to the Consultant’s satisfaction may result in the rejection of the request due to insufficient information or time for evaluation.

4. The Region and Consultant retain full discretion to accept or reject any proposed equivalent product. If a proposed product is rejected, the Bidder must supply the base specified or acceptable manufacturer's product in its Bid.

5. Where a manufacturer is listed as “acceptable” in the specifications Sections, it does not imply automatic acceptance of all products from that manufacturer. The Contractor remains responsible for ensuring the selected product meets the specifications and that any impacts (e.g. larger dimensions or energy use) are accounted for in the Bid Price

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 33 00 – Submittal Procedures.

2. REFERENCES
   1. Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
   2. Health Canada/Workplace Hazardous Materials Information System (WHMIS)
      Material Safety Data Sheets (MSDS)/ Safety Data Sheets (SDS).
   3. Province of Ontario
      Occupational Health and Safety Act, R.S.O. [1990 Updated 2005].

3. ACTION AND INFORMATIONAL SUBMITTALS
   1. Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
   2. Submit site-specific Health and Safety Plan: Within 7 days after date of Notice of Award and prior to commencement of Work. Health and Safety Plan must include:
      a. Results of site specific safety hazard assessment.
      b. Results of safety and health risk or hazard analysis for site tasks and operation found in work plan
   3. Submit electronic copy of Contractor's authorized representative's work site health and safety inspection reports to the Regional Representative weekly.
   4. Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.
   5. Submit copies of incident and accident reports.
   6. Submit MSDS/ SDS - Material Safety Data Sheets/ Safety Data Sheets in accordance with Section 01 33 00 – Submittal Procedures.
   7. Consultant will review Contractor's site-specific Health and

		Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within 7 days after receipt of comments from Consultant.
		8. Consultant review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
		9. On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
4.	FILING OF NOTICE	1. File Notice of Project with Provincial authorities prior to beginning of Work.
5.	SAFETY ASSESSMENT	1. Perform site specific safety hazard assessment related to project.
6.	MEETINGS	1. Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.
7.	GENERAL REQUIREMENTS	1. Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
		2. Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
8.	RESPONSIBILITY	1. Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
		2. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

9. COMPLIANCE REQUIREMENTS	1. Comply with Ontario Health and Safety Act, R.S.O.
10. UNFORSEEN HAZARDS	1. When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.
11. HEALTH AND SAFETY CO-ORDINATOR	1. Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must: a. Have site-related working experience specific to activities associated with this project. b. Have working knowledge of occupational safety and health regulations. c. Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work. d. Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan. e. Be on site during execution of Work and report directly to and be under direction of site supervisor.
12. POSTING OF DOCUMENTS	1. Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Consultant.
13. CORRECTION OF NON-COMPLIANCE	1. Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by the Regional Representative. 2. Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified. 3. Consultant may stop Work if non-compliance of health and safety regulations is not corrected.
14. POWDER ACTUATED DEVICES	1. Use powder actuated devices only after receipt of written permission from Consultant.

15. WORK STOPPAGE

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

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. REFERENCES
   1. Owner (“the Region”)/Contractor Agreement.
2. INSPECTION
   1. Refer to the Region Agreement
   2. Consultant will order 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.
3. 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.
4. REJECTED WORK
   1. Refer to the Region Agreement
   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 Consultant 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 Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the Region will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined Consultant.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. REFERENCES
   1. Canadian General Standards Board (CGSB)
      a. CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
      b. CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
   2. Canadian Standards Association (CSA International)
      a. CSA-O121-M1978(R2003), Douglas Fir Plywood.

2. INSTALLATION AND REMOVAL
   1. Provide temporary controls in order to execute Work expeditiously.
   2. Remove from site all such work after use.

3. HOARDING
   1. Provide barriers at designated locations for erosion control.
   2. Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

4. GUARD RAILS AND BARRICADES
   1. Provide secure, rigid guard rails and barricades around deep excavations.
   2. Provide as indicated.

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

6. PUBLIC TRAFFIC FLOW
   1. Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public. Provide per road occupancy permits.

7. PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY
   1. Protect surrounding private and public property from damage during performance of Work.
   2. Be responsible for damage incurred.

8. PROTECTION OF FINISHES
   1. Provide protection for finished and partially finished construction finishes and equipment during performance of

Work.

2. Provide necessary screens, covers, and hoardings.

3. Confirm with the Consultant's locations and installation schedule 3 days prior to installation.

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

9. WASTE MANAGEMENT AND DISPOSAL

1. Separate waste materials for reuse and recycling in accordance with Contract requirements.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 33 00 – Submittal Procedures
   2. Section 02 41 13 – Selective Site Demolition

2. ACTION AND INFORMATIONAL SUBMITTALS
   1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
   2. Submit written request in advance of cutting or alteration which affects:
      a. Structural integrity of elements of project.
      b. Integrity of weather-exposed or moisture-resistant elements.
      c. Efficiency, maintenance, or safety of operational elements.
      d. Visual qualities of sight-exposed elements.
      e. Work of the Region or separate contractor.
   3. Include in request:
      a. Identification of project.
      b. Location and description of affected Work.
      c. Statement on necessity for cutting or alteration.
      d. Description of proposed Work, and products to be used.
      e. Alternatives to cutting and patching.
      f. Effect on Work of the Region or separate contractor.
      g. Written permission of affected separate contractor.
      h. Date and time work will be executed.

3. MATERIALS
   1. Required for original installation.
   2. Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

4. PREPARATION
   1. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
   2. After uncovering, inspect conditions affecting performance of Work.
   3. Beginning of cutting or patching means acceptance of existing conditions.

4. Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

5. Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

5. EXECUTION

1. Execute cutting, fitting, and patching including excavation and fill, to complete Work.

2. Fit several parts together, to integrate with other Work.

3. Uncover Work to install ill-timed Work.

4. Remove and replace defective and non-conforming Work.

5. Remove samples of installed Work for testing.

6. Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

7. Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

8. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

9. Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

10. Fit Work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

11. Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

12. Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

6. WASTE MANAGEMENT AND DISPOSAL

1. Separate waste materials for reuse and recycling in accordance with Section 02 41 13 – Selective Site Demolition.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. REFERENCES
   1. Owner (“the Region”) Agreement

2. PROJECT CLEANLINESS
   1. Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by the Region or other contractors.
   2. Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
   3. Clear snow and ice from access to site, bank/pile snow in designated areas only or remove from site.
   4. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
   5. Provide on-site containers for collection of waste materials and debris.
   6. Provide and use marked separate bins for recycling, as directed by Consultant.
   7. Dispose of waste materials and debris at designated landfills and authorized recycling facilities as appropriate.
   8. Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
   9. Store volatile waste in covered metal containers, and remove from premises at end of each working day.
   10. Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
   11. Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

3. FINAL CLEANING	1. Owner (“the Region”) Agreement 2. When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work. 3. Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy. 4. Prior to final review remove surplus products, tools, construction machinery and equipment. 5. Remove waste products and debris including that caused by the Region or other Contractors. 6. Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant. 7. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. 8. Remove stains, spots, marks and dirt from decorative work. 9. Inspect finishes, fitments and equipment and ensure specified workmanship and operation. 10. Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds. 11. Remove dirt and other disfiguration from exterior surfaces. 12. Sweep and wash clean paved areas. 13. Clean drainage systems.
4. WASTE MANAGEMENT AND DISPOSAL	1. Separate waste materials for reuse and recycling as indicated by Consultant.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 74 11 – Cleaning
2. REFERENCES
   1. Owner Agreement
3. ADMINISTRATIVE REQUIREMENTS
   1. Acceptance of Work Procedures:
      a. Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
         i. Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
         ii. Request Consultant inspection.
      b. Consultant Inspection:
         i. Consultant and Contractor to inspect Work and identify defects and deficiencies.
         ii. Contractor to correct Work as directed.
      c. Completion Tasks: submit written certificates in English that tasks have been performed as follows:
         i. Work: completed and inspected for compliance with Contract Documents.
         ii. Defects: corrected and deficiencies completed.
         iii. Equipment and systems: tested, adjusted and balanced and fully operational.
         iv. Certificates required by Utility companies: submitted.
         v. Operation of systems: demonstrated to Owner's personnel.
4. FINAL CLEANING
   1. Clean in accordance with Section 01 74 11 - Cleaning.
      a. Remove surplus materials, excess materials, rubbish, tools and equipment.
   2. Waste Management: separate waste materials for reuse and recycling as indicated by the Consultant.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 31 19 - Project Meetings
   2. Section 01 33 00 - Submittal Procedures
   3. Section 01 45 00 - Quality Control

2. REFERENCES
   1. Canadian Environmental Protection Act (CEPA)
      a. SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

3. ADMINISTRATIVE REQUIREMENTS
   1. Pre-warranty Meeting:
      a. Convene meeting one week prior to Contract completion with contractor's representative and Consultant in accordance with Section 01 31 19 - Project Meetings to:
         i. Verify Project requirements.
         ii. Review manufacturer's installation instructions and warranty requirements.
      b. Consultant to establish communication procedures for:
         i. Notifying construction warranty defects.
         ii. Determine priorities for type of defects.
         iii. Determine reasonable response time.
      c. Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
      d. Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

4. ACTION AND INFORMATIONAL SUBMITTALS
   1. Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
   2. Two weeks prior to Substantial Performance of the Work, submit to the Consultant, two final hard copies and one digital version of operating and maintenance manuals in English.
   3. Provide maintenance materials and special tools of

same quality and manufacture as products provided in work.

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

5. FORMAT

1. Organize data as instructional manual.

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

3. When multiple binders are used correlate data into related consistent groupings.
    a. Identify contents of each binder on spine.

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

5. Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.

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

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

8. Drawings: provide with reinforced punched binder tab.
    a. Bind in with text; fold larger drawings to size of text pages.

6. CONTENTS - PROJECT RECORD DOCUMENTS

1. Table of Contents for Each Volume: provide title of project;

    a. Date of submission; names.
    b. Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
    c. Schedule of products and systems, indexed to content of volume.

2. For each product or system:
    a. List names, addresses and telephone

numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

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

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

5. Typewritten Text: as required to supplement product data.
    a. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

7. AS -BUILT DOCUMENTS AND SAMPLES

1. Maintain, in addition to requirements in General Conditions, at site for Consultant one record copy of:
    a. Contract Drawings.
    b. Specifications.
    c. Addenda.
    d. Change Orders and other modifications to Contract.
    e. Reviewed shop drawings, product data, and samples.
    f. Field test records.
    g. Inspection certificates.
    h. Manufacturer's certificates.

2. Store record documents and samples in field office apart from documents used for construction.
    a. Provide files, racks, and secure storage.

3. Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
    a. Label each document "PROJECT RECORD" in neat, large, printed letters.

4. Maintain record documents in clean, dry and legible condition.
    a. Do not use record documents for construction

purposes.

5. Keep record documents and samples available for inspection by Consultant.

8. RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

1. Record information on set of black line opaque drawings, provided by Consultant.

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

3. Record information concurrently with construction progress.
    a. Do not conceal Work until required information is recorded.

4. Contract Drawings and shop drawings: mark each item to record actual construction, including:
    a. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
    b. Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
    c. Field changes of dimension and detail.
    d. Changes made by change orders.
    e. Details not on original Contract Drawings.
    f. References to related shop drawings and modifications.

5. Specifications: mark each item to record actual construction, including:
    a. Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
    b. Changes made by Addenda and change orders.

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

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

9. MATERIALS AND FINISHES

1. Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
    a. Provide information for re-ordering custom manufactured products.

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

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

4. Additional requirements: as specified in individual specifications Sections.

10. MAINTENANCE MATERIALS

1. Spare Parts:
    a. Provide spare parts, in quantities specified in individual specification Sections.
    b. Provide items of same manufacture and quality as items in Work.
    c. Deliver to site location as directed; place and store.
    d. Receive and catalogue items.
        i. Submit inventory listing to Consultant.
        ii. Include approved listings in Maintenance Manual.
    e. Obtain receipt for delivered products and submit prior to final payment.

2. Extra Stock Materials:
    a. Provide maintenance and extra materials, in quantities specified in individual specification Sections.
    b. Provide items of same manufacture and

quality as items in Work.
   c. Deliver to site location as directed; place and store.
   d. Receive and catalogue items.
      i. Submit inventory listing to Consultant.
      ii. Include approved listings in Maintenance Manual.
   e. Obtain receipt for delivered products and submit prior to final payment.

3. Special Tools:
   a. Provide special tools, in quantities specified in individual specification Section.
   b. Provide items with tags identifying their associated function and equipment.
   c. Deliver to site location as directed; place and store.
   d. Receive and catalogue items.
      i. Submit inventory listing to Consultant.
      ii. Include approved listings in Maintenance Manual.

11. DELIVERY, STORAGE AND HANDLING

1. Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration. Contractor to store materials onsite only as directed by Consultant.

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

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

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

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

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 31 00 99 - Earthworks for Minor Works.

2. REFERENCES
   1. Canadian Council of Ministers of the Environment (CCME).
   2. Department of Justice Canada (Jus).
      a. Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
      b. Canadian Environmental Protection Act, 1999 (CEPA), c. 33.
   3. Health Canada/Workplace Hazardous Materials Information System (WHMIS).
      a. Safety Data Sheets (SDS).
   4. Transport Canada (TC).
      a. Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

3. DEFINITIONS
   1. Demolition: rapid destruction of building following removal of hazardous materials.
   2. Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well-being or environment if handled improperly.

4. ACTION AND INFORMATIONAL SUBMITTALS
   1. Product Data: submit WHMIS SDS - Safety Data Sheets.
   2. Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

5. QUALITY ASSURANCE
   1. Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial/Territorial regulations.

2. Health and Safety.

    a. Do construction occupational health and safety in accordance with Contract requirements.

6. DELIVERY, STORAGE AND HANDLING

3. Storage and Protection.
    a. Protect in accordance with Section 31 00 99 - Earthworks for Minor Works.
    b. Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of the Consultant and at no cost to the Region.
    c. Remove and store materials to be salvaged, in manner to prevent damage.
    d. Store and protect in accordance with requirements for maximum preservation of material.
    e. Handle salvaged materials as new materials.

4. Waste Management and Disposal.

    a. Separate waste materials for reuse and recycling.
    b. Divert excess materials from landfill to site approved by the Consultant.
    c. Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.
    d. Remove materials that cannot be salvaged for reuse or recycling and dispose of in accordance with applicable codes at licensed facilities.

7. SITE CONDITIONS

5. Site Environmental Requirements.
    a. Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
    b. Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
        i. Ensure proper disposal procedures are maintained throughout the project.
    c. Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

d. Control runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
e. Protect trees, plants and foliage on site and adjacent properties where indicated.

2. Existing Conditions.

a. Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site, prior to start of demolition Work, and dispose of in safe manner in accordance with TDGA and other applicable regulatory requirements.

PART 2 - PRODUCTS

1. EQUIPMENT

1. Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

PART 3 - EXECUTION

1. PREPARATION

1. Locate and protect utilities. Preserve active utilities traversing site in operating condition.

2. Notify and obtain approval of utility companies before starting demolition.

3. Disconnect and Cap Designated Mechanical Services.
   a. Sewer and Water Lines: in accordance with authority having jurisdiction and securely plug to form watertight seal.

2. REMOVAL OF HAZARDOUS WASTES

1. Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3. REMOVAL

1. Remove items as indicated.

OPERATIONS

2. Do not disturb items designated to remain in place.

3. Removal of Pavements, Curbs and Gutters:
    a. Square up adjacent surfaces to remain in place by saw cutting or other method approved by the Consultant.
    b. Protect adjacent joints and load transfer devices.
    c. Protect underlying and adjacent granular materials.

4. Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,

5. Remove designated trees during demolition.
    a. Obtain written approval of the Consultant prior to removal of trees not designated.

6. Disposed and/or reuse trees designated for removal at the contractor's digression, unless otherwise identified by the Consultant.
    a. Grind, chip, or shred other vegetation for mulching and composting.

7. Stockpile topsoil for final grading and landscaping.
    a. Provide erosion control and seeding if not immediately used.

8. Disposal of Material.
    a. Dispose of materials not designated for salvage or reuse on site at authorized facilities.

9. Backfill.

    a. Backfill in areas as indicated and in accordance with Section 31 00 99 - Earthworks for Minor Works.

4. STOCKPILING

1. Label stockpiles, indicating material type and quantity.

2. Designate appropriate security resources/measures to prevent vandalism, damage and theft.

3. Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.

4. Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

5. REMOVAL FROM SITE

1. Remove stockpiled material as directed by the Consultant, when it interferes with operations of project.

2. Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

3. Transport material designated for alternate disposal using approved receiving organizations and in accordance with applicable regulations.

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

6. RESTORATION

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

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

7. CLEANING

1. Remove debris, trim surfaces and leave work site clean, upon completion of Work in accordance with Contract requirements

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

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 01 35 29_06 - Health and Safety.
   2. Section 03 30 00 - Cast-In-Place Concrete.

2. REFERENCES
   1. Canadian Standards Association (CSA International)
      a. CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
      b. CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
      c. CSA O121-M1978(R2003), Douglas Fir Plywood.
      d. CSA O151-04, Canadian Softwood Plywood.
      e. CSA O153-M1980(R2003), Poplar Plywood.
      f. CAN/CSA-O325.0-92(R2003), Construction Sheathing.
      g. CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
      h. CSA S269.1-1975(R2003), Falsework for Construction Purposes.
      i. CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada
   2. Underwriters' Laboratories of Canada (ULC)
      a. CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

3. ACTION AND INFORMATIONAL SUBMITTALS
   1. Submittals in accordance with Section 01 33 00 - Submittal Procedures.
   2. Submit shop drawings for formwork and falsework.
      a. Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
   3. Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29_06 - Health and Safety.
   4. Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.

5. Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

4. DELIVERY, STORAGE AND HANDLING

1. Waste Management and Disposal:
    a. Place materials defined as hazardous or toxic in designated containers.
    b. Divert wood materials from landfill to a recycling or reuse or composting facility as approved by Consultant
    c. Divert plastic materials from landfill to a recycling facility as approved by Consultant.
    d. Divert unused form release material from landfill to an official hazardous material collections site as approved by the Consultant.

PART 2 - PRODUCTS

1. MATERIALS

1. Formwork materials:
    a. For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.
    b. For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
    c. Rigid insulation board: to CAN/ULC-S701.

2. Form ties:
    a. 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 diameter in concrete surface.
    b. For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

3. Form liner:
    a. Plywood: Canadian Softwood Plywood to CSA O151 Poplar to CSA O153, square edge, 25 mm thick.

4. Form release agent: non-toxic, biodegradable, low VOC.

5. Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

6. Falsework materials: to CSA-S269.1.

PART 3 - EXECUTION

1. FABRICATION AND ERECTION

1. Fabricate and erect falsework in accordance with CSA S269.1.

2. Refer to architectural drawings for concrete members requiring architectural exposed finishes.

3. Do not place shores and mud sills on frozen ground.

4. Provide site drainage to prevent washout of soil supporting mud sills and shores.

5. 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 CSA-A23.1/A23.2.

6. Align form joints and make watertight.
    a. Keep form joints to minimum.

7. Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

8. Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

9. Construct forms for architectural concrete, and place ties as indicated.
    a. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

10. Build in anchors, sleeves, and other inserts required to accommodate Work specified in other Sections.
    a. Ensure that anchors and inserts will not protrude

beyond surfaces designated to receive applied finishes, including painting.

11. Line forms for following surfaces:
    a. Outer face of outside and vertical edge of bridge sidewalk slab.
    b. Soffit of girders and underside of bridge decks if exposed.
    c. Secure lining taut to formwork to prevent folds.
    d. Pull down lining over edges of formwork panels.
    e. Ensure lining is new and not reused material.
    f. Ensure lining is dry and free of oil when concrete is poured.
    g. Application of form release agents on formwork surface is prohibited where drainage lining is used.
    h. If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
    i. Cost of textile lining is included in price of concrete for corresponding portion of Work.

12. Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

2. REMOVAL AND RESHORING

1. Leave formwork in place for following minimum periods of time after placing concrete.
    a. 7 days for footings and abutments.

2. Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

3. Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

4. Space reshoring in each principal direction at not more than 3000 mm apart.

5. Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. PRICE AND PAYMENT PROCEDURES

1. Measurement and Payment:
    a. Cast-in-place concrete will not be measured but will be paid for as fixed price item.

2. REFERENCES

1. Abbreviations and Acronyms:
    a. Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
        i. Type GU or GUb - General use cement.
    b. Fly ash:
        i. Type F - with CaO content less than 8%.

2. Reference Standards:
    a. ASTM International
        i. ASTM C 260-06, Standard Specification for Air-Entraining Admixtures for Concrete.
        ii. ASTM C 309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
        iii. ASTM C 494/C 494M-08a, Standard Specification for Chemical Admixtures for Concrete.
        iv. ASTM C 1017/C 1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
        v. ASTM D 412-06ae1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
        vi. ASTM D 624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
        vii. ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
        viii. ASTM D 1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
    b. Canadian General Standards Board (CGSB)
        i. CAN/CGSB-37.2-M88, Emulsified Asphalt,

Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

ii. CAN/CGSB-51.34-[M86(R1988)], Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

c. CSA International

i. CSA A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

ii. CSA A283-06, Qualification Code for Concrete Testing Laboratories.

iii. CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

3. ADMINISTRATIVE REQUIREMENTS

1. Pre-installation Meetings: convene pre-installation meeting three days prior to beginning concrete works.
   a. Ensure key personnel, Contract Administrator, testing laboratories attend.
      i. Verify project requirements.

4. ACTION AND INFORMATIONAL SUBMITTALS

2. Provide submittals in accordance with Contract requirements.

3. Provide testing and inspection results and reports for review by Contract Administrator and do not proceed without written approval when deviations from mix design or parameters are found.

4. Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

5. Concrete hauling time: provide for review by Contract Administrator deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

6. Provide digital copies of WHMIS SDS.

5. QUALITY ASSURANCE

1. Quality Assurance: in accordance with Contract requirements.

2. Provide Contract Administrator, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
    a. Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

3. Quality Control Plan: provide written report to Contract Administrator verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

6. DELIVERY, STORAGE AND HANDLING

1. Delivery and Acceptance Requirements:

    a. Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
        i. Do not modify maximum time limit without receipt of prior written agreement from Contract Administrator and concrete producer as described in CSA A23.1/A23.2.
        ii. Deviations to be submitted for review by Contract Administrator.

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

2. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials.

PART 2 - PRODUCTS

1. DESIGN CRITERIA

1. Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2. PERFORMANCE CRITERIA

1. Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Contract Administrator and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

3. MATERIALS

1. Cement: to CSA A3001, Type GU

2. Blended hydraulic cement: Type GUb to CSA A3001.

3. Water: to CSA A23.1.

4. Aggregates: to CSA A23.1/A23.2.

5. Admixtures:
    a. Air entraining admixture: to ASTM C 260.
    b. Chemical admixture: to ASTM C 494. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather placing.

6. Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
    a. Compressive strength: 25 MPa at 28 days.

7. Non-premixed dry pack grout: composition of non-metallic aggregate cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 25 MPa at 28days.

8. Post-Tensioning Ducts: to CSA A23.1/A23.2.

9. Curing compound: to CSA A23.1/A23.2 whit and ASTM C 309, Type 1-chlorinated rubber.

10. Pre-molded joint fillers:
    a. Bituminous impregnated fiber board: to ASTM D 1751.
    b. Sponge rubber: to ASTM D 1752, Type I, flexible grade.
    c. Standard cork: to ASTM D 1752, Type II.

11. Weep hole tubes: plastic.

12. Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.

4. MIXES

1. Performance Method for specifying concrete: to meet Contract Administrator performance criteria to CSA A23.1/A23.2.
    a. Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
    b. Provide concrete mix to meet following plastic state

requirements:
   i. Uniformity: 90%.
   ii. Workability: free of surface blemishes and segregation.

c. Provide concrete mix to meet following hard state requirements:
   i. Durability and class of exposure: C-1, C-2, A-2, C-3.
   ii. Compressive strength at 28-day age: 32 Mpa minimum.
   iii. Aggregate size 19 mm maximum.

d. Provide quality management plan to ensure verification of concrete quality to specified performance.
e. Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

PART 3 - EXECUTION

1. PREPARATION

1. Obtain Consultant’s written approval before placing concrete.
   a. Provide 24 hours minimum notice prior to placing of concrete.

2. During concreting operations:
   a. Development of cold joints not allowed.
   b. Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

3. Pumping of concrete is permitted only after approval of equipment and mix.

4. Ensure reinforcement and inserts are not disturbed during concrete placement.

5. Prior to placing of concrete, obtain Contract Administrator’s approval of proposed method for protection of concrete during placing and curing.

6. Protect previous Work from staining.

7. Clean and remove stains prior to application for concrete

finishes.

8. Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

9. Do not place load upon new concrete until authorized by Contract Administrator.

2. INSTALLATION/ APPLICATION

1. Do cast-in-place concrete work to CSA A23.1/A23.2.

2. Sleeves and inserts:
    a. Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Contract Administrator.
    b. Where approved by Contract Administrator, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
    c. Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Contract Administrator.
    d. Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Contract Administrator before placing of concrete.
    e. Confirm locations and sizes of sleeves and openings shown on drawings.
    f. Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

3. Anchor bolts:
    a. Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
    b. Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Contract Administrator.
        i. Formed holes: 100 mm minimum diameter.
        ii. Drilled holes: to manufacturers' recommendations.
    c. Protect anchor bolt holes from water accumulations, snow and ice build-ups.
    d. Set bolts and fill holes with epoxy grout.
    e. Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient

temperature at time of erection.

4. Drainage holes and weep holes:
    a. Form weep holes and drainage holes as indicated by the Consultant. If wood forms are used, remove them after concrete has set.
    b. Install weep hole tubes and drains as indicated.

5. Dovetail anchor slots:
    a. Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
    b. Install continuous vertical anchor slots at 800 mm on centre where concrete walls are masonry faced.

6. Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

7. Finishing and curing:

    a. Finish concrete to CSA A23.1/A23.2.
    b. Use procedures as reviewed Contract Administrator or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
    c. Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: sponge finish. Provide written declaration that compounds used are compatible.
    d. Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.

8. Waterstops:
    a. Install waterstops to provide continuous water seal.
    b. Do not distort or pierce waterstop in way as to hamper performance.
    c. Do not displace reinforcement when installing waterstops.
    d. Use equipment to manufacturer's requirements to field splice waterstops.
    e. Tie waterstops rigidly in place.
    f. Use only straight heat sealed butt joints in field.
    g. Use factory welded corners and intersections unless otherwise approved by Contract Administrator.

9. Joint fillers:
    a. Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Contract Administrator.
    b. When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
    c. Locate and form expansion and control joints as indicated.
    d. Install joint filler.
    e. Use [12] mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

3. SURFACE TOLERANCE

1. Concrete tolerance to CSA A23.

4. FIELD QUALITY CONTROL

1. Site tests: conduct tests as follows and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
    a. Concrete pours.
    b. Slump.
    c. Air content.
    d. Compressive strength at 7 and 28 days.
    e. Air and concrete temperature.

2. Inspection and testing of concrete and concrete materials will be carried out by testing laboratory approved by Contract Administrator for review to CSA A23.1/A23.2.
    a. Ensure testing laboratory is certified to CSA A283.

3. Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Contract Administrator.

4. The Region will pay for costs of tests as specified in Allowances 01 21 00

5. Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

5. CLEANING

1. Cleaning in accordance with Contract requirements.

1. Waste Management: separate waste materials for reuse and recycling in accordance with Contract requirements.

    a. Divert unused concrete materials from landfill to local facility after receipt of written approval from the Consultant.
    b. Provide appropriate area on job site where concrete trucks are to be safely washed.
    c. Divert unused admixtures and additive materials (pigments, fibers) from landfill to official hazardous material collections site as approved by the Consultant.
    d. Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
    e. Prevent admixtures and additive materials from entering drinking water supplies or streams.
    f. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
    g. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. REFERENCES
   1. Division 00 and Division 01 apply to and are a part of this Section.

2. APPLICATION
   1. This Section specifies requirements that are common to Electrical Divisions work Sections and it is a supplement to each Section and is to be read accordingly. Where requirements of this Section contradict requirements of Divisions 00 or 01, conditions of Division 00 or 01 to take precedence, as confirmed with Owner and reviewed with Consultant prior to Bid submission.
   2. Advise product vendors of requirements of this Section.

3. DEFINITIONS
   1. "concealed" - means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls and partitions.
   2. "exposed" - means work normally visible, including work in equipment rooms, service tunnels, and similar spaces.
   3. "finished" - means when in description of any area or part of an area or a product which receives a finish such as paint, or in case of a product may be factory finished.
   4. "provision" or "provide" (and tenses of "provide") - means supply and install complete.
   5. "install" (and tenses of "install") - means secure in position, connect complete, test, adjust, verify and certify.
   6. "supply" - means to procure, arrange for delivery to site, inspect, accept delivery and administer supply of products; distribute to areas; and include manufacturer's supply of any special cables, standard on site testing, initial start-up, programming, basic commissioning, warranties and manufacturers' assistance to Contractor.
   7. "delete" or "remove" (and tenses of "delete" or "remove") - means to disconnect, make safe, and remove obsolete materials including back boxes and exposed piping and raceways; and patch and repair/finish surfaces to match adjoining similar construction; include for associated re-programming of

systems and/or change of documentation identifications to suit deletions, and properly dispose of deleted products off site unless otherwise instructed by Owner and reviewed with Consultant.

8. "barrier-free" - means when applied to a building and its facilities, that building and its facilities can be approached, entered and used by persons with physical or sensory disabilities in accordance with requirements of local governing building code.
9. "governing authority" and/or "authority having jurisdiction" and/or "regulatory authority" and/or "Municipal authority" - means government departments, agencies, standards, rules and regulations that apply to and govern work and to which work must adhere.
10. "OSHA" and "OHSA" - stands for Occupational Safety and Health Administration and Occupational Health and Safety Act, and wherever either one is used, they are to be read to mean local governing occupational health and safety regulations that apply to and govern work and to which work must adhere, regardless if Project falls within either authority's jurisdiction.
11. "Electrical Divisions" - typically, refers to Divisions 26, 27, 28 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Electrical Contractor, unless otherwise noted.
12. "Consultant" - means person, firm or corporation identified as such in Agreement or Documents and is licensed to practice in Place of the Work and has been appointed by Owner to act for Owner in a professional capacity in relation to the Work.
13. Wherever words "indicated", "shown", "noted", "listed", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean product referred to is "indicated", "shown", "listed", or "noted" on Contract Documents.
14. Wherever words "reviewed", "satisfactory", "as directed", "submit", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean that work or product referred to is "reviewed by", "to the satisfaction of", "submitted to", etc., Consultant.

4. DOCUMENTS

1. Documents for bidding include but are not limited to issued Drawings, Specifications and Addenda.
2. Specification is typically generally arranged in coordination with guidelines of Construction Specifications Institute/Canadian Specifications Canada (CSI/CSC) 50 Division MasterFormat.
3. Drawings and Specifications are portions of Contract Documents and identify labour, products and services necessary for performance of work and form a basis for determining pricing. They are intended to be cooperative. Perform work that is shown, specified, or reasonably implied on drawings but not mentioned in Specification, or vice-versa, as though fully covered by both.
4. Review Drawings and Specification in conjunction with documents of other Divisions and, where applicable, Code Consultant's report.
5. Unless otherwise specifically noted in Specifications and/or on Drawings, Sections of Electrical Divisions are not intended to delegate functions nor to delegate work and supply of materials to any specific trade, but rather to generally designate a basic unit of work, and Sections are to be read as a whole.
6. Drawings are performance drawings, diagrammatic, and show approximate locations of equipment and materials. Any information regarding accurate measurement of building is to be taken on site. Do not scale Drawings, and do not use Drawings for prefabrication work.
7. Drawings are intended to convey scope of work and do not show architectural and structural details. Provide fittings, offsets, transformations and similar items required as a result of obstructions and other architectural and/or structural details but not shown on Drawings.
8. Locations of equipment and materials shown may be altered, when reviewed by Consultant, to meet requirements of equipment and/or materials, other equipment or systems being installed, and of building, all at no additional cost to Contract.
9. Specification does not generally indicate specific number of items or amounts of material required. Specification is intended to provide product data and installation requirements. Refer to schedules,

Drawings (layouts, riser diagrams, schematics, details) and Specification to provide correct quantities. Singular may be read as plural and vice versa.

10. Drawings and Specifications are prepared solely for use by party with whom Consultant has entered into a contract and there are no representations of any kind made by Consultant to any other party.
11. In case of discrepancies or conflicts between Drawings and Specifications, Documents will govern in order specified in "General Conditions", however, when scale and date of Drawings are same, or when discrepancy exists within Documents, include most costly arrangement.

5. METRIC AND IMPERIAL MEASUREMENTS

1. Generally, both metric and imperial units of measurement are given in Sections of Specification governed by this Section. Measurement conversions may be generally "soft" and rounded off. Exact measurements to be confirmed based on application. Where measurements are related to installation and onsite applications, confirm issued document measurements with applicable local code requirements, and/or as applicable, make accurate measurements onsite. Where significant discrepancies are found, immediately notify Consultant for direction.

6. EXAMINATION OF BID DOCUMENTS AND SITE

1. Carefully examine Documents and visit site to determine and review existing site conditions that will or may affect work and include for such conditions in Bid Price.
2. Report to Consultant, prior to Bid Submittal, any existing site condition that will or may affect performance of work as per Documents. Failure to do so will not be grounds for additional costs.
3. Upon finding discrepancies in, or omissions from Documents, or having doubt as to their meaning or intent, immediately notify Consultant, in writing.

7. WORK STANDARDS

1. Where any code, regulation, bylaw, standard, contract form, manual, printed instruction, and installation and application instruction is quoted it means, unless otherwise specifically noted, latest published edition at time of submission of Bids adopted by and enforced by local governing authorities having jurisdiction. Include

for compliance with revisions, bulletins, supplementary standards or amendments issued by local governing authorities.

2. Where regulatory codes, standards and regulations are at variance with Drawings and Specification, more stringent requirement will apply unless otherwise directed by Owner and reviewed with Consultant.
3. Supplementary mandatory Specifications and requirements to be used in conjunction with project include but are not limited to following:
    a. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., (ASHRAE);
    b. American National Standards Institute (ANSI);
    c. ANSI/ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings;
    d. Building Industry Consulting Services, International (BICSI);
    e. Canadian Standards Association (CSA);
    f. CSA Z432, "Safeguarding of Machinery";
    g. CSA Z462, "Workplace Electrical Safety";
    h. Electrical and Electronic Manufacturers Association of Canada (EEMAC);
    i. Electrical Safety Authority (ESA);
    j. Electronic Industries Association (EIA);
    k. Illuminating Engineering Society (IES);
    l. Institute of Electrical and Electronic Engineers (IEEE);
    m. Intertek's Electrical Testing Labs (ETL);
    n. National Building Code of Canada (NBC);
    o. National Electrical Manufacturers Association (NEMA);
    p. Occupational Health and Safety Act (OHSA);
    q. Occupational Health and Safety Act - Ontario Regulation 632, "Confined Spaces";
    r. Ontario Building Code (OBC);
    s. Ontario Electrical Safety Code (OESC);
    t. Ontario Provincial Standard Specification (OPSS) 603;
    u. Technical Standards and Safety Authority (TSSA);
    v. Underwriters' Laboratories of Canada (ULC);
    w. Material Safety Data Sheets by product manufacturers;

x. local utility inspection permits;
y. codes, standards, and regulations of local governing authorities having jurisdiction;
z. additional codes and standards listed in Trade Sections;
aa. Owner's standards.

4. Provide applicable requirements for barrier free access in accordance with latest edition of local governing building code.
5. Where any governing Code, Regulation, or Standard requires preparation and submission of special details or drawings for review they are to be prepared and submitted to appropriate authorities. Be responsible for costs associated with these submittals.
6. Unless otherwise specified install, equipment in accordance with equipment manufacturer's recommendations and instructions, and requirements of governing Codes, Standards, and Regulations. Governing Codes, Standards, and Regulations take precedence over manufacturer's instructions. Notify Consultant in writing of conflicts between Contract Documents and manufacturer's instructions.
7. Work is to be performed by journeyperson who perform only work that their certificates permit, or by apprentices under direct on-site supervision of experienced journeyperson. Journeyperson to apprentice ratio is not to exceed ratio in accordance with requirements of Bill 47, Making Ontario Open for Business Act - 2018.
8. Journeyperson are to have copy of valid trade certificates available at site for review by Consultant at any time.
9. Maintain experienced and qualified superintendent on-site at times when work is being performed.
10. Coordinate work inspection reviews and approvals with governing inspection department to ensure construction schedule is not delayed. Be responsible for prompt notification of deficiencies to Consultant and submission of reports and certificates to Consultant.
11. Properly protect equipment and materials on site from damage and defacement due to elements and work of trades, to satisfaction of Owner and reviewed with Consultant. Equipment and materials are to be in new condition upon Substantial Performance of the Work.

8. PERMITS, CERTIFICATES, APPROVALS AND FEES

1. Contact and confirm with local authorities having jurisdiction including utility providers, requirements for approvals from such authorities.
2. Submit required applications, shop drawings, and any other information requested by local authority.
3. Provide ample notification to authorities having jurisdiction to perform required on-site inspection of work, allowing sufficient lead time to correct deficiencies in a manner that will not impede schedule of completion of Work. If any defect, deficiency or non-compliancy is found in work by inspection, be responsible for costs of such inspection, including any related expenses, making good and return to site, until work is passed by governing authorities.
4. Obtain, pay for and submit to Consultant, approval/inspection certificates issued by governing authorities to confirm that Work as installed is in accordance with rules and regulations of local governing authorities and are acceptable by such authorities.
5. Include in each copy of operating and maintenance instruction manuals, copies of approvals and inspection certificates issued by regulatory authorities.

9. REQUIREMENTS FOR CONTRACTOR RETAINED ENGINEERS

1. Professional engineers retained to perform consulting services with regard to Project work are to be legally qualified to practice professional engineering in the Place of the Work, and are to carry and pay for errors and omissions professional liability insurance in compliance with requirements of governing authorities in Place of the Work.
2. Retained engineer's professional liability insurance is to protect Contractor's consultants and their respective servants, agents, and employees against any loss or damage resulting from professional services rendered by aforementioned consultants and their respective servants, agents, and employees in regard to the Work of this Contract.

3. Unless otherwise specified in Division 00 and 01, liability insurance requirements are as follows:
   a. coverage is to be a minimum of $1,000,000.00 CDN inclusive of any one occurrence;

b. insurance policy is not to be cancelled or changed in any way without insurer giving Owner minimum thirty days written notice;
c. liability insurance is to be obtained from an insurer registered and licensed to underwrite such insurance in the Place of the Work;
d. retained consultants are to ascertain that sub-consultants employed by them carry insurance in form and limits specified above;
e. evidence of required liability insurance in such form as may be required is to be issued to Owner, Owner's Consultant, and Municipal Authorities as required prior to commencement of aforementioned consultant's services.

10. WORKPLACE SAFETY

1. Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials. Submit WHMIS SDS (Safety Data Sheets) for products where required and maintain one copy at site in a visible and accessible location available to personnel.
2. Comply with requirements of Occupational Health and Safety Act and other regulations pertaining to health and safety, including worker's compensation/ insurance board and fall protection regulations. When working in confined spaces, comply with requirements of Occupational Health and Safety Act - Ontario Regulation 632, "Confined Spaces" and any other applicable Ministry of Labour requirements.
3. If at any time during course of existing work, hazardous materials other than those identified in Documents and pertaining to Project Scope of Work, are encountered or suspected that were not identified as being present and which specific instructions in handling of such materials were not given, cease work in area in question and immediately notify Consultant. Comply with local governing regulations with regards to working in areas suspected of containing hazardous materials. Do not resume work in affected area without approval from Owner and review with Consultant.

11. PLANNING AND LAYOUT OF WORK

1. Plan, coordinate, and establish exact locations and routing of services with affected trades prior to installation such that services clear each other as well as other obstructions. Generally, as confirmed prior to start of Work with each trade and with Owner and reviewed with Consultant, to suit specific project requirements, order of right of way for services to be as follows:
    a. piping requiring uniform pitch;
    b. piping 100 mm (4") dia. and larger;
    c. large ducts (main runs);
    d. conduit 100 mm (4") dia. and larger;
    e. piping less than 100 mm (4") dia.;
    f. smaller branch ductwork;
    g. conduit less than 100 mm (4") dia.
2. Do not use Contract Drawing measurements for prefabrication and layout of raceways, conduits, ducts, bus ducts, luminaires, and other such work. Locations and routing are to be generally in accordance with Contract Drawings, however, prepare layout drawings for such work. Use established bench marks for both horizontal and vertical measurements. Confirm inverts, coordinate with and make allowances for work of other trades. Accurately layout work and be entirely responsible for work installed in accordance with layout drawings. Where any invert, grade, or size is at variance with Contract Drawings, notify Consultant prior to proceeding with work.
3. Prepare plan and interference drawings (at a minimum drawing scale of 1:50 or ¼"=1' 0") of work for coordination with each trade contractor. Obtain from Consultant, engineering drawings for this use. Contractors' interference drawings are to be distributed among other Trade Contractors. Submit drawings to Consultant for review. Failure of General Contractor to prepare and coordinate overall interface drawings of trades does not relieve respective Division Contractor of responsibility to ensure that work is properly planned and coordinated.
4. Carry out alterations in arrangement of work that has been installed without proper coordination, study, and review, even if in accordance with Contract Documents, in order to conceal work behind finishes, or to allow installation of other work, without additional

cost. In addition, make necessary alterations in other work required by such alterations, without additional cost.

5. Locate control products, products requiring maintenance, junction boxes, and similar products for easy access for servicing and/or removal. Relocate products which do not meet this location requirement to accessible location, at no additional cost.
6. Be responsible for making necessary changes, at no additional cost, to accommodate structural and building conditions that were missed due to lack of coordination.
7. Base installation layout, design, terminations, and supply of accessories, on Contract Documents with specific coordination with reviewed shop drawings.

12. COORDINATION OF WORK

1. Review Contract Documents and coordinate work with work of each trade. Coordination requirements are to include, but not be limited to following:
   a. requirements for openings, sleeves, inserts and other hardware necessary for installation of work;
   b. concrete work such as housekeeping pads, bases, etc., required for work, and including required dimensions, operating weight of equipment, location, etc.;
   c. depth and routing of excavation required for work, and requirements for bedding and backfill;
   d. wiring work required for equipment and systems, including termination points, wiring type and size, and any other requirements.
2. Ensure materials and equipment are delivered to site at proper time and in such assemblies and sizes.
3. Wherever possible, coordinate equipment deliveries with manufacturers and/or suppliers so equipment is delivered to site when it is required.
4. Ensure proper access and service clearances are maintained around equipment, and, where applicable, access space for future equipment removal or replacement is not impeded. Comply with code requirements with regards to access space provision around equipment. In coordination with Owner and review with Consultant, relocate equipment which does not meet this requirement.

5. Where work is to be integrated or is to be installed in close proximity with work of other trades, coordinate work prior to and during installation.

13. COMPONENT FINAL LOCATIONS

1. Owner and Consultant reserve right to relocate electrical components later, but prior to installation, without additional cost to Owner, if relocation per components do not exceed 3 m (10') from original location. No credits will be anticipated where relocation per components of up to and including 3 m (10') reduces materials, products and labour. Should relocations exceed 3 m (10') from original location, adjust Contract Price for that portion beyond 3 m (10') in accordance with provisions for changes in Contract Documents.

14. SYSTEMS COORDINATION

1. Be responsible for and perform specific coordination of various low voltage systems supplied by Electrical Divisions and also with systems supplied by other Divisions of Work. Include for but not be limited to provision of following, as applicable:
   a. coordinate with General Contractor and other Subcontractors, various systems of trades which in any way are interfaced with or monitored by or integrated to, or need to be coordinated with;
   b. prepare systems coordination drawings detailing related system coordination and integration points being monitored and/or controlled; submit coordination drawings as part of shop drawing submission;
   c. review systems requirements for component back boxes and conduits; ensure that system of conduits and boxes meet respective system wiring bending radii requirements;
   d. review with manufacturers coordination and integration requirements of their systems;
   e. review each systems communication protocols to ensure they are compatible and can communicate with each other as required;
   f. review system shop drawings prior to submission to Consultant, to verify that each system has been coordinated with other systems and that required options and features are selected to meet coordination requirements;

g. be present at testing and commissioning functions of each system and provide technical assistance with regards to system operations;
h. be "on-site" coordinator of respective system trades with regards to respective system coordination of installation and testing;
i. coordinate with various trades and equipment vendors and review with Consultant with regards to ensuring that systems coordinate and integrate properly to meet intent of design and Owner requirements;
j. document coordination and integration requirements and maintain records for submission as part of shop drawings;
k. respond to coordination and integration requirements and be responsible for such work.

15. PRODUCTS

1. Order products (equipment and materials) in a timely manner to meet project-scheduling timelines. Failure to order products to allow manufacturers sufficient production/delivery time to meet project-scheduling timelines is an unacceptable reason to request for use of other suppliers or substitutions.
2. Provide Canadian manufactured products wherever possible or required and when quality and performance is obtainable at a competitive price. Products are to be supplied from manufacturer's authorized Canadian representative, unless otherwise noted. Unless otherwise specified, products are to be new.
3. Products are to comply with applicable respective Canadian standards, and typically with Canadian Standards Association (CSA) approvals and/or Underwriters Laboratories of Canada (ULC) listings markings. References to UL listings of products to include requirements that products are to be also Underwriters Laboratories of Canada ULC / cUL listed for use in Canada. Other certification organizations accredited by Standards Council of Canada to approve electrical equipment may be acceptable subject to approval from local governing electrical authority and review with Consultant. Applicable products are to meet or exceed latest ANSI/ASHRAE/IES 90.1 standards enforced by local governing authorities.

4. Systems and equipment of this Project are to be "State of the Art" and be most recent and up to date series/version of product that is available at time of shop drawing review process. Products that have been stored or "on shelf" for extended period will not be accepted. Software is to be of latest version available and be provided with updates available at time of shop drawing review process. Systems are to be designed such that its software is backwards compatible. Future upgrades are not to require any hardware replacements or additions to utilize latest software.
5. Requirements for low voltage systems of this project that are of technology that changes rapidly and are forever evolving and changing, resulting in systems that may be outdated by time of installation, are to include provisions to allow Owner option to select most updated technology. Shop drawings for such systems and equipment are to include provisions for a minimum 6-week review time for Owner to review degree of technology of each system and determine acceptance. Owner will have right to substitute a more advanced technology subject to negotiated pricing.
6. Products scheduled and/or specified have been selected to establish a performance and quality standard, and, in some instances, a dimensional standard. In many cases acceptable product manufacturers are specified for products with manufacturer name, series name and/or and model number. Bid Price may be based on products supplied by any of the base specified manufacturers or manufacturers named as acceptable for product. If acceptable manufacturers are not stated for a product, base Bid Price on product supplied by base specified manufacturer. Where product is listed as “or approved equal” Bidders may only base Bid Price on proposed equivalent product **with prior approval from the Region during the Bid period**. Refer to Section 01 33 00 for instructions on proposing substitutions during Bid period.
7. Documents have been prepared based on product available at time of Bidding. If, after award of Contract, and if successful manufacturer can no longer supply a product that meets base specifications, notify Consultant immediately. Be responsible for obtaining

other manufacturers product that complies with base specified performance and criteria and meets project timelines. Proposed products are subject to review and consideration by Consultant. If accepted, any resulting change in cost (increase or decrease) shall be reflected as an adjustment to the Contract Price. In addition, if such products require modifications to spaces, electrical systems, etc., include required changes. Such changes are to be submitted in detail to Consultant for review and consideration for acceptance. Above conditions supplement and are not to supersede any specification conditions in Division 01 or the General Conditions of Contract, as amended by the Supplementary Conditions, with regards to substitutions or failure to supply product.

8. Listing of a product as "acceptable" does not imply automatic acceptance by Consultant and/or Owner. It is responsibility of Contractor to ensure that any price quotations received, and submittals made are for products that meet or exceed specifications included herein. If products supplied by a manufacturer named as acceptable are used in lieu of base specified manufacturer, be responsible for ensuring that they are equivalent in performance and operating characteristics (including energy consumption if applicable) to base specified products. It is understood that any additional costs (i.e. for larger feeders, additional spaces, etc.), and changes to associated or adjacent work resulting from provision of product supplied by a manufacturer other than base specified manufacturer, is included in Bid Price. In addition, in equipment spaces where equipment named as acceptable is used in lieu of base specified equipment and dimensions of such equipment differs from base specified equipment, prepare and submit for review accurately dimensioned layouts affected, identifying architectural and structural elements, systems and equipment to prove that equipment in room will fit properly meeting design intent. There will be no increase in Contract Price for revisions.
9. Where products are listed as "or approved equal", certify in writing that product to be used in lieu of base specified product, at least meets space, power, design, energy consumption, and other requirements of base

specified product and is equivalent or better than base specified product. When requested by Consultant, provide full design detail drawings and specifications of proposed products. Acceptance of these "or approved equal" products is at sole discretion of Consultant. There must be no increase in Contract Price due to Consultant's rejection of proposed equivalent product. Do not order such products until they are approved by Owner, and reviewed with and recommended by Consultant.

10. Whenever use of product other than base specified product is being supplied, ensure corresponding certifications and product information (detailed catalogue and engineering data, fabrication information and performance characteristics) are submitted to Consultant for review. Failure of submission of these documents to Consultant in a timely manner to allow for review will result in base specified product to be supplied at Consultant's discretion, at no additional cost to Contract.
11. Whenever use of product other than based specified products or named as acceptable is being supplied, allow sufficient time for processing of product submissions and time for Consultant's review, such that there will not be significant impact on Contract Time or work schedule. Additional costs for Consultant’s review, to be borne by Contractor.

16. SHOP DRAWINGS

1. At start-up meeting review with Consultant, products to be included in shop drawing submission. Prepare and submit list of products to Consultant for review.
2. Submit electronic copies of shop drawings unless otherwise directed by Owner or reviewed with Consultant. Review exact requirements with Consultant.
3. Submit for review, drawings showing in detail design, construction, and performance of equipment and materials as requested in Specification. Submit shop drawings to Consultant for review prior to ordering and delivery of product to site. Include minimally for preparation and submission of following, as applicable:
   a. product literature cuts;
   b. equipment data sheets;

c. equipment dimension drawings;
d. system block diagrams;
e. sequence of operation;
f. connection wiring schematic diagrams;
g. functionality with integrated systems.

4. Each shop drawing or product data sheet is to be properly identified with project name and product drawing or specification reference. Shop drawing or product data sheet dimensions are to match dimension type on drawings.
5. Where any item of equipment is required by Code or Standard or By-Law to meet a specific energy efficiency level, or any other specific requirement, ensure this requirement is clearly indicated on submission.
6. Ensure proposed products meet each requirement of Project. Endorse each shop drawing copy "CERTIFIED TO BE IN ACCORDANCE WITH ALL REQUIREMENTS". Include company name, submittal date, and sign each copy. Shop drawings that are received and are not endorsed, dated and signed will be returned to be resubmitted.
7. Consultant to review shop drawings and indicate review status by stamping shop drawing copies as follows:
   a. "REVIEWED" or "REVIEWED AS NOTED" (appropriately marked) - If Consultant's review of shop drawing is final, Consultant to stamp shop drawing;
   b. "REVISE & RESUBMIT" - If Consultant's review of shop drawing is not final, Consultant to stamp shop drawing as stated above, mark submission with comments, and return submission. Revise shop drawing in accordance with Consultant's notations and resubmit.

8. Following is to be read in conjunction with wording on Consultant's shop drawing review stamp applied to each and every shop drawing submitted:
   "THIS REVIEW BY CONSULTANT IS FOR SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH GENERAL DESIGN CONCEPT. THIS REVIEW DOES NOT MEAN THAT CONSULTANT APPROVES DETAILED DESIGN INHERENT IN SHOP DRAWINGS, RESPONSIBILITY FOR WHICH REMAINS WITH

CONTRACTOR. CONSULTANT'S REVIEW DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR ERRORS OR OMISSIONS IN SHOP DRAWINGS OR OF CONTRACTOR'S RESPONSIBILITY FOR MEETING REQUIREMENTS OF CONTRACT DOCUMENTS. BE RESPONSIBLE FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED AT JOB SITE, FOR INFORMATION THAT PERTAINS SOLELY TO FABRICATION PROCESSES OR TO TECHNIQUES OF CONSTRUCTION AND INSTALLATION, AND FOR CO-ORDINATION OF WORK OF SUB-TRADES."

9. Submit each system and each major component as separate shop drawing submissions. Submit together, shop drawings for common devices such as devices of each system.
10. Obtain shop drawings for submission from product manufacturer's authorized representatives and supplemented with additional items specified herein.
11. Do not order product until respective shop drawing review process has been properly reviewed with Consultant.
12. Where extended warranties are specified for equipment items, submit specified extended warranty with shop drawing submittal.
13. Refer to specific requirements in other Sections.

17. ENGINEERED SUBMITTALS

1. Submittals for items required to be sealed by a professional engineer (engineered) are to be duly prepared, sealed, and signed under direct control and supervision of a qualified professional engineer licensed in jurisdiction of the work. Professional engineer is to conform to requirements specified in this Section in article entitled Requirements for Contractor Retained Engineers.
2. Engineered submittals are to include, but not be limited to, following:
    a. complete CAD layout drawings indicating equipment, wiring schematic, conduit routing and sizing, zones, devices, and any other pertinent data;
    b. listing of design data used to determine system layout and sizing;
    c. list detailing standards, codes, regulations, etc. adhered to when designing system;

d. items as noted in other Sections of the Specification.

3. Professional engineer responsible for engineered submittals is to perform periodic field reviews at locations wherever work as described by engineered submittal is in progress, during fabrication and installation of such work, and submit a field review report after each visit. Submit field review reports to Consultant and authorities having jurisdiction as required.
4. Field reviews are to be at intervals as necessary and appropriate to progress of work described by engineered submittal to allow engineer to be familiar with progress and quality of such work and to determine if work is proceeding in general conformity with Contract Documents including reviewed shop drawings and design calculations.
5. Upon completion of work as described by engineered submittal, professional engineer responsible for preparation of engineered submittal and for performing periodic field reviews is to prepare and submit to Consultant and, if applicable, authorities having jurisdiction, a letter certifying that work has been supplied and installed in accordance with requirements of Contract Documents, authorities having jurisdiction and engineered submittal.

18. OPENINGS

1. Supply opening sizes and locations to Consultant to allow verification of their effect on design, and for inclusion on structural drawings where appropriate.
2. No openings are permitted through completed structure without written approval from Owner and review with Consultant. Show required openings on a copy of structural drawings. Identify exact locations, elevations, and size of proposed openings and submit to Consultant for review, well in advance of doing work.
3. Prior to leaving site at end of each day, walk through areas of work and check for any openings, penetrations, holes, and/or voids created under scope of work of project, and ensure that any openings created under scope of work have been closed off, fire-stopped and smoke-sealed. Unless otherwise directed by Owner and reviewed with Consultant, do not leave any openings unprotected and unfinished overnight.

19. SCAFFOLDING, HOISTING, AND RIGGING

1. Unless otherwise specified or directed, supply, erect and operate scaffolding, rigging, hoisting equipment and associated hardware required for work, and subject to approval from Owner and review with Consultant.
2. Use scaffolds in such a manner as to interfere as little as possible with work of other trades.
3. Do not place major scaffolding/hoisting equipment loads on any portion of structure without approval from Owner and review with Consultant. No supports, clips, brackets or similar devices are to be welded, bolted or otherwise affixed to any finished member or surface without approval from Owner and review with Consultant.
4. Immediately remove from site scaffolding, rigging and hoisting equipment when no longer required.

20. REQUEST FOR INFORMATION (RFI)

1. Review Contract Documents for information prior to issuance of RFI during performance of Work. Where it is determined, at discretion of Owner and Consultant, that information requested in RFI was readily identifiable as part of Contract Documents, respective Trades Contractor to be back-charged against their Contract amount for time spent by Consultant and/or Owner in preparing response to RFI. Minimum amount of $150 CDN plus GST to be back charged against Contract amount for any response to a readily identifiable RFI.

21. CHANGES IN THE WORK

1. Whenever Consultant proposes in writing to make a change or revision to design, arrangement, quantity, or type of any work from that required by Contract Documents, prepare and submit to Consultant for review, a quotation detailing proposed cost for executing change or revision.
2. Quotation to be a detailed and itemized estimate of product, labour, and equipment costs associated with change or revision, plus overhead and profit percentages and applicable taxes and duties.
3. If overhead and profit percentages are not specified in Division 00 or 01, but allowable under Contract as reviewed with Consultant prior to contract signing, then allowable maximum percentages for overhead and profit are to be 5% for each.

4. Unless otherwise specified in Divisions 00 or 01, following additional requirements apply to quotations submitted:
    a. when change or revision involves deleted work as well as additional work, cost of deleted work (less overhead and profit percentages but including taxes and duties) is to be subtracted from cost of additional work before overhead and profit percentages are applied to additional work;
    b. material costs are not to exceed those published in local estimating price guides;
    c. electrical labour unit costs are to be in accordance with National Electrical Contractors Association Manual of Labor Units at normal level, less 25%;
    d. costs for journeyperson and apprentice labour must not exceed prevailing rates at time of execution of Contract and must reflect actual personnel performing work;
    e. cost for site superintendent must not exceed 10% of total hours of labour estimated for change or revision, and change or revision must be such that site superintendent's involvement is necessary;
    f. costs for rental tools and/or equipment are not to exceed local rental costs;
    g. overhead percentage will be deemed to cover quotation costs other than actual site labour and materials, and rentals;
    h. quotations, including those for deleted work, to include a figure for any required change to Contract Time.
5. Quotations submitted that are not in accordance with requirements specified above will be rejected and returned for re-submittal. Failure to submit a proper quotation to enable Consultant to expeditiously process quotation and issue a Change Order will not be grounds for any additional change to Contract Time.
6. Make requests for changes or revisions to work in writing to Consultant and, if accepted by Owner, Notice of Change to be issued.
7. Do not execute any change or revision until written authorization for change or revision has been obtained from Owner and reviewed with Consultant.

22. PROGRESS PAYMENT BREAKDOWN

1. Prior to submittal of first progress payment draw, submit a detailed breakdown of work cost to assist Consultant in reviewing and approving progress payment claims.
2. Payment breakdown is subject to Owner's approval and Consultant's review and recommendations. Progress payments will not be processed until an approved breakdown is in place. Breakdown is to include one-time claim items such as mobilization and demobilization, insurance, bonds (if applicable), shop drawings and product data sheets, commissioning including system testing and verification, and project closeout submittals.
3. Indicate equipment, material and labour costs for site services (if applicable) and indicate work of each trade in same manner as they will be indicated on progress draw.

23. NOTICE FOR REQUIRED FIELD REVIEWS

1. Whenever there is a requirement for Consultant to perform a field review prior to concealment of any work, to inspect/re-inspect work for deficiencies prior to Substantial Performance of the Work, for commissioning demonstrations, and any other such field review, give minimum 7 working days' notice in writing to Consultant.
2. If Consultant is unable to attend a field review when requested, arrange an alternative date and time.
3. Do not conceal work until Consultant advises that it may be concealed.
4. When Consultant is requested to perform a field review and work is not ready to be reviewed, reimburse Consultant for time and travel expenses.

24. PRELIMINARY TESTING

1. When directed by Consultant, promptly arrange, pay for, and perform site tests on any piece of equipment or any system for such reasonable lengths of time and at such times as may be required to prove compliance with Specification and governing Codes and Regulations, prior to Substantial Performance of the Work.
2. When, in Consultant's opinion, tests are required to be performed by a certified testing laboratory, arrange and pay for such tests.

3. These tests are not to be construed as evidence of acceptance of work, and it is agreed and understood that no claim for delays or damage will be made for injury or breakage to any part or parts of equipment or system due to test where such injuries or breakage were caused by faulty parts and/or workmanship of any kind.
4. When, in Consultant's opinion, tests indicate that equipment, products, etc., are defective or deficient, immediately remove such equipment and/or products from site and replace them with acceptable equipment and/or products, at no additional cost.
5. Prior to application for a Certificate of Substantial Performance of the Work and turn over to Owner, such systems/equipment to be cleaned, restored to "new" condition, paint finishes "touched-up", filters cleaned or replaced, etc.

25. CLEANING

1. During construction, keep site reasonably clear of rubbish and waste material resulting from work on a daily basis to the satisfaction of Owner and Consultant. Before applying for a Certificate of Substantial Performance of the Work, remove rubbish and debris, and be responsible for repair of any damage caused as a result of work.
2. At time of final cleaning, clean luminaire reflectors, lenses, and other luminary surfaces that have been exposed to construction dust and dirt, including top surface, whether it is exposed or in ceiling space.
3. Clean cover plates, and exposed surfaces.
4. Clean other electrical equipment and devices installed as part of this project.

26. RECORD AS-BUILT DRAWINGS

1. As work progresses at site, clearly mark in red in a neat and legible manner on a set of bound white prints of Contract Drawings, changes and deviations from routing of services and locations of equipment shown on Contract Drawings, on a daily basis. Changes and deviations include those made by addenda, change orders, and site instructions. Use notes marked in red as required. Maintain white print red line as-built set at site for exclusive use of recording as-built conditions, keep set up-to-date, and ensure set is available for periodic review. As-built set is also to include following:

a. dimensioned location of inaccessible concealed work;
b. locations of control devices with identification for each;
c. location and identification of devices in concealed locations;
d. for underground piping and ducts, record dimensions, invert elevations, offsets, fittings, cathodic protection and accessories if applicable, and locate dimensions from benchmarks to be preserved after construction is complete;
e. location of concealed services terminated for future extension in inaccessible locations.
f. identify routing and location of concealed conduits/ducts of diameter 50 mm (2") and greater.

2. Before applying for a Certificate of Substantial Performance of the Work, update a clean copy of Contract Drawing set in accordance with marked up set of "as-built" white prints including deviations from original Contract Drawings, thus forming an "as-built" drawing set. Submit "as-built" site drawing prints to Consultant for review. Make necessary revisions to drawings as per Consultant's comments, to satisfaction of Consultant.
3. Unless otherwise noted in Divisions 00 or 01, failure to maintain accurate record drawings will incur additional 5% holdback on progress claims until drawings are brought up to date to satisfaction of Owner and reviewed with Consultant.

27. OPERATING AND MAINTENANCE MANUALS

1. Unless otherwise specified in Division 01, for each item of equipment for which a shop drawing is required (except for simple equipment), supply minimum 3, project specific, indexed copies of equipment manufacturers' operating and maintenance (O & M) instruction data manuals. Review exact quantity of manuals with Consultant. Consolidate each copy of data in an identified hard cover three "D" ring binder. Each binder to include:
   a. front cover: project name label; wording - "Electrical Systems Operating and Maintenance Manual"; and date;

b. introduction sheet listing Consultant, Contractor, and Subcontractor names, street addresses, telephone and fax numbers, and e-mail addresses;
c. equipment manufacturer's authorized contact person name, telephone number and company website;
d. Table of Contents sheet, and corresponding index tab sheets;
e. copy of each "REVIEWED" or clean, updated "REVIEWED AS NOTED" shop drawing or product data sheet, with manufacturer's/supplier's name, telephone and fax numbers, email address, company website address, and email address for local source of parts and service; when shop drawings are returned marked "REVIEWED AS NOTED" with revisions marked on shop drawing copies, they are to be revised by equipment supplier to incorporate comments marked on "reviewed" shop drawings and a clean updated copy is to be included in operating and maintenance manuals;
f. maintenance data as follows:
    i. operation and trouble-shooting instructions for each item of equipment and each system;
    ii. schedules of tasks, frequency, tools required, and estimated task time;
    iii. recommended maintenance practices and precautions including warnings of any maintenance practice that will damage or disfigure equipment/systems;
    iv. complete parts lists with numbers.
g. performance data as follows:
    i. equipment and system start-up data sheets;
    ii. equipment test reports;
    iii. final verification and commissioning reports.
h. explanation of operating principles and sequences;
i. inspection certificates issued by regulatory authorities;
j. wiring and connection diagrams;

k. copies of additional and revised panelboard directories;
l. warranties;
m. items requested specifically in Section Articles.

2. Generally, binders are not to exceed 75 mm (3") thick and not to be more than 2/3 full.
3. Operating and maintenance instructions are to relate to job specific equipment supplied under this project and related to Owner's building. Language used in manuals is to contain simple practical operating terms and language easy for in-house maintenance staff to understand how to operate and maintain each system.
4. Before applying for a Certificate of Substantial Performance of the Work, assemble one draft copy of O & M Manual and submit to Consultant for review prior to assembling remaining copies. Incorporate Consultant's comments into final submission.
5. Provide 2 digital copies of contents of operating and maintenance manuals and load onto separate USB type flash drives and submit to Consultant. Prepare digital copies using version of Adobe Acrobat Portable Document Format or equal as reviewed with Consultant and enhanced with bookmarks and internal document links.

28. COMMISSIONING

1. Interface, cooperate and coordinate with Commissioning Agent and attend commissioning meetings. Perform commissioning activities for aspects of work provided in Electrical Divisions and perform corrective work identified by Commissioning Agent.
2. After successful start-up and prior to Substantial Performance of the Work, commission electrical work. Demonstrate to Owner and Consultant, for purpose of final acceptance, by means of successful and documented functional performance testing, that equipment, systems and/or subsystems are capable of being operated and maintained to perform in accordance with requirements of Contract Documents.
3. Verify modes and sequences of control. Complete commissioning data sheets to document successful operational performance testing.
4. Submit copies of submittals such as O & M manuals, shop drawings, schedules and test reports of systems and equipment to Commissioning Agent, prior to start

of commissioning activity or as directed by Commissioning Agent.

5. Commissioning Agent may also be present for any testing/commissioning activities. Notify Commissioning Agent in advance of these activities.

29. WARRANTY

1. Unless otherwise specified in Divisions 00 and 01, warrant work to be in accordance with Contract Documents and free from defects for a period of 1 year from date of issue of a Certificate of Substantial Performance of the Work.
2. Where equipment includes extended warranty period, e.g., 5 years, first year of warranty period is to be governed by terms and conditions of warranty in Contract Documents, and remaining years of warranty are to be direct from equipment manufacturer and/or supplier to Owner. Submit signed and dated copies of extended warranties to Consultant.
3. Warranty to include parts, labour, travel costs and living expenses incurred by manufacturer's authorized technician to provide factory authorized on-site service.
4. Repair and/or replace any defects that appear in Work within warranty period without additional expense to Owner. Be responsible for costs incurred in making defective work good, including repair or replacement of building finishes, other materials, and damage to other equipment. Ordinary wear and tear and damage caused willfully or due to carelessness of Owner's staff or agents is exempted.
5. Do not include Owner deductible amounts in warranties.

30. PROJECT CLOSE OUT SUBMITTALS

1. Prior to application for Substantial Performance of the Work, submit required items and documentation specified, including following:
   a. O&M Manuals;
   b. as-built record drawings and associated data;
   c. extended warranties for equipment as specified;
   d. operating test certificates;
   e. final commissioning report;
   f. identified keys for equipment and/or panels for which keys are required, and other items required to be submitted;

g. other data or products specified;

2. Refer to additional requirements in Division 01.

31. INSTRUCTIONS TO OWNER

1. Train Owner's designated personnel in aspects of operation and maintenance of equipment and systems as specified. Demonstrations and training are to be performed by qualified technicians employed by equipment/system manufacturer/supplier. Supply hard copies of training materials to each attendee.
2. Unless where specified otherwise in trade Sections, minimum requirements are for manufacturer/suppliers of each system and major equipment, to provide minimum one session each consisting of minimum 2 hours on site or in factory training (at Owner's choice), of Owner's designated personnel (for up to 6 people each session), on operation and maintenance procedures of system.
3. For each item of equipment and for each system for which training is specified, prepare training modules as specified below. Use Operating and Maintenance Manuals during training sessions. Training modules include but are not limited to:
   a. Operational Requirements and Criteria: equipment function, stopping and starting, safeties, operating standards, operating characteristics, performance curves, and limitations;
   b. Troubleshooting: diagnostic instructions, test and inspection procedures;
   c. Documentation: equipment/system warranties, and manufacturer's/supplier's parts and service facilities, telephone numbers, email addresses, and the like;
   d. Maintenance: inspection instructions, types of cleaning agents to be used as well as cleaning methods, preventive maintenance procedures, and use of any special tools;
   e. Repairs: diagnostic instructions, disassembly, component removal and repair instructions, instructions for identifying parts and components, and review of any spare parts inventory.

4. Before instructing Owner's designated personnel, submit to Consultant for review preliminary copy of training manual and proposed schedule of demonstration and training dates and times. Incorporate Consultant's comments in final copy.
5. Obtain in writing from Consultant, list of Owner's representatives to receive instructions. Submit to Consultant prior to application for Certificate of Substantial Performance of the Work, complete list of systems for which instructions were given, stating for each system:
    a. date instructions were given to Owner's staff;
    b. duration of instruction;
    c. names of persons instructed;
    d. other parties present (manufacturer's representative, consultants, etc.).
6. Obtain signatures of Owner's staff to verify they properly understood system installation, operation and maintenance requirements, and have received operating and maintenance instruction manuals and "as-built" record drawings.
7. Submit to Consultant copy of electronic version of training materials loaded on USB flash drive. Include in operating and maintenance manuals submission.

32. FINAL INSPECTION

1. Submit to Consultant, written request for final inspection of systems. Include written certification that:
    a. deficiencies noted during job inspections have been completed;
    b. field quality control procedures have been completed;
    c. maintenance and operating data have been completed and submitted to, reviewed with Consultant and accepted by Owner;
    d. tags and nameplates are in place and equipment identifications have been completed;
    e. clean-up is complete;
    f. spare parts and replacement parts specified have been provided, as confirmed by Owner and reviewed with Consultant;
    g. as-built and record drawings have been completed and submitted to and reviewed with Consultant and accepted by Owner;

h. Owner's staff has been instructed in operation and maintenance of systems;
i. commissioning procedures have been completed;
j. fire alarm verification has been 100% completed and Verification Certificate has been submitted to and accepted by Consultant.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. REFERENCES
   1. Division 00 and Division 01 apply to and are a part of each Electrical Division Section.
   2. Section 31 00 99 Earthwork for Minor Works.
   3. Section 31 22 13 Rough Grading.

2. APPLICATION
   1. This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Electrical Divisions. It is intended as a supplement to each Section of Electrical Divisions and is to be read accordingly.
   2. Be responsible for advising product vendors of requirements of this Section.

3. SUBMITTALS
   1. Submit shop drawings for products of this Section.
   2. Additionally, as part of shop drawing submission process, submit following to Consultant for review:
      a. dimensioned location drawings indicating required sleeves and formed openings in structural poured concrete or precast concrete construction, and locations of cutting or drilling required for Electrical Divisions work;
      b. samples of materials and any other items as specified in succeeding Sections of Electrical Divisions;
      c. equipment nameplate and warning sign proposed nomenclature, print type, symbols, sizing and colours;
      d. copies of prior to start of construction approvals from local governing authorities having jurisdiction.

4. PRODUCT REQUIREMENTS IN SPECIAL AREAS
   1. Products in public areas are to also be vandal-proof and impact resistant.

PART 2 - PRODUCTS

1. DUCT FOR DIRECT BURIED CABLES	1. DB/2 solid wall rigid PVC duct and fittings, CSA Certified, tested to CSA Standard C22.2 No. 211.1. 2. Synthetic polypropylene fibre (plastic) twine cord or 19 mm (3/4") diameter polyethylene rope, and where required approved by local governing Utility.
2. OUTLET BOXES	1. CSA approved stamped galvanized steel outlet boxes. 2. CSA certified rigid plastic (PVC) outlet boxes. 3. Each outlet box and back box to be suitable in respects for application and complete with suitable securing lugs, connectors suitable for connected conduit, knockouts and, where necessary, suitable plaster rings, concrete rings, covers, carpet flanges and any other required accessory. 4. Electrical boxes exposed exterior of building or in non-climate controlled locations to be weatherproof boxes complete with gasketted covers/faceplates.
3. PULLBOXES AND JUNCTION BOXES	1. Galvanized or prime coat plated steel, suitable in respects for application and complete with screw-on or hinged covers as required, and connectors suitable for connected conduit. 2. Rigid plastic (PVC), CSA certified, junction boxes and access fittings with solvent weld type joints and screw-on PVC covers. 3. Physical size of pullboxes to be as required by local governing electrical code to suit number and size of conduits and conductors. 4. Each box to be suitable in respects for application and complete with suitable securing lugs, connectors suitable for connected conduit, knockouts and, where necessary, suitable plaster rings, concrete rings, covers and any other required accessory. 5. Boxes exposed to exterior of building or in non-climate-controlled locations to be weatherproof boxes complete with gasketted covers. 6. Anchors, fasteners and other securing hardware to be of capacity and type to suit application and for which materials to which hardware are being installed. Include manufacturer's product literature with shop drawing submissions detailing that supplied hardware is suitable for respective applications. Arrange for manufacturer's representative to provide onsite installation training for hardware products.

4. SLEEVES

1. Galvanized steel sleeves as follows:
   a. No. 24 gauge with an integral flange at one (1) end to secure sleeve to formwork construction;
   b. Schedule 40 pipe.
2. Schedule 40 PVC sleeves.

5. FASTENING AND SECURING HARDWARE

1. Concrete inserts - Crane Canada Ltd., No. 4-M for concrete work for single or double conduit, etc., runs and equipment. Unistrut Ltd. multiple type inserts for runs of three (3) or more conduits etc., or where a grid support system is required.
2. Concrete fasteners - "WEJ-IT" anchors, lead cinch anchors and/or "STAR" or "PHILLIPS" self-drilling anchors.
3. Masonry inserts - "WEJ-IT" expansion shields and machine bolts or, for light loads, fibre or lead plugs and screws.
4. Anchors, fasteners and other securing hardware to be of capacity and type to suit application and for which materials to which hardware are being installed. Include manufacturer's product literature with shop drawing submissions detailing that supplied hardware is suitable for respective applications. Arrange for manufacturer's representative to provide onsite installation training for hardware products.
5. Acceptable manufacturers of fastening and securing hardware:
   a. Crane;
   b. Hilti;
   c. Thomas & Betts.

6. IDENTIFICATION NAMEPLATES

1. Laminated plastic (Lamacoid) black-white-black with bevelled edges, stainless steel screws, and proper identification engraving. Each nameplate to be sized to suit equipment for which it is provided and required wording. Various colour configurations to be used to differentiate systems. Confirm exact nomenclature, sizing, print type and colour scheme with Owner and review with Consultant.
2. For non-climate-controlled areas: nameplates to be weather resistant, corrosion resistant and UV resistant to prevent fading. Mounting hardware to be corrosion resistant stainless-steel construction.

7. SIGNAGE

1. Thomas & Betts Ltd., or approved equal, semi-rigid vinyl panels with drilled holes in each corner, stainless steel screws, pressure sensitive mounting pads on back, and required printed wording. Generally, wording to be red on a white background with black trim confirmed with Owner and reviewed with Consultant.
2. For non-climate-controlled areas: signage to be weather resistant, corrosion resistant and UV resistant to prevent fading. Mounting hardware to be corrosion resistant stainless-steel construction.
3. Warning signage to comply with applicable requirements of local governing authorities and codes.

PART 3 - EXECUTION

1. GENERAL INSTALLATION REQUIREMENTS

1. Install conduit concealed in finished areas, and concealed to degree made possible by finishes in partially finished and unfinished areas. Documents do not identify exact routing. Where shown, routing is diagrammatic, identifying general requirements of routing and locations. Include for necessary offsets, fittings, transformations and similar items required as a result of obstructions and other architectural or structural details not shown.
2. For proposed use of conduit runs underground below slab include following provisions:
    a. proper drain pit;
    b. system to be a pull-in system;
    c. 20% spare conduits (with minimum of at least 1);
    d. system proposal to consider and address any effects of magnetic fields.
3. Conduits are sized on drawings, but in absence of type and sizing, type and size to suit intended application in accordance with applicable local governing electrical code requirements. Sizes identified on drawings are minimum sizes and are not to be decreased unless approved by Owner and reviewed with Consultant.
4. Mounting heights of devices may be typically identified on drawings, but such dimensions are for general pricing only. Review exact mounting heights with Consultant prior to roughing -in, refer to Landscape drawings and comply with local governing codes and standards including building code barrier free requirements.

2. INSTALLATION OF DUCT FOR DIRECT BURIED CABLES

1. Provide ducts as required for running direct buried cables as noted. Install in accordance with applicable local governing authority codes and standards and manufacturer's recommendations and instructions. Coordinate Work with trades responsible for performing excavation and backfill Work. Confirm requirements with local authority having jurisdiction. Refer to drawings for additional requirements.
2. Support direct buried underground ducts on a well-tamped flat bed of earth, free from rocks or protrusions of any kind. Grade and slope bed to provide ducts with proper drainage. Coordinate with General Trades Contractor for provision of means to carry away drainage water. Obtain required approvals of work from local governing electrical utility and review with Consultant prior to back filling and covering. Provide pull cord in each duct run.
3. Use standard duct lengths and fittings as much as possible and practicable. When cutting is necessary, carefully taper duct ends with special field tapering machine. Make joints by means of manufacturer's standard couplings. Maintain minimum bending radius of 1 m (3.3'). Use manufacturer's solvent cement and primer, and procedures for joint fitting connections.
4. Provide sloping and drainage of ducts to prevent pooling of water within ducts. Review requirements with Consultant prior to start of Work.
5. Provide manufactured expansion joints in duct at spacing as recommended by duct manufacturer.
6. When duct has been laid, draw a steel test mandrel through each duct in presence of Consultant. Diameter of mandrel to be 13 mm (1/2") less than inside diameter of duct. Remove obstruction found in duct to satisfaction of Consultant and leave duct system completely clear. No conduit will be accepted as being ready for installation of feeders until this is done.
7. Whenever Work is suspended, protect ends of ducts by means of suitable plugs and leave such plugs in use as long as may be necessary. When duct is installed for future extension, plug end of ducts for protection.
8. Provide marking tape and marking pavers as required by local governing authorities and as reviewed with Consultant.

9. Provide one continuous length of polyethylene rope or Brantford twine in each duct indicated as spare or for future use.

3. INSTALLATION OF OUTLET BOXES AND BACK BOXES

1. Provide an outlet box or back box for each luminaire, wiring device, and each other such outlet.
2. Size boxes to accommodate exact supplied components and for bending radii of installed cables. Confirm requirements with respective system vendors.
3. Outlet boxes in plastic conduit systems to be rigid PVC plastic outlet boxes, unless otherwise noted.
4. Outlet boxes for flush floor mounted devices to be concrete tight formed galvanized steel fully adjustable flush floor boxes. Locate in to position and install in accordance with manufacturer's instructions. Coordinate installation with trades pouring concrete floor slab or trade responsible for floor construction.
5. Size and arrangement of outlet boxes to suit device which they serve.
6. Mounting heights and locations for outlet boxes are typically indicated on drawings, however confirm exact location and arrangement of outlets prior to roughing-in. Landscape drawings and Consultant's instructions have precedence over electrical drawing diagrammatic layouts and specified mounting heights and locations.
7. Properly support exterior mounted boxes. Where location is not adjacent a structure, provide rigid conduit support properly imbedded into ground and secure box at suitable required height. Review exact installation requirements with Consultant prior to start of work.
8. Provide blank coverplates on existing obsolete boxes which are to remain in position.
9. Provide blank coverplates over boxes left empty for future installation of devices. Clearly identify each box as to its intended use, to Owner's approval and reviewed with Consultant. Generally, provide stainless steel type blank coverplates.

4. INSTALLATION OF PULLBOXES AND JUNCTION BOXES

1. Provide pullboxes in conduit systems wherever shown on drawings, and/or wherever necessary to facilitate conductor installations. Generally, conduit runs exceeding 30 m (100") in length, or with more than two - 90° bends, are to be equipped with a pullbox installed at a convenient and suitable intermediate accessible location.

2. Size boxes to accommodate exact supplied system and for bending radii of installed cables. Confirm requirements with respective system vendors.
3. Provide junction boxes wherever required and/or indicated on drawings and as required by local governing electrical code.
4. Provide sealing around boxes in walls where insulation and vapour barrier is present or for walls of rooms that are sealed. Maintain sealing system of wall.
5. Boxes in exterior rigid conduit and boxes in perimeter wall where insulation and vapour barrier is present, to be "Condulet" cast gasketted boxes, unless otherwise noted.
6. Boxes in plastic conduit to be rigid PVC plastic boxes complete with required couplings.
7. Pullboxes and junction boxes to be accessible after work is completed.
8. Accurately locate and identify concealed pullboxes and junction boxes on "As-built" record drawings.
9. Clearly identify main pull or junction boxes (excluding obvious outlet boxes) by painting outside of covers. Spray painting is not permitted unless approved by Owner and reviewed with Consultant.

5. INSTALLATION OF SLEEVES

1. Sleeves in poured concrete walls and foundation are to be Schedule 40 pipe.
2. Size sleeves, unless otherwise noted, to leave 13 mm (1/2") clearance around conduit, duct, conductor, etc. Pack and seal sleeves set in exterior walls with governing authority approved materials suitable for application and pack both ends of sleeves watertight with approved permanently flexible and water tight materials. Coordinate exact responsibility of work with General Trades Contractor.
3. Submit to concrete reinforcement detailer at proper time, drawings indicating required sleeves, recesses and formed openings in poured concrete work. Completely and accurately dimension such drawings and relate sleeves, recesses and formed openings to suitable grid lines and elevation datum.

6. INSTALLATION OF FASTENING AND SECURING HARDWARE

1. Provide fasteners, anchors and similar hardware required for conduit, duct, raceway, conductors, etc. and for equipment hanger and/or support material unless otherwise noted.

2. Accurately and properly set concrete inserts in concrete framework. Where multiple type inserts are used, space same to suit requirements of smallest conduit, etc., in group.
3. Fasten hanger and support provisions to masonry with expansion shields and machine bolts, or, for light loads, use plugs, and screws.
4. In drywall or plaster walls and/or ceilings use two wing toggles and for heavy loads, provide steel anchor plates with two or more toggles to spread load.
5. Provide beam clamps for attaching hanging and/or support provisions to structural steel, or where approved by Owner and reviewed with Consultant, weld hanging and support provisions to structural steel.
6. Install devices in accordance with manufacturer's instructions to suit each respective application.
7. Explosive powder actuated fasteners are not permitted unless specific approval for their use and type has been obtained from Owner and reviewed with Consultant.
8. Under no circumstances use ceiling suspension hangers or grids for suspension of conduit and conductors. Install supports to permanent structure of building, limited to areas that will not damage structural stability.

7. INSTALLATION OF IDENTIFICATION NAMEPLATES

1. In pull boxes, junction boxes and at terminations, identify feeders by use of plastic plates indicating system voltage and circuit designations. Plates to be 25 mm (1") in diameter and have letter stamped 9 mm (5/8") high. Colour coding to be:
   a. Phase A - red;
   b. Neutral - white;
   c. Ground - green.
2. Review print size type and size, colours, sizing and nomenclature of nameplates with Consultant prior to ordering. Submit sample board.

8. INSTALLATION OF SIGNAGE

1. Provide signage as required.
2. Secure signs to equipment with stainless steel screws. Number of signs required and sign wording, symbols, and colours to be approved by Owner and reviewed with Consultant, and local electrical utility and other governing authorities, where applicable.

9. DISCONNECTION, REMOVAL AND RELOCATION WORK

1. Prior to start of any disconnection, removal or relocation work in any areas, prepare schedule of work and notify Consultant and Owner to obtain approval of work to proceed.
2. Where indicated on drawings or where required to perform Work of this Project, disconnect and remove items of existing obsolete electrical work. Relocate required devices as required to accommodate work of other Divisions. Where luminaires, switches, receptacles, and other devices and/or equipment is removed, disconnect at point of electrical supply, remove obsolete wiring and conduit up to source, unless otherwise noted, and make system safe to Owner's satisfaction and as reviewed with Consultant. Remove obsolete conduit/raceways in accessible ceiling spaces, exposed locations, etc. Where existing obsolete conduit and similar raceway material cannot be removed, such as embedded in concrete, cut back and cap obsolete conduit and raceways. Refer to specific notes on drawings.
3. When respective work is deleted, such deletions are to in no way affect operation of any existing interconnected components that remain. When existing circuits are being disconnected, maintain supervision of area to ensure that such circuits do not affect essential existing circuits being retained.
4. Refer to applicable landscape and electrical drawings which define extent of areas being demolished. Review drawings and site and include for demolition and/or renovation of services as required to accommodate alterations detailed.
5. Except where directed by Owner, remove from site and properly dispose obsolete materials which are removed and are not relocated or reused. Obtain from Owner and review with Consultant, list of existing electrical items for removal and turn over to Owner. Said items remain property of Owner. Package items and provide itemized list.

6. Where existing services pass through or are in an area to serve items which are to remain, or pass through areas that are to be deleted, maintain services, but re-route as required. Include for rerouting existing services concealed behind existing finishes and which become exposed during renovation work, so as to be concealed behind new or existing finishes. Confirm with Owner services which are to be kept in service and operational.
7. Revise panelboard directories accordingly, if affected by any renovation, disconnection, or removal of work. Provide revised typed directory cards. Ensure service to all equipment being demolished, removed, or relocated has been de-energized prior to disconnecting. Revise all other labels for breakers being reused to suit new loads.
8. Protect existing devices being relocated or deleted to ensure that they are not damaged. Test such devices prior to disconnection and de-energization, to ensure that each device is in proper working condition. Ensure that motors are in proper rotation direction. Examine each device for damage. Report devices not working or with damage to Consultant prior to initiating any work. It will be assumed that devices are in proper working order and good condition if not reported.
9. Provide junction boxes, outlet boxes, wiring, plates, etc., as necessary for complete relocation of devices. Clean relocated or temporary removed devices and equipment, and ensure that they are in good operating condition before being reinstalled. Where existing luminaires are relocated, clean luminaires and inspect for damage. Report defects or damages to Consultant. Do not splice conductors unless approved by Owner and reviewed with Consultant. Utilize junction boxes and terminal devices for proper extension of circuits where approved. Otherwise replace circuits with home run continuous run of suitable lengths.
10. Provide blank coverplates on existing obsolete boxes which are to remain in position, as designated by Owner.
11. After installation is complete, test parts of re-used or relocated electrical equipment and correct faults and grounds.

12. Close openings in boxes, panels, etc., that result from removal of equipment, conduit, wiring, fixtures, etc. Close openings in a proper manner and properly terminate and insulate cables to restore system to a safe operating condition as reviewed with Consultant and to Owner's satisfaction.
13. If at any time during course of work, asbestos containing materials are encountered or suspected, cease work in area in question and immediately notify Consultant. Comply with local governing authority regulations. Do not resume work in affected area without approval from Owner and review with Consultant.

10. INTERRUPTIONS TO AND SHUT-DOWNS OF SERVICES AND SYSTEMS

1. Shutdowns and interruptions to existing systems and services are to be coordinated fully with and performed at times acceptable to Owner and reviewed with Consultant. Generally, shutdown may be performed only between hours of 12:00 midnight Sunday until 6:00 a.m. Monday morning. Include for costs of premium time to perform work during nights, weekends or other times outside of normal working hours, which may be necessary to comply with stipulations specified herein this Article. Services for operation of existing non-renovated areas of building are to be maintained.
2. Upon award of contract, submit to Consultant for review and approval, a list of anticipated shut-down times and their maximum duration.
3. Prior to each shut-down or interruption, inform Consultant and Owner in writing minimum 7 working days in advance of proposed shut-down or interruption and obtain written consent to proceed. Do not shut down or interrupt any system or service without written consent. Note that shutdowns of some essential services may require additional advance notification time.
4. Work associated with shut-downs and interruptions are to be carried out as continuous operations to minimize shut-down time and to reinstate systems as soon as possible. Prior to any shut-down, ensure that materials and labour required to complete work for which shut-down is required are available at site.
5. Confirm any methods of procedures with Owner and review with Consultant prior to start of work.

11. EQUIPMENT BASES AND SUPPORTS	1. Provide equipment bases, supports and concrete housekeeping pads for mounting of floor standing equipment and luminaire pole bases. 2. Secure floor mounted equipment in place on 100 mm (4") high concrete housekeeping pads, 100 mm (4") wider and longer than equipment base dimensions. Chamfer edges of bases. Include for seismic restrains as required by local governing building code. 3. Supply dimensioned drawings, templates, and anchor bolts for proper setting of equipment on bases and pads. Be responsible for required levelling, alignment, and grouting of equipment. 4. Submit to Consultant for review, dimensioned shop drawings of structurally designed concrete pads or bases for support of large, heavy equipment. Indicate on shop drawings total weight of pad or base, reinforcement, and equipment for which it is required.
12. CONCRETE WORK	1. Provide concrete required for work, including formwork and reinforcing steel. 2. Unless otherwise noted in Division 03, concrete to be minimum 20700 kPa (3000 psi) ready mix concrete provided in accordance with latest editions of CAN/CSA-A23.1 "Concrete Materials and Methods of Concrete Construction" and CAN/CSA-A23.2 "Methods of Tests for Concrete". 3. Perform work to standards and general requirements of Division 03. 4. Comply with local governing authority and local standard practices in providing concrete to compensate for local frost level of Place of Work.
13. EXCAVATION AND BACKFILL	1. Before commencement of excavation for work, determine in consultation with Consultant, Owner, Municipality and utilities, presence, if any, of existing underground services at site. Engage local utilities to locate and mark out such services. Ensure that trades concerned are aware of their presence. 2. Be responsible for any damage done to underground services caused by neglect to determine and mark out location of such services prior to excavation work commences.

3. Inverts and locations of existing site services may have been site surveyed and approximate location may be shown on drawings. Be responsible for confirming that inverts and locations are correct, prior to commencing excavation. Where discrepancies are found, immediately inform Consultant, and await a direction.
4. Where Work falls under jurisdiction of local governing utility, confirm requirements and comply with utility requirements.
5. Provide excavation, backfill, and related work required for work. Obtain a copy of soil test report if available from Owner or Consultant. Depth of excavations must accommodate local governing requirements and local standard practices to compensate for local frost levels of Place of Work.
6. Grade bottom of excavation. In firm, undisturbed soil, lay services directly on soil. Backfill excess excavation with 13,790 kPa (2,000 psi) concrete. Grade bottom such that ducts are installed to drain as reviewed with Consultant.
7. Prepare new bedding under service in unstable soil, in fill, and in cases where bedding has been removed in earlier excavation, particularly near perimeter walls of buildings, and at manholes and catch basins, compact to maximum possible density and support service by means of 200 mm (8") thick concrete cradles spanning full length between firm supports. Refer to detail on drawings.
8. Where excavation is necessary in proximity to and below level of any footing, backfill with 13,790 kPa (2,000 psi) concrete to level of highest adjacent footing. Proximity is determined by angle of repose as reviewed with Consultant.
9. Do not open trenches ahead of installation of services and backfilling more than weather permits. Break up rocks and boulders and remove by drilling and wedging. Do not use blasting unless specifically permitted by Owner and reviewed with Consultant.
10. Before backfilling, arrange for inspection of work by Consultant Do not backfill work unless reviewed with Consultant. Failure to do so prior to backfilling will require re-excavating work and re-backfill at no additional cost to Owner. Remove shoring during backfilling.

11. Backfill trenches within building with clean sharp sand in individual layers of maximum 150 mm (6") thickness, compacted to a density of 100% Standard Proctor. Hand compact first layers up to compacted level of 300 mm (12") above top of service. Hand or machine compact balance up to grade using approved equipment.
12. Backfill trenches outside building (not under roads, parking lots or traffic areas), up to a compacted level of 450 mm (18") above service with Granular "A" material, hand compacted to a density of 95% Standard Proctor. Backfill balance with 150 mm (6") layers of approved excavated material compacted to 95% Standard Proctor density, using approved equipment.
13. Backfill trenches outside building under roads, parking lots or traffic areas with granular "A" material in layers not exceeding 150 mm (6") thickness, compacted to 100% Proctor density up to grade level.
14. Fill depressions to correct grade level with appropriate material, after an adequate period has passed to reveal any settlement. Use maximum possible compaction. Pay costs required to make good damages caused by settlement. Generally, final surface toppings are responsibility of another Division of Work. Coordinate exact requirements with General Contractor to ensure surface toppings are provided as required to match adjacent surfaces.
15. Unless otherwise directed in Division 02 and/or 31, store and dispose of excavated materials as follows:
    a. during progress of contract, place material as directed in such a manner that minimum damage or disfigurement of ground and which in no causes way impedes progress of work;
    b. separately place surplus topsoil and subsoil as directed; leave site clean and unencumbered.
16. Provide pumping equipment as required to keep excavations free of water.
17. Coordinate requirements for final surface toppings (concrete, asphalt, pavers, grass sod, etc.) with General Contractor.
18. Directional boring shall be in conformance with OPSS-603.07.09.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. SUBMITTALS

1. Submit shop drawings for products and accessories.
2. Submit samples of conductors, where requested in Contract Documents or when requested by Consultant.

PART 2 - PRODUCTS

1. GENERAL POWER CABLES

1. CSA approved, ULC labelled and certified. Unless otherwise noted, conductors to be copper and be suitable for applications as noted in governing local electrical code.
2. "RWU90" CSA certified, single copper conductor to CSA C22.2 No. 38, 1000 volts, maximum 90°C (194°F) conductor temperature, -40°C (-40°F) minimum installation temperature, extra thickness X-link polyethylene (XLPE) insulation suitable for wet and buried installations, colour coded.

2. CONNECTORS

1. General:
   a. materials: CSA approved and/or ULC listed and labelled as required by local governing authorities and codes;
   b. certification: CSA C22.2 No. 65;
   c. connectors marked with certification, manufacturer, manufacturer catalogue number and approval for conductor size and type.
2. Armoured cable connectors of proper squeeze type connectors and plastic anti-short bushings at terminations.
3. Connectors for conductors connecting to devices in accordance with local governing electrical requirements, equal to Ideal Industries No. 451, No. 452 and No. 453, "Wing-Nut", CSA certified, 600 volts rated, contoured wing design, fire retardant shell, twist on pressure type connectors.
4. Splice connectors to line voltage branch circuit conductors and feeders to be CSA approved compression type connectors as follows:
   a. of voltage rating to suit application;
   b. typically for conductors No 8 AWG and greater;
   c. long barrel, double crimp compression;

d. tin plated seamless copper tubing;
e. chamfered barrel;
f. colour coded for die identification;
g. used with manufacturer's matching dies and compression tool;
h. covered with suitable 3M or Raychem flexible polyolefin, fire resistant, heat shrink tubing.

5. For conductors sized 3/0 and greater, provide long barrel double crimp, 2-hole compression type lug connectors, unless otherwise noted.

3. CONDUCTOR PULLING LUBRICANT

1. IDI Electric, "Ideal Yellow 77" or "Wire Lube" as required.

4. CABLE SPLICE KITS

1. 3M Company, cold shrink in line splice kits as follows:
   a. CSA approved;
   b. meets requirements of ANSI C119-1 Standard with voltage ratings up to 1 kV;
   c. cold shrink design which requires no application of heat source for installation;
   d. open-ended, tubular, rubber sleeves which are factory expanded and assembled onto removable core;
   e. core is removed after the tube has been positioned for installation over inline connection, terminal lug, etc., allowing tube to shrink and form water-resistant seal;
   f. cold shrink tubing constructed of EPDM rubber;
   g. suitable for indoor, outdoor and direct burial applications;
   h. additionally, include required compression lugs of type compatible with cable type and electrical vinyl or silicone tape.
2. Provide exact splice type as per termination manufacturer's recommendations to match (or exceed where applicable) cable properties including following:
   a. voltage class rating and insulation BIL level;
   b. conductor material, conductor size and cable/shielding type;
   c. indoor or outdoor application.

3. Install splice kits in accordance with manufacturer's detailed instructions. Prepare cable for accommodating splice jacketing tubes and body in accordance with splice kit manufacturer's instructions. Install proper lugs to suit application as per cable manufacturer's recommendations, using matching size die and crimping tool. Apply overall taping. After installation has been completed and inspected, test splice as per manufacturer's recommendations.
4. Acceptable manufacturers are:
    a. 3M Company;
    b. Tyco Raychem;
    c. Prysmian Cables.

5. TRACER WIRE

1. Tracer wire, also called locator wire, to be provided to assist in locating ducts, conduits, pipes and other lines after they have been buried underground.
2. Standards:
    a. ULC listed and labelled.
    b. ASTM.
    c. ICEA/NEMA.
    d. Direct burial rated.
3. Standard Tracer Wire: solid copper conductor insulated with high molecular weight polyethylene (HMWPE); manufactured according to ULC constructions in both 30 V and 600 V versions suitable for use at maximum continuous operating temperature of 75°C (167°F) in wet and dry locations.
4. Copper-Clad Steel (CCS) Tracer Wire: solid steel core conductor with concentrically clad copper coating and insulated with high molecular weight polyethylene (HMWPE). Copper cladding measures 3% of conductor diameter and has total conductivity of IACS (International Annealed Copper Standard); manufactured according to ULC constructions in both 30 V and 600 V, suitable for use at maximum continuous operating temperature of 75°C (167°F) in wet and dry conditions.
5. Tracer wire to be compatible for use and connection to industry standard frequency generator which is connected directly to cable to be traced, and high or low frequency signal is applied. In passive method, power voltages are sometimes applied at frequency of 50-60 Hz.

6. Connectors to be moisture displacement connectors as recommended by wire manufacturer to suit applications. Connectors equivalent to Copperhead SnakeBite or 3M DBR series.
7. Typically, size no.14 AWG for installation in open trench; no. 2 AWG typically in conjunction with trenching machine; for directional boring applications, minimum no.10 AWG. Comply with manufacturer's recommendations.
8. Jacket colour: unless otherwise required by local governing authority or code, or by Owner, and reviewed with Consultant, provide jacket colour for applications as follows:
   a. Electrical - red;
9. Include for after installation inspection and testing. Refer to Part 3 for additional requirements.

PART 3 - EXECUTION

1. PROJECT CONDITIONS

1. If identified in documents, verify that field measurements and conditions are as identified.
2. Unless specifically noted, cable routing on drawings is schematic and approximate and not reflective of elevations. Route cable as required to meet project conditions. Determine exact routing and lengths on site.

2. CO-ORDINATION

1. Co-ordinate work with work provided under other electrical work and work of other trades.
2. Determine required separation between cable and other work.
3. Determine cable routing to avoid interference with other work.
4. Submit any alternative cable routing to Consultant for review prior to proceeding with work.

3. INSTALLATION OF CONDUCTORS

1. Provide required conductors. Provide fire rated conductors for applications as required by local governing codes and standards, and requirements of local governing authorities.
2. Conductors, unless otherwise noted, to be as follows:
   a. underground inside or outside building and for non-climate-controlled areas - "TWU" or "RWU90";

3. Splicing of conductors is permitted for replacement of existing conductors and extension as noted on drawings and where approved by Owner and reviewed with Consultant. Splicing of conductors is subject to following conditions:
    a. splicing to extend existing conductors;
    b. for low voltage control and signal conductors, splicing made within an electrical box with terminal strips;
    c. for exterior line voltage conductors, splicing made with outdoor weatherproof cold shrink splice kits and mechanical compression connectors; full assembly to suit type and size of conductors and as reviewed with Consultant;
    d. splice/splice box properly identified with suitable painting or labelling;
    e. splice/splice box clearly identified on "as-built" drawings;
    f. use of pressure type twist connectors only for specific applications with prior review with Consultant, but generally not permitted;
    g. use of "split bolts" is not permitted.
4. Install compression connectors with proper dies and compression tool as per connector manufacturer's instructions. Install cold shrink tubing and associated materials as per manufacturer's instructions.
5. Install control wiring as required and as indicated. Confirm exact type of control wiring with manufacturers of equipment/systems being interconnected, and as required by local governing electrical code.
6. Generally, conductor sizes are indicated on drawings. Such sizes are minimum requirements and must be increased, where required, to suit length of run and voltage drop in accordance with applicable conductor voltage drop schedule on drawings or obtained from Consultant. Conductors not sized or specified of type, to be sized and of type in accordance with requirements of local governing electrical code.
7. Do not use conductors smaller than No. 12 AWG in systems over 30 volts, unless otherwise noted. Do not use conductors smaller than No. 6 AWG for exterior luminaire wiring unless otherwise noted.

8. Colour code conductors throughout to identify phases, neutrals and ground by means of self-laminating coloured tape, coloured conductor insulation, or properly secured coloured plastic discs. Colours, unless otherwise noted, to be as follows:
    a. Phase A - red;
    b. Phase B - black;
    c. Phase C - blue;
    d. Ground - green;
    e. Neutral - white;
    f. Control - orange.
9. When pulling wires into conduit use lubricant and ensure that wires are kept straight and are not twisted or abraised.
10. Control conductors, in addition, to be numbered with Brady Ltd. or Electrovert Ltd. Z type markers.
11. Colour code conductors for communications systems in accordance with system component manufacturer's recommendations.
12. Neatly secure exposed wire in apparatus enclosures with approved supports or ties.
13. Install low voltage conductors in conduits, unless otherwise noted within Documents.

4. INSTALLATION OF TRACER WIRE

1. Install tracer wire in accordance with wire manufacturer's recommendations for specific applications.
2. Connect with proper connectors to protect from moisture and corrosion. Do not twist wires together and wrap with electrical tape.
3. Place tracer wire in same orientation to installed pipe. Using spacer, tape tracer wire to pipe every 2.4 m to 3 m (8 to 10 feet) in three o'clock position or provide fill between pipe and tracer wire. Install colour coded warning tape minimum 300 mm (1') above pipe.
4. Bring tracer wire above ground for ease of terminating signal and terminate in test station.
5. Ground ends or wire.
6. After installation is complete, perform conductivity test or locate test and demonstrate to Consultant and Owner.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. SUBMITTALS

1. Submit shop drawings for products and accessories.

PART 2 - PRODUCTS

1. BASIC MATERIALS

1. General:
   a. Materials: CSA approved and/or ULC listed and labelled as required by local governing authorities and codes.
   b. Certification: CSA C22.2 No. 41.
   c. connectors marked with certification, manufacturer, manufacturer catalogue number and approval for conductor size and type.
2. Ground Rods: Copper-clad steel, 20 mm (3/4") diameter circular cross-sectionalized, with driving cap and bronze tip, overall length of 3 m (10') long.
3. Ground Conductors: Solid copper, insulated and bare to suit application and code requirements; and bond conductors.
4. Ground Connections:
   a. Below Grade: Exothermic-welded type connectors, made by exothermic welding process of joining similar metals using high temperature reaction of powdered copper oxide and aluminum.
   b. Above grade or in manholes or hand holes: Compression type copper connectors of type to suit intended applications.
   c. Within substations and vaults: Compression type copper connectors of type to suit intended applications, and in accordance with IEEE 837.
   d. Exothermic connections permitted above grade when approved by Owner and reviewed with Consultant.
   e. When making ground and bonding connections, apply corrosion inhibitor to contact surfaces. Use corrosion inhibitor appropriate for protecting connection between metals used.

5. Ground Pit: Flush in grade grounding pits with following features:
    a. removable cast concrete cover with recessed lifting handle;
    b. cast iron or precast concrete pit;
    c. ground rod, ground clamps and grounding conductors as required;
    d. clay sewer tile for proper drainage.
6. Gravel/Stones: Provide gravel and crushed stones as required by local governing authorities to suit application. Layers to be of thickness not less than required by local governing authorities.
7. Miscellaneous ancillary components to complete grounding and bonding work to requirements of local governing electrical authority and codes.
8. Acceptable Manufacturers:
    a. Exothermic Process:
        i. Cadweld (nVent - Erico).
        ii. BURNDYWeld (Hubbell).
9. Compression Connectors, Ground Rods, Bus Bars, Fittings and Ancillary Products:
    a. Hubbell - Burndy.
    b. nVent - Erico.
    c. ABB - T&B.
    d. ILSCO.

PART 3 - EXECUTION

1. GENERAL GROUNDING AND BONDING REQUIREMENTS

1. Provide required grounding and bonding work in accordance with drawings, local governing electrical authority, governing authorities having jurisdiction and local governing electrical inspection authority. Provide local governing electrical utility's grounding requirements for stations, vaults and electrical rooms, as applicable. Confirm requirements with local governing electrical utility. Comply with requirements of local governing electrical codes.
2. Ground metal fences enclosing electrical equipment. Bond metal equipment platforms which support electrical equipment to equipment ground.

3. Ground and bond various systems in accordance with respective system manufacturers' recommendations and in accordance with local governing electrical code requirements.
4. Make ground connections buried underground, using exothermic welding type copper connections. Install in accordance with manufacturer instructions.
5. Make exposed ground connections using compression connectors and other grounding fittings suitable for applications. Install in accordance with manufacturer instructions.
6. Ground conductors not sized on drawings are to be sized in accordance with local governing electrical authority requirements. Ground conductor size is to be no smaller than requirements specified on drawings.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. SUBMITTALS
   1. Submit shop drawings for products specified in this Section.

PART 2 - PRODUCTS

1. IN GROUND HANDHOLES AND PULL BOXES
   1. Fully weatherproof, watertight and corrosion resistant types for splices, pulls and junction applications:
      a. Cast-in-place concrete.
      b. Pre-cast concrete.
      c. Pre-fabricated made of semi-concrete or non-concrete materials polymer concrete.
   2. CSA approved and in accordance with following, as applicable:
      a. OPSS 602;
      b. ASTM C857;
      c. ANSI/SCTE 77;
      d. Local governing authority requirements.
   3. Concrete to be in accordance with CSA A23.1 and CSA A23.2. Minimum compressive strength to be of 32 MPa (4600 psi), 6-8% air entrainment, and be suitable for installation and use through a temperature range of minus 40°C to 70°C. (-40°F to 158°F).
   4. Polymer concrete to consist of aggregates in combination with polymer resin, and reinforced with fibreglass. Non-conductive and non-flammable. Stable under freeze / thaw conditions.
   5. Include required drainage provisions consisting of sump pit or duct opening in bottom for connection to drainage ducts, as indicated and as reviewed with Consultant.
   6. Enclosures to be designed and installed to withstand loads likely to be imposed and be of size, with wiring/duct entries, covers and bottoms (as noted) and of type to suit specific applications.
   7. Steel Covers:
      a. Galvanized steel according to CAN/CSA-G40.20/G40.21 and CAN/CSA-G164M92.
      b. Checker tread on top side for skid resistance.
      c. Tamper-proof, stainless steel head bolts recessed into cover.

d. Area for logo.
e. Flush mounted with gaskets to prevent ingress of water.
f. No protrusions extending out from top of cover; no tripping hazards.
g. Minimum thickness of cover is 10 mm (3/8").

8. Cable termination hardware to accommodate cables and required grounding hardware. Hardware to be corrosion resistant and in accordance with code requirements.
9. Provide PVC seals on cable entry openings.
10. Identification:
    a. Identification engraving / warning signage, weather and corrosion resistant.
    b. Identification markings on each box embedded on outside vertical surface of box, showing manufacturer's name or trademark, and date of manufacture.
    c. Top surface of cover permanently marked, showing manufacturer's name or trademark, and date of manufacture; this marking embedded into top surface of cover, or embedded into a corrosion-resistant metal plate securely cemented to top surface of cover.
11. Refer to drawings for dimensions.
12. Acceptable manufacturers are:
    a. Armtec Ltd (Brooklin Concrete);
    b. Industrial Cast Stone Ltd.;
    c. Utility Structures Inc.;
    d. Hanson Pipe and Pre-cast;
    e. Hubbell.

PART 3 - EXECUTION

1. INSTALLATION OF HANDHOLES/JUNCTION BOXES

1. Coordinate installation work with trades responsible for excavation and backfilling work.
2. Install handholes/boxes plumb, true to alignment and grade, and firmly bedded on drainage pocket backfill.
3. During installation, duct entry holes to be oriented in required direction. Enlarging of duct entry holes is prohibited.
4. Coordinate connection of ducts to ensure that proper sloping is maintained to suit designed elevations and

slope of duct run and required drainage.

5. Refer to drawing detail for additional requirements.
6. Comply with grounding and bonding requirements of local governing electrical codes and authorities.
7. Confirm drainage provisions and provide as required. Coordinate work with General Contractor to connect drains.
8. Obtain required approvals of work from local governing electrical utility and review with Consultant prior to back filling and covering.
9. Refer to Section entitled Basic Electrical Materials and Methods for excavation, concrete, and backfilling work requirements.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. SUBMITTALS

1. Submit shop drawings for products specified in this Section. In addition to requirements of Section 26 00 10, include for copies of documents of respective manufacturers confirming complete compatibility between lighting controls and luminaires.

2. PRODUCT COMPATIBILITY

1. Lighting controls and luminaires when integrated together for control purposes must be 100% compatible with each other. Coordinate with ballast/driver and LED/lamp manufacturers, switches/timers manufacturers and dimmer/light sensor/occupancy sensor control manufacturers to ensure that components are compatible with each other and that interconnections do not adversely affect performance, life or any warranties.

PART 2 - PRODUCTS

1. ASTRONOMIC TIME SWITCH

1. 7-Day Electronic Astronomic Time Switch, Intermatic ET8015C, CSA certified, with features as follows:
    a. Program can be repeated on a weekly basis;
    b. Multi-volt operation from 120-277 VAC, 50/60 Hz;
    c. Automatically adjusts for daylight savings time;
    d. to-the-minute programming for accurate load control and reduced energy costs;
    e. Astronomic feature provides sunset ON and sunrise OFF settings to eliminate the need for separate photo control devices;
    f. Astronomic programming can be combined with independent programs to provide a sunset ON and timed OFF program;
    g. 2-circuit models are field (jumper) configurable for: 2 independent outputs, DPST output, or 1 channel ON pulse OFF pulse output;
    h. Up to 28 ON/28 OFF setpoints or events and 4 Astronomic events;
    i. Dusk/Dawn Astronomic events can be distributed throughout the days of the week;
    j. Automatic Daylight Saving Time (DST) ON/OFF adjustment (factory enabled);

k. Non-volatile EEPROM memory protects programming indefinitely;
l. Temporary override or permanent manual override available via control buttons.

2. Include for required wiring, standard turn-lock receptacle and mounting hardware.
3. Acceptable manufacturers are:
   a. Intermatic;
   b. Tork;
   c. Paragon Electric.

PART 3 - EXECUTION

1. GENERAL

1. Install components in accordance with manufacturer's instructions to suit specific installation requirements.
2. When outside lighting control work is complete, test operation of control system and adjust as required.
3. Review exact sequence of operation with Consultant prior to start of Work.

2. INSTALLATION OF TIMERS

1. Provide timers to control lighting and other equipment as required and reviewed with Consultant.
2. Exact type of timers to be verified by manufacturer/supplier to ensure proper compatibility to interconnected equipment and loads. Confirm with respective manufacturers.
3. Install devices in accordance with manufacturer's instructions. Provide wiring in conduit. Provide required power connections and interconnection to luminaires, equipment, and power panels.
4. Programme timers as per schedule confirmed with Owner and reviewed with Consultant.
5. Provide engraved nameplate identifying each timer.
6. After installation, adjust, test, and verify operation.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. INTRODUCTION
   1. The work covered in this Section is subject to all the requirements in the General Conditions of the Specifications.
   2. The contractor shall coordinate all of the work in this Section with all of the trades covered

2. DESCRIPTION OF WORK
   1. The extent of the power control enclosure work is indicated by the drawings and by the requirements of this Section. It is defined to include, but not by way of limitation:
      a. The power management control system controlled locally through master switches
      b. The lighting management control system controlled locally through switching provided by devices such as astronomic timers, etc.
   2. The power control enclosure and control system shall comprise the following equipment, all of which is to be supplied by approved manufacturer(s) includes, but is not limited to the following:
      a. Factory pre-wired enclosure.
      b. Fused Disconnect Switch.
      c. Astronomic timers with auto-adjust dust to dawn feature.
      d. Override Switch Bat-Handled.
      e. Contactors (if applicable).
      f. Terminal Blocks.

3. QUALITY ASSURANCE
   1. Manufacturers: Firms engaged in the manufacture of power control equipment and ancillary equipment, of the types indicated, whose products have been in satisfactory use in similar service for not less than five years.
   2. Component Testing: All electronic components, and electrical components are to be factory tested.
   3. System Support: Factory telephone/email support shall be available free of charge during normal business hours.

4. REFERENCES
   1. NEMA Compliance: Applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.
   2. Enclosure must meet or exceed NEMA 3R testing,

from an approved NEMA testing centre.

5. WARRANTY
   1. Manufacturer shall warrant specified equipment to be free from defects in materials and workmanship for at least five years from the date of purchase.

6. MANUFACTURER
   1. Acceptable manufacturer: Pedestal Solutions Inc.
   2. Refer to Section 01 33 00 for instructions on substitutions.
   3. Proposed substitutions must include detailed summary of specification review noting compliance on a line by line basis.
   4. Contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and structural changes
   5. Complete shop drawings with deviations are required for review prior to installation and rough-in.

7. SUBMITTALS
   1. Product Data Sheets: Submit manufacturer's data sheet for the lighting control enclosure and specified components
   2. Panel Drawings: Submit manufacturer's dimensional drawings and schematics drawing for electrical system.
   3. One Line Diagram: Submit a one-line diagram of the system configuration proposed if it differs from that illustrated in the drawings included in these Specifications.
   4. Typical Wiring Diagrams: Submit typical connection diagrams for all components.

PART 2 - PRODUCTS

1. ENCLOSURES
   1. The enclosures shall be of a free-standing pedestal type, built from aluminum or 316 stainless steel. Include a two-piece front panel complete with locking latch and pad lock connection. The standard color shall be Protech PS211G58, a substitution must be approved beforehand. All enclosures shall have a maximum depth of 248 mm (10"), a maximum width of 502 mm (19.75"), a maximum height of 1067 mm (42"). The enclosures shall be #12 gauge thickness.
      a. The enclosures shall come equipped with steel backplates.

b. Enclosures shall be entirely factory assembled and wired:
    i. Each enclosure shall meet all Electrical Safety Authority requirements.
    ii. Each enclosure shall have an ESA approval sticker before going into use.

PART 3 - EXECUTION

1. CUSTOMIZATION

1. Manufacturer shall provide any custom components and/or alterations as required by designer, and engineer, as per supplied design build drawings.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. SUBMITTALS

1. Submit shop drawings for products of this Section, and on Schedule of Luminaires on drawings.
2. Submittals to include:
    a. luminaire dimensions, aperture dimensions, cutout dimensions;
    b. driver information for each luminaire, including maximum circuit loading limitations, and dimming details;
    c. total input watts;
    d. lumen rating in accordance with IESNA testing procedures;
    e. candlepower summary, candela distribution zonal lumen summary;
    f. luminaire efficiency;
    g. lamp life rating (based on LM-80 and TM-21);
    h. colour temperature;
    i. colour fidelity (as per TM-30 preferred);
    j. finishes;
    k. options being provided;
    l. other relevant information to ensure design intent.
3. For poles, submit documentation that poles supplied are suitable for steady wind velocity and gust velocity of area of installation, and suitable for total effective projected area of mounted lighting equipment.
4. For exterior site areas, provide luminaire manufacturer's computer prepared detailed photometric layout drawings with complete photometry showing performance levels of proposed luminaires. Clearly identify lighting levels, quantity, locations, mounting heights, etc. Identify variances from base design.

2. WARRANTY

1. Warranty requirements for luminaires are as follows:
    a. warranties to be full comprehensive product replacement direct from luminaire manufacturers;
    b. when LEDs and drivers, or lamps and ballasts are supplied with luminaire by luminaire manufacturer, warranty to be under responsibility of luminaire manufacturer;

c. unless otherwise noted, warrant LED luminaires and LED drivers for a period of minimum 5 years from date when Ready-for-Takeover has been achieved; include for personnel, equipment and labour for replacing products onsite, for duration of Contract warranty period defined in Division 00 or 01; for remainder of 5 years extended warranties beyond Contract warranty period, include typical conditions of product manufacturers' replacement warranty.

3. PRODUCT COMPATIBILITY

1. Luminaires and lighting controls when integrated together for control purposes must be 100% compatible with each other. Coordinate with ballast/driver and LED/lamp manufacturers, LV relay panel manufacturers, switches/timers manufacturers and dimmer/light sensor/occupancy control manufacturers to ensure that components are compatible with each other and that interconnections do not adversely affect performance, life or any warranties.

4. SUBSTITUTIONS

1. Provide luminaires as specified in Schedule of Luminaires and as per documented List of Manufacturers, where applicable. During construction period, no substitutions are permitted unless compelling reasons are given and accepted by Owner and reviewed with Consultant. A delay caused by Contractor's failure to order luminaires to meet construction schedule is not a valid reason.
2. Make requests for proposed substitutions as per requirements of Section entitled Electrical Work General Instructions. In addition, make payments for additional costs to Consultant for these reviews, based on amount of $250 per luminaire type, and per submission.
3. Consideration of any proposed substitutions after Bid Period to be at Consultant's sole discretion.

PART 2 - PRODUCTS

1. LUMINAIRES

1. Provide luminaires in accordance with Schedule of Luminaires. Luminaires including integrated LEDs and drivers are to be CSA approved or have special local electrical authority approval. Ensure luminaires and integrated LEDs and drivers are tested for full compatibility operation prior to shipping to site.

2. LEDS AND DRIVERS

1. Typically, general features include:
    a. CSA approved, ULC listed and labelled;
    b. NEMA 410 compliant drivers;
    c. typical operating temperatures:
        i. Luminaires for applications in extreme cold, non-climate-controlled area: operating temperature range through -40°C (-40°F) to 60°C (140°F).
    d. with rapid and changing development of LED technology, provide most technically proven and most advanced and successfully tested LED technology at time of installation;
    e. specification standards to meet requirements of IES LM 79 and LM-80.
    f. where connected to dimmers, be 100% compatible with connected dimmer controls to provide dimming down to 1%. Coordinate with dimming controls vendors to ensure that technical operations of dimmers (i.e. forward phase, reverse phase, etc.) match LED/ driver technology. Clearly identify this information in shop drawing submissions.
2. Typical light emitting diodes (LEDs) features to include:
    a. LEDs to be selected from same colour bin size for consistency in chromaticity and meet ANSI C78 377A as a minimum;
    b. generally, colour temperature range to be from 2700 K to 6500 K; specific temperature requirements to be identified on Schedule of Luminaires and reviewed with Consultant prior to ordering;
    c. minimum CRI of 85;

   d. minimum rated life (based on LM-80 and TM-21) from 50,000 to 70,000 hours.

3. Typical driver features to include:
   a. operate from 60 Hz input source of 120 VAC/347VAC (as applicable) with sustained variations of ± 10% (voltage and frequency) with no damage to driver;
   b. output regulated to ±5% across load range;
   c. power factor greater than 0.90;
   d. total harmonic distortion less than 20%;
   e. Class A sound rating;
   f. comply with ANSI C62.41 Category A for transient protection.
4. LEDs and drivers are to be 100% compatible with each other. Luminaire with LED and driver to be CSA approved or ULC listed, and certified and tested as a complete assembly.
5. Above features are general requirements to ensure that any proposed luminaires that are not base specified are to have premium quality LEDs and drivers. Refer to Schedule of Luminaires.
6. Acceptable LED manufacturers are:
   a. Cree;
   b. Nichia;
   c. Lumileds;
   d. Toshiba;
   e. Samsung.
7. Acceptable driver manufacturers are:
   a. Philips;
   b. OSRAM Sylvania;
   c. Lutron;
   d. eldoLED;
   e. GE.
8. For specialty luminaires used for accent or task lighting applications, acceptable manufacturers of LEDs and drivers to be as listed above. Additionally, for these specialty luminaires, acceptable manufacturer of LEDs and drivers to include those of base specified luminaires. Refer to Schedule of Luminaires for additional requirements.

3. SURGE PROTECTION FOR LED SYSTEMS

1. Luminaire manufacturers supplying exterior LED luminaires are to include surge protection for LED systems in accordance with IEEE and ANSI C62.41.2 transient surge requirements. Surge protection to be level of 6 kV/3 kA for low exposure conditions (low grade level landscape lighting) and, 10 kV/10 kA for high exposure conditions (pole mounted lighting).

PART 3 - EXECUTION

1. INSTALLATION OF LUMINAIRES

1. Reference Electrical Drawings for general luminaire location, circuiting, and controls. Reference landscape Drawings for more detailed location of luminaires. Consult both sets of drawings in preparation for installation. Review final locations with Consultant prior to roughing-in.
2. Review construction of materials where luminaires are to be located. Comply with local governing building code requirements for providing openings in walls, partitions and floor assemblies required to be a fire separation, to be protected with fire separations and closures. Where luminaires are not specified with fire rated housings, provide other means reviewed with Consultant and meeting local governing building code requirements.
3. Installed luminaires may be energized for testing installation and be de-energized until system commissioning. Installed luminaires may not be used as construction lights.
4. Protective material to remain on luminaires until prior to commissioning. At commissioning, clean luminaires to in new condition.
5. Confirm with luminaire manufacturers that luminaires have been tested at factory with integrated LEDs and drivers to ensure 100% compatibility of operation between products. Document in report signed by manufacturer's authorized representative. Submit copy to Consultant.

6. After shop drawing review process has been completed with Consultant, provide luminaires as required. Obtain required training from manufacturer's representative on any special installation procedures. Install products in accordance with manufacturer's instructions to suit specific installation requirements.
7. Before placing luminaire orders:
    a. verify quantity requirements;
    b. thoroughly review finishes and construction details;
    c. ensure that required mounting assemblies, frames, rings and similar features are included;
    d. review colours and finishes with Consultant.
8. Include for assembly and mounting of luminaires and lamps, complete with:
    a. wiring and connections;
    b. fittings and hangers;
    c. aligners;
    d. box covers;
    e. other accessories required for a complete, safe and fully operational assembly.
9. Where outlet boxes locations are shown on drawings, they are diagrammatic only. Position outlet boxes to coincide with suspension hangers and knockouts.
10. Prepare fixtures, trim and poles and standards required to be painted.
11. Splices:
    a. Minimize number of splices.
    b. Splices are not to be made unless properly terminated in accessible identified junction boxes.
12. Use cloth gloves when handling reflector cones, louvers, lamps, glass, sconces and all exposed surfaces of luminaires.
13. Co-ordinate luminaire installation with work of other trades to ensure that necessary recessing depths and mounting spaces are provided.
14. Install luminaires in accordance with applicable landscape Drawings and/or field instructions issued by Consultant. Review final luminaire locations with Consultant prior to roughing-in. In equipment rooms, shafts and similar secondary areas, install luminaires after mechanical and other major work is roughed in and adjust luminaire locations as required.

15. Align and position all adjustable luminaires and ensure that luminaires with adjustable lamp holders are properly positioned to correspond to lamps specified.
16. Comply with requirements of local governing electrical code regarding support of luminaires in suspended ceilings.
17. Connect luminaires to power circuits and controls as required. Refer to drawings notes and schedules. Include for both normal and emergency power circuits as required.
18. Notify Consultant immediately and relocate if necessary as reviewed with Consultant, if
    a. any reason that a fixture cannot be located where it is dimensioned or shown on construction documents.
19. Concrete Bases:
    a. Secure poles for pole mounted, exterior type luminaires to concrete bases as detailed.
    b. Co-ordinate required work including excavation/backfilling/concrete work to provide bases.
    c. Provide anchor bolt covers and anchor bolt templates for proper positioning of anchor bolts in concrete.
    d. Refer to concrete base detail on drawings; this detail is for general requirements only.
    e. Include costs for and engage Professional Structural Engineer licensed in Place of Work and with liability insurance, to review and endorse final base design work; review exact details with Consultant; grade levels may be different in various areas.
20. Extend ground conductors from metal parts of poles to building grounding provisions. Generally, locate devices in locations on drawings, but base exact locations on coordination and review with Consultant and requirements of local governing authorities. Review luminaires and pole finishes with Consultant prior to ordering. Run wiring in conduit.
21. Provide seismic restraints to suspended luminaires, in accordance with latest local governing building code requirements to suit zone of Place of Work.
22. Ground and bond luminaires as per local governing electrical code requirements.

23. If requested by Owner or Consultant, demonstrate operation of luminaires intended for special applications such as building floodlights and other decorative purposes. Adjust their locations within reasonable distance to obtain effects desired.
24. Test and adjust exterior luminaires at times after sunset, in presence of Consultant and at times acceptable to Owner and reviewed with Consultant.
25. Properly identify circuits and components in manner reviewed with Consultant.
26. Prior to Ready-for-Takeover to Owner, clean luminaires in manner recommended by manufacturer and to satisfaction of Owner.
27. Lamps to be new and intact when project is complete and ready for acceptance.
28. Include a full lamp listing in Operating and Maintenance Instruction Manuals.
29. Additionally, refer to testing and verification requirements as recommended by the manufacturer.
30. Refer to Section entitled Lighting Control for related controls work.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 32 11 23 Aggregate Base Courses

2. REFERENCES
   1. ASTM International
      a. ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600kN-m/m³).
   2. CSA International
      a. CSA A23.1/A23.2-[09], Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
   3. Ontario Provincial Standard Specifications (OPSS)
      a. OPSS 1004-[05], Material Specification for Aggregates-Miscellaneous.
      b. OPSS SP 110F13-[03], Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

3. ACTIONAND INFORMATIONAL SUBMITTALS
   4. Submit in accordance with Contract requirements.

PART 2 - PRODUCTS

1. MATERIALS
   1. Select Subgrade to OPSS SP 110F13. Sand to OPSS 1004.
   2. Unshrinkable fill: concrete to CSA A23.1/A23.2.

PART 3 - EXECUTION

1. EXAMINATION
   1. Verification of Conditions:
      a. Before commencing work verify locations of buried services on and adjacent to site.

2. Evaluation and Assessment:
    a. Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.
    b. Testing of materials and compaction of backfill and fill will be carried out by testing laboratory approved by Contract Administrator.
    c. Not later than 1 week before backfilling or filling, provide to designated testing agency, 23 kg sample of fill materials proposed for use.
    d. Not later than 48 hours before backfilling or filling with approved material, notify Consultant so that compaction tests can be carried out by designated testing agency.
    e. Before commencing work, conduct, with the Consultant, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, and paving, survey bench marks and monuments which may be affected by work.

2. PREPARATION

1. Temporary Erosion and Sedimentation Control:
    a. Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with sediment and erosion control plan.
    b. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
    c. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

2. Protection of in-place conditions:
    a. Protect excavations from freezing.
    b. Keep excavations clean, free of standing water, and loose soil.
    c. Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Consultant’s approval.
    d. Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
    e. Protect buried services that are to remain undisturbed.

3. Removal:
    a. Remove obsolete buried services within 2 m of foundations. Cap cut-offs.
    b. Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
    c. Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
    d. Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
    e. Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.

3. EXCAVATION

1. Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.

2. Topsoil / Soil Cover stripping:
    a. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
    b. Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
    c. 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.
    d. Stockpile in locations as directed by the Consultant.

3. Excavate as required to carry out work, in all materials met.
    a. Do not disturb soil or rock below bearing surfaces. Notify the Consultant when excavations are complete.
    b. If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
    c. Fill excavation taken below depths shown without the Consultant's written authorization with concrete of same strength as for footings.

4. Excavate for slabs and paving to subgrade levels.
    a. Remove topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

4. SITE QUALITY CONTROL

1. Fill material and spaces to be filled to be inspected and approved by the Consultant.

5. BACKFILLING

1. Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from the Consultant.

2. Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

3. Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

4. Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with selected subgrade material compacted as specified for fill.

5. Placing:
    a. Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
    b. Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.

6. Compaction: compact each layer of material to following densities for material to ASTM D 698:
    a. To underside of basecourses: 98%.
    b. Basecourses: 98%.
    c. Elsewhere: 95%.

7. Under slabs and paving:
    a. as per Contract Drawings

8. In trenches:
    a. Up to 300 mm above pipe or conduit: sand placed by hand.
    b. Over 300 mm above pipe or conduit: native material approved by the Consultant.

9. Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

10. Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.

6. GRADING

1. Grade to ensure that water will drain away from structures, walls and paved areas, to catch basins and other disposal areas approved by Consultant. Grade to be gradual between finished spot elevations as indicated.

7. CLEANING

1. Progress Cleaning: clean in accordance with Contract requirements
    a. Dispose of cleared and grubbed material off site daily.

2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Contract requirements.

3. Waste Management: separate waste materials for reuse and recycling in accordance with Contract requirements.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 32 12 16 Asphalt Paving
2. REFERENCES
   1. American Society for Testing and Materials (ASTM)
      a. ASTM D 4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
3. SAMPLES
   2. Submit samples in accordance with Contract requirements.
   3. Provide the Consultant with access to source and processed material for sampling.
4. WASTE MANAGEMENT AND DISPOSAL
   1. Divert unused granular materials from landfill to local quarry facility as approved by Consultant.

PART 2 - PRODUCTS

1. MATERIALS
   1. Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
   2. Flat and elongated particles of coarse aggregate: to ASTM D 4791.
      a. Greatest dimension to exceed five times least dimension.
   3. Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
      a. Natural sand.
      b. Manufactured sand.
      c. Screenings produced in crushing of quarried rock, boulders, gravel or slag.
   4. Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
      a. Crushed rock.

b. Gravel and crushed gravel composed of naturally formed particles of stone.
c. Light weight aggregate, including slag and expanded shale.

2. SOURCE QUALITY CONTROL

1. Inform the Consultant of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.

2. If, in opinion of the Consultant, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

3. Advise the Consultant 1 week in advance of proposed change of material source.

4. Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

1. PREPARATION

1. Topsoil stripping

a. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
b. Begin topsoil stripping of areas as indicated after area has been cleared of weeds and grasses and removed from site.
c. Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
d. Stockpile in locations as on site for reuse. Stockpile height not to exceed 2 m.

2. Processing
a. Process aggregates uniformly using methods that prevent contamination, segregation and degradation.
b. Blend aggregates, if required, to obtain gradation

requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by the Consultant.

c. Wash aggregates, if required to meet specifications. Use only equipment approved by the Consultant.
d. When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

3. Handling
    a. Handle and transport aggregates to avoid segregation, contamination and degradation.

4. Stockpiling
    a. Stockpile aggregates on site in locations as indicated unless directed otherwise by the Consultant. Do not stockpile on completed pavement surfaces.
    b. Stockpile aggregates in sufficient quantities to meet Project schedules.
    c. Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
    d. Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
    e. Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
    f. Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Consultant within 48 h of rejection.
    g. Stockpile materials in uniform layers of thickness as follows:
        i. Max 1.5 m for coarse aggregate and base course materials.
        ii. Max 1.5 m for fine aggregate and sub-base materials.
        iii. Max 1.5 m for other materials.
    h. Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
    i. Do not cone piles or spill material over edges of piles.
    j. Do not use conveying stackers.
    k. During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being

removed from stockpile.

2. CLEANING

1. It will be contractor's responsibility to remove any unused aggregate onsite.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 31 00 99 Earthworks for Minor Works
   2. Section 31 05 16 Aggregate Materials

2. REFERENCES
   1. ASTM International
      a. ASTM D698 [91(1998)], Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN m/m).

3. EXISTING CONDITIONS
   1. Known underground and surface utility lines and buried objects are as indicated on site plan.

4. PROTECTION
   1. Protect pavement, surface or underground utility lines which are to remain as directed by Consultant. If damaged, restore to original or better condition unless directed otherwise.
   2. Maintain access roads to prevent accumulation of construction related debris on roads.

5. SCOPE OF WORK
   1. Finish rough grading in all areas of the project area within the limit of work as directed.

PART 2 - PRODUCTS

1. MATERIALS
   1. Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Geotechnical Consultant.

PART 3 - EXECUTION

1. GRADING
   1. Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
   2. Contractor to verify excavation depths below finish grades, and obtain approval from consultant and city prior to excavation.

3. Slope rough grade away from structures as indicated.

4. Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

5. Compact filled and disturbed areas to maximum dry density to ASTM D698 as follows:
   a. 95% under landscaped areas.
   b. 98% S.P.M.D.D. under driveway, pathway, and pavement areas.

6. Do not disturb soil within branch spread of trees or shrubs to remain.

2. TESTING

1. Inspection and testing of soil compaction will be carried out by a 3rd party testing laboratory designated by the Region. Costs of tests will be paid as an allowance.

2. Submit testing procedure, frequency of tests as designated by the Region and Consultant for approval.

3. SURPLUS MATERIAL

1. Remove surplus material and material unsuitable for fill, grading or landscaping off site as directed by the Consultant and accordance with Contract requirements.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 31 05 16 – Aggregate Materials.
2. REFERENCES
   1. American Society for Testing and Materials (ASTM)
      a. ASTM C 117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
      b. ASTM C 131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
      c. ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
      d. ASTM D 422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.
      e. ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
      f. ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
      g. ASTM D 4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
   2. Canadian General Standards Board (CGSB)
      a. CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
      b. CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
3. WASTE MANAGEMENT AND DISPOSAL
   3. Separate and recycle waste materials in accordance with Contract requirements.
   4. Divert unused granular material from landfill to local quarry facility as approved by the Consultant.

PART 2 - PRODUCTS

1. MATERIALS

1. Granular sub-base material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
    a. Crushed, pit run or screened stone, gravel or sand.
    b. Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

PART 3 - EXECUTION

1. PLACING

1. Place granular sub-base after subgrade is inspected and approved by the Consultant.
2. Construct granular sub-base to depth and grade in areas indicated.
3. Ensure no frozen material is placed.
4. Place material only on clean unfrozen surface, free from snow or ice.
5. Begin spreading sub-base material on crown line or high side of one-way slope.
6. Place granular sub-base materials using methods which do not lead to segregation or degradation.
7. Place material to full width in uniform layers not exceeding 150 mm compacted thickness. The Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.
8. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
9. Remove and replace portion of layer in which material has become segregated during spreading.

2. COMPACTION

1. Compaction equipment to be capable of obtaining required material densities.

2. Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from the Consultant before use.

3. Equipped with device that records hours of actual work, not motor running hours.

4. Compact to density of not less than 98% corrected maximum dry density maximum dry density in accordance with ASTM D 698 ASTM D 1557.

5. Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

6. Apply water as necessary during compaction to obtain specified density.

7. In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Consultant.

8. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3. PROOF ROLLING

1. For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

2. Obtain approval from the Consultant to use non-standard proof rolling equipment.

3. Proof roll at level in sub-base as indicated. If non-standard proof rolling equipment is approved, the Consultant to determine level of proof rolling.

4. Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

5. Where proof rolling reveals areas of defective subgrade:
    a. Remove sub-base and subgrade material to

depth and extent as directed by the Consultant.

b. Backfill excavated subgrade with common material and compact in accordance with sub-base material and compact in accordance with this Section.
c. Replace sub-base material and compact.

6. Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this Section at no extra cost.

4. SITE TOLERANCES

1. Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

5. PROTECTION

1. Maintain finished sub-base in condition conforming to this Section until succeeding base is constructed, or until granular sub-base is accepted by the Consultant.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 31 05 16 Aggregate Materials.
   2. Section 32 11 16.01 Granular Sub-base

2. REFERENCES
   1. American Society for Testing and Materials (ASTM)
      a. ASTM C 117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
      b. ASTM C 131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
      c. ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
      d. ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
      e. ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
      f. ASTM D 4318-[00], Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
   2. Canadian General Standards Board (CGSB)
      a. CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
      b. CAN/CGSB-8.2-M8, Sieves, Testing, Woven Wire, Metric.

3. DELIVERY, STORAGE, AND HANDLING
   1. Deliver and stockpile aggregates in accordance with Section 31 05 16 - Aggregate Materials. Stockpile minimum 50% of total aggregate required prior to beginning operation.
   2. Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

4. WASTE MANAGEMENT AND DISPOSAL
   1. Separate and recycle waste materials accordance with Contract requirements.

2. Divert unused granular material from landfill to local quarry facility as approved by the Consultant.

PART 2 - PRODUCTS

1. MATERIALS

1. Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
    a. Crushed stone or gravel.
    b. Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

PART 3 - EXECUTION

1. SEQUENCE OF OPERATION

1. Place granular base after subgrade surface is inspected and approved by the Consultant.

2. Placing
    a. Construct granular base to depth and grade in areas indicated.
    b. Ensure no frozen material is placed.
    c. Place material only on clean unfrozen surface, free from snow and ice.
    d. Begin spreading base material on crown line or on high side of one-way slope.
    e. Place material using methods which do not lead to segregation or degradation of aggregate.
    f. Place material to full width in uniform layers not exceeding 150 mm compacted thickness. The Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.
    g. Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
    h. Remove and replace that portion of layer in which material becomes segregated during spreading.

3. Compaction Equipment
    a. Compaction equipment to be capable of

obtaining required material densities.
   b. Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from the Consultant before use.
   c. Equipped with device that records hours of actual work, not motor running hours.

4. Compacting
   a. Compact to density not less than 98% corrected maximum dry density in accordance with ASTM D 698 and ASTM D 1557.
   b. Shape and roll alternately to obtain smooth, even and uniformly compacted base.
   c. Apply water as necessary during compacting to obtain specified density.
   d. In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Consultant.
   e. Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

5. Proof rolling
   a. For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
   b. Obtain approval from the Consultant to use non-standard proof rolling equipment.
   c. Proof roll at level in granular base as indicated. If use of non-standard proof rolling equipment is approved, the Consultant to determine level of proof rolling.
   d. Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
   e. Where proof rolling reveals areas of defective subgrade:
      i. Remove base, sub-base and subgrade material to depth and extent as directed by the Consultant.
      ii. Backfill excavated subgrade with

common material and compact in accordance with sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.

iii. Replace sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-base.

iv. Replace base material and compact in accordance with this Section.

f. Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by the Consultant and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this Section at no extra cost.

2. SITE TOLERANCES

1. Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3. PROTECTION

1. Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by the Consultant.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 32 12 16 Asphalt Paving
2. REFERENCES
   1. American Society for Testing and Materials International, (ASTM)
      a. ASTM D 140-01, Standard Practice for Sampling Bituminous Materials.
   2. Canadian General Standards Board (CGSB)
      a. CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
3. ACTION AND INFORMATIONAL SUBMITTALS
   3. Submit samples in accordance with Contract requirements.
   4. Sample asphalt tack coat material to: ASTM D 140.
   5. Provide access on tank truck for the Consultant to sample asphalt material to be incorporated into Work, in accordance with ASTM D 140.
4. QUALITY ASSURANCE
   1. Upon request by the Consultant, submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this Section.
5. DELIVERY, STORAGE AND HANDLING
   1. Deliver, store and handle materials in accordance with ASTM D 140.
   2. Provide, maintain and restore asphalt storage area.
6. WASTE MANAGEMENT AND DISPOSAL
   1. Separate waste materials for reuse and recycling in accordance with Contract requirements, and with the O. Reg.102/94: Waste Audits and Waste Reduction Work Plans.
   2. Divert unused asphalt from landfill to facility capable of recycling materials.

PART 2 - PRODUCTS

1. MATERIALS
   1. Anionic emulsified asphalt: to CAN/CGSB-16.2, grade: SS-1.
   2. Water: clean, potable, free from foreign matter.
2. EQUIPMENT
   1. Pressure distributor to be:
      a. Designed, equipped, maintained and operated so that asphalt material can be:
         i. Maintained at even temperature.
         ii. Applied uniformly on variable widths of surface up to 5 m.
         iii. Applied at readily determined and controlled rates from 0.2 to 5.4 L/m² with uniform pressure, and with an allowable variation from any specified rate not exceeding 0.1 L/m².
         iv. Distributed in uniform spray without atomization at temperature required.
      b. Equipped with meter, registering metres of travel per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
      c. Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
      d. Equipped with an easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
      e. Equipped with accurate volume measuring device or calibrated tank.
      f. Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
      g. Equipped with nozzle spray bar, with operational height adjustment.
      h. Cleaned if previously used with incompatible asphalt material.

PART 3 - EXECUTION

1. APPLICATION
   1. Obtain the Consultant’s approval of surface before

applying asphalt tack coat.

2. Apply asphalt tack coat only on clean and dry surface.

3. Dilute asphalt emulsion with water at 1:1 ratio for application.
    a. Mix thoroughly by pumping or other method approved by the Consultant.

4. Apply asphalt tack coat evenly to pavement surface at rate as directed by the Consultant, but not to exceed 0.7 L/m².

5. Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.

6. Do not apply asphalt tack coat when air temperature is less than 10 degrees C or when rain is forecast within 2 hours of application.

7. Apply asphalt tack coat only on unfrozen surface.

8. Evenly distribute localized excessive deposits of tack coat by brooming as directed by Contract Administrator.

9. Where traffic is to be maintained, treat no more than one half of width of surface in one application.

10. Keep traffic off tacked areas until asphalt tack coat has set.

11. Re-tack contaminated or disturbed areas as directed by the Consultant.

12. Permit asphalt tack coat to set before placing asphalt pavement.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 32 11 16.01 Granular Sub-Base
   2. Section 32 11 23 Aggregate Base Courses

2. REFERENCES
   1. American Association of State Highway and Transportation Officials (AASHTO)
      a. AASHTO M320-02, Standard Specification for Performance Graded Asphalt Binder.
      b. AASHTO R29-02, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
      c. AASHTO T245-97(2001), Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.
   2. Asphalt Institute (AI)
      a. AI MS2-1994 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
   3. American Society for Testing and Materials International, (ASTM)
      a. ASTM C 88-99a, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
      b. ASTM C 117-95, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
      c. ASTM C 123-98, Standard Test Method for Lightweight Particles in Aggregate.
      d. ASTM C 127-01, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
      e. ASTM C 128-01, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
      f. ASTM C 131-01, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
      g. ASTM C 136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

h. ASTM C 207-91(1997), Standard Specification for Hydrated Lime for Masonry Purposes.
i. ASTM D 995--95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
j. ASTM D 2419-02, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
k. ASTM D 3203-94(2000), Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
l. ASTM D 4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

4. Canadian General Standards Board (CGSB)
   a. CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.
   b. CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
   c. CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.

3. PRODUCT DATA

5. Provide submittals in accordance with Contract requirements.

6. Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175 degrees C at least 4 weeks prior to beginning Work.

7. Submit manufacturer's test data and certification that asphalt cement meets requirements of this Section.

8. Submit manufacturer's test data and certification that hydrated lime meets requirements of this Section.

4. SAMPLES

1. Submit samples in accordance with Contract requirements.

2. Inform the Consultant of proposed source of aggregates and provide access for sampling at least 4 weeks prior to beginning Work.

5. DELIVERY,

1. Deliver and stockpile aggregates in accordance with

STORAGE AND HANDLING

Section 31 05 16 - Aggregate Materials. Stockpile minimum 50 % of total amount of aggregate required before beginning asphalt mixing operation.

2. When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.

3. Stockpile fine aggregate separately from coarse aggregate, although separate stockpiles for more than two mix components are permitted.

4. Provide approved storage, heating tanks and pumping facilities for asphalt cement.

5. Submit to the Consultant copies of freight and waybills for asphalt cement as shipments are received. The Consultant reserves right to check weights as material is received.

6. Stockpile crushed RAP separately in accordance with Section 31 05 16 - Aggregate Materials.

6. WASTE MANAGEMENT AND DISPOSAL

1. Separate waste materials for reuse and recycling in accordance with Contract requirements.

2. Remove from site and dispose of all packaging materials at appropriate recycling facilities.

3. Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling where approved by the Consultant.

4. Divert unused aggregate materials from landfill to quarry facility for reuse as approved by the Consultant.

5. Divert unused asphalt from landfill to facility capable of recycling materials.

6. Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

1. MATERIALS

1. Asphalt cement: to CAN/CGSB-16.3.

2. Performance graded asphalt cement: to AASHTO M320, grade PG 58 - 28 when tested to AASHTO R29.

3. Reclaimed asphalt pavement:
    a. Crushed and screened so that 100% of RAP material passes 50 mm screen before mixing.

4. Aggregates: in accordance with Section 31 05 16 - Aggregate Materials: General and following requirements:
    a. Crushed stone or gravel.
    b. Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
    c. Coarse aggregate: aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C 136.
    d. When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.
    e. Separate stockpiles for coarse and fine aggregates not required for sheet asphalt.
    f. Do not use aggregates having known polishing characteristics in mixes for surface courses.
    g. Sand equivalent: ASTM D 2419. Min: 50.

5. Mineral filler:
    a. Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
    b. Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.
    c. Mineral filler to be dry and free flowing when added to aggregate.

6. Anti-stripping agent: hydrated lime to ASTM C 207 type

N. Add lime at rate of approximately 2-3% of dry weight of aggregate.

7. Water: to approval of the Consultant.

2. EQUIPMENT

1. Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

2. Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

3. Vibratory rollers:
    a. Minimum drum diameter: 1200 mm.
    b. Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.

4. Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
    a. Boxes with tight metal bottoms.
    b. Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
    c. In cool weather or for long hauls, insulate entire contact area of each truck box.
    d. Use only trucks which can be weighed in single operation on scales supplied.

5. Hand tools:
    a. Lutes or rakes with covered teeth for spreading and finishing operations.
    b. Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by the Consultant, may be used instead of tamping irons.
    c. Straight edges, 4.5 m in length, to test finished surface.

6. Plant testing facility: provide laboratory space at plant site for exclusive use of the Consultant, for performing tests, keeping records and making reports.

3. MIX DESIGN

1. Mix design to be approved by the Consultant.
2. Mix design to be developed by testing laboratory approved by the Consultant.
3. Mix to contain maximum 50% by mass of RAP. The Consultant may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.
4. Design of mix: by Marshall method to requirements below.
    a. Compaction blows on each face of test specimens: 50.
    b. Do not change job-mix without prior approval of the Consultant. When change in material source proposed, new job-mix formula to be approved by the Consultant.

PART 3 - EXECUTION

1. PLANT AND MIXING REQUIREMENTS

1. Batch and continuous mixing plants:
    a. To ASTM D 995.
    b. Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Do not load frozen materials into bins.
    c. Feed cold aggregates to plant in proportions to ensure continuous operations.
    d. Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
    e. Before mixing, dry aggregates to moisture content not greater than 1 % by mass or to lesser moisture content if required to meet mix design requirements. Heat to temperature required to meet mixing temperature as directed by the Consultant after combining with RAP.
    f. Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.

g. Store hot screened aggregates in manner to minimize segregation and temperature loss.
h. Heat asphalt cement and aggregate to mixing temperature directed by the Consultant. Do not heat asphalt cement above 160 degrees C maximum temperature indicated on temperature-viscosity chart.
i. Make available current asphalt cement viscosity data at plant. With information relative to viscosity of asphalt being used, Consultant to approve temperature of completed mix at plant and at paver after considering hauling and placing conditions.
j. Maintain temperature of materials within 5 degrees C of specified mix temperature during mixing.
k. Mixing time:
    i. In batch plants, both dry and wet mixing times as directed by the Consultant. Continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30s or more than 75s.
    ii. In continuous mixing plants, mixing time as directed by the Consultant but not less than 45s.
    iii. Do not alter mixing time unless directed by the Consultant.

2. Dryer drum mixing plant:
    a. To ASTM D 995.
    b. Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.
    c. Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

3. Temporary storage of hot mix:
    a. Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.
    b. Do not store asphalt mix in storage bins in excess of 3 hours.

4. While producing asphalt mix for this Project, do not produce mix for other users unless separate storage and pumping facilities are provided for materials supplied to this project.

5. Mixing tolerances:
    a. Permissible variation in aggregate gradation from job mix (percent of total mass).

        4.75 mm sieve and larger
        2.00 mm sieve
        0.425 mm sieve
        0.180 mm sieve
        0.075 mm sieve

    b. Permissible variation of asphalt cement from job mix: 0.25%.
    c. Permissible variation of mix temperature at discharge from plant: 5 degrees C.

6. Addition of anti-stripping agent:
    a. Plant to be equipped with pug mill to thoroughly mix aggregates and lime prior to entering the plant.
    b. Plant to be equipped with suitable conveyor systems capable of supplying aggregates and lime at constant rate.
    c. Plant and equipment used for addition of lime to be equipped with covers to control loss of lime.
    d. Plant to be equipped to control rate of lime incorporation to within 1/4%.
    e. Add water to aggregate prior to entering pug mill.
7. Add water to lime sufficiently in advance to permit time to slake prior to entering pug mill.

2. PREPARATION

1. Prior to laying mix, clean surfaces of loose and foreign material.

3. TRANSPORTATION OF MIX

1. Transport mix to job site in vehicles cleaned of foreign material.

2. Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product, at least daily or as required. Elevate truck bed and thoroughly drain. No excess solution to remain in

truck bed.

3. Schedule delivery of material for placing in daylight, unless the Consultant approves artificial light.

4. Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation. Do not dribble mix into trucks.

5. Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

6. Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by the Consultant, but not less than 135 degrees C.

4. TEST STRIP

1. Construct and test strip to approval of the Consultant.

2. During construction of test strip, the Consultant will establish optimum rolling pattern by taking nuclear densimeter readings and observations to:
    a. Determine sequence and number of passes.
    b. Determine correct operating characteristics of vibratory rollers.
    c. Determine maximum density of asphalt mix.
    d. Ensure smooth surface finish.
    e. Establish actual density achieved by coring in order to determine if additional or other rolling equipment is required to achieve density of not less than 100 % of density obtained with Marshall specimens prepared from samples of mix being used.

5. PLACING

1. Obtain Consultant’s approval of base and existing surface prior to placing asphalt.

2. Place asphalt concrete to thicknesses, grades and lines as indicated as directed by the Consultant.

3. Placing conditions:
    a. Place asphalt mixtures only when air temperature is above 5 degrees C.
    b. When temperature of surface on which material is to be placed falls below 10 degrees C, provide

extra rollers as necessary to obtain required compaction before cooling.

c. Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

4. Place asphalt concrete in compacted lifts of thickness as indicated.

5. Where possible do tapering and leveling where required in lower lifts. Overlap joints by not less than 300 mm.

6. Spread and strike off mixture with self-propelled mechanical finisher.
   a. Construct longitudinal joints and edges true to line markings. Consultant to establish lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.
   b. When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
   c. Maintain constant head of mix in auger chamber of paver during placing.
   d. If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
   e. Correct irregularities in alignment left by paver by trimming directly behind machine.
   f. Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.
   g. Do not throw surplus material on freshly screeded surfaces.

7. When hand spreading is used:
   a. Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.
   b. Distribute material uniformly. Do not broadcast

material.

c. During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.
d. After placing and before rolling, check surface with templates and straightedges and correct irregularities.
e. Provide heating equipment to keep hand tools free from asphalt. Control temperature to avoid burning material. Do not use tools at higher temperature than temperature of mix being placed.

6. COMPACTING

1. Roll asphalt continuously using established rolling pattern for test strip and to density of not less than 100 % of maximum density determined for test strip.

2. Do not change rolling pattern unless mix changes or lift thickness changes. Change rolling pattern only as directed by the Consultant.

3. Roll asphalt continuously to density not less than 100 % of blow Marshall density to AASHTO T245.

4. General:
   a. Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be pneumatic tired type.
   b. Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
   c. Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.
   d. Use static compaction for leveling coarse less than 25 mm thick.
   e. For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.
   f. Overlap successive passes of roller by minimum

of 200mm and vary pass lengths.

g. Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
h. Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
i. Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
j. After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.
k. When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.
l. Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

5. Breakdown rolling:
    a. Begin breakdown rolling with static steel wheeled roller immediately following rolling of transverse and longitudinal joint and edges.
    b. Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.
    c. Operate breakdown roller with drive roll or wheel nearest finishing machine. When working on steep slopes or super-elevated sections use operation approved by the Consultant.
    d. Use only experienced roller operators.

6. Intermediate rolling:
    a. Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.
    b. Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

7. Finish rolling:
    a. Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by the Consultant.
    b. Conduct rolling operations in close sequence.

8. Dust entire area of sheet asphalt pavements with hydrated lime immediately after rolling to eliminate tendency to pick-up under traffic.

7. JOINTS

1. General:
    a. Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
    b. Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.
    c. Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

2. Transverse joints:
    a. Offset transverse joint in succeeding lifts by at least 600mm.
    b. Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
    c. Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

3. Longitudinal joints:
    a. Offset longitudinal joints in succeeding lifts by at least 150 mm.
    b. Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.
        i. For airfield runway paving, avoid cold joint construction in mid 30 m of runway.
        ii. If cold joint cannot be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and

tack face with thin coat of hot asphalt of adjacent lane.

c. Overlap previously laid strip with spreader by 25 to 50 mm.
d. Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
e. Roll longitudinal joints directly behind paving operation.
f. When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.

4. Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade. Location of feather joints as indicated.

8. FINISH TOLERANCES

1. Finished asphalt surface to be within 5mm of design elevation but not uniformly high or low.

2. Finished asphalt surface not to have irregularities exceeding 5mm when checked with 4.5 m straight edge placed in any direction.

9. DEFECTIVE WORK

1. Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.

2. Repair areas showing checking, rippling, or segregation.

3. Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 32 11 16.01 Granular Sub-Base
   2. Section 32 11 23 Aggregate Base Courses

3. MEASUREMENT PROCEDURES
   1. Measurement and Payment:
      a. Cast-in-place concrete will not be measured but will be paid for as fixed price item.

4. REFERENCES
   1. American Society for Testing and Materials International, (ASTM).
      a. ASTM C 117-95, Standard Test Method for Material Finer Than 75-mu m (No.200) Sieve in Mineral Aggregates by Washing.
      b. ASTM C 136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
      c. ASTM C 902-02, Standard Specification for Pedestrian and Light Traffic Paving Brick.
      d. ASTM C 1272-02, Standard Specification for Heavy Vehicular Paving Brick.
      e. ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600kN-m/m³)).
      f. ASTM D 1557-00, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700kN-m/m³)).
      g. ASTM E 11-01, Standard Specification for Wire-Cloth Sieves for Testing Purposes.
   2. Canadian General Standards Board (CGSB).
      a. CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
      b. CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
   3. Canadian Standards Association (CSA International).

a. CSA A23.1/A23.2-00, Concrete Materials and Methods of Construction/Methods of Test for Concrete.
b. CSA A179-94(R1999), Mortar and Grout for Unit Masonry.
c. CSA-A231.1-99, Precast Concrete Paving Slabs.

5. ACTION AND INFORMATIONAL SUBMITTALS

1. Submit following product test data:
   a. Sieve analysis for gradation of bedding and joint material.
   b. Unit paver test data.
2. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
3. Indicate layout, pattern and relationship of paving joints to fixtures and project formed details.
4. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
5. Submit full size sample of each type paving unit.

6. WASTE MANAGEMENT AND DISPOSAL

1. Separate waste materials for reuse and recycling in accordance with Contract requirements.
2. Remove from site and dispose of all packaging materials at appropriate recycling facilities.
3. Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling where approved by the Consultant.
4. Divert unused aggregate materials from landfill to quarry facility for reuse as approved by the Consultant.
5. Divert unused asphalt from landfill to facility capable of recycling materials.
6. Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

1. MATERIALS

1. Unit pavers: uniform in material, colour, size and from one manufacturer.

2. Precast concrete paving slabs: to CSA-A231.1 Techo-Bloc Eva, Smooth, 60mm thick. Colour Champlain Grey

1. Aggregates: in accordance with Section 31 05 16 - Aggregate Materials: General and following requirements:
    a. Crushed stone or gravel.
    b. Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
    c. Coarse aggregate: aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C 136.
    d. When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.
    e. Separate stockpiles for coarse and fine aggregates not required for sheet asphalt.
    f. Do not use aggregates having known polishing characteristics in mixes for surface courses.
    g. Sand equivalent: ASTM D 2419. Min: 50.

3. Manufactured sand for bedding: hard, durable, crushed stone particles, conforming to gradation of concrete sand as specified in CAN/CSA A23.1Sand: free from clay lumps, cementation, organic material, frozen material and other deleterious materials. Do not use limestone screenings or stone dust.
    a. Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2 rather than ASTM E 11. 0% to pass 0.075 mm sieve.

Sieve Designation	% Passing
10 mm	100
5 mm	95-100
2.5 mm	80-100

1.25 mm	50- 90
0.630 mm	25- 60
0.315 mm	10- 35
0.160 mm	2- 10

4. Joint sand: polymeric sand

PART 3 - EXECUTION

1. PROTECTION
   1. Prevent damage to below and above grade utilities, buildings, landscaping, sidewalks, trees, garden beds, fences, and adjacent property. Make good any damage.
   2. Provide access to building at all times. Coordinate paving schedule to minimize interference with normal use of premises.
2. SUBGRADE
   1. Ensure that applicable soil subgrade preparation details related to unit paving are specified in Section 31 22 13 – Rough Grading.
   2. Ensure that subgrade preparation conforms to levels and compaction required to allow for installation of granular base.
3. GEOTEXTILE
   1. Install geotextile filter as indicated.
4. GRANULAR BASE
   1. Base minimum thickness: 200 mm as indicated.
   2. Spread and compact crushed stone or gravel base in uniform layers not exceeding 100 mm compacted thickness.
   3. Compact base to a density of not less than 98 % Standard Modified Density in accordance with ASTM.
   4. Shape and roll alternately to obtain smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.
   5. Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist,

remove it and install more granular material to rid it of sponginess.

6. In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.

7. Ensure top of granular base does not exceed plus or minus 10mm over 3 m straightedge.

5. EDGING

1. Install edging true to grade, in location, layout and pattern as indicated.

6. BEDDING SAND

1. Place and spread bedding sand to 25 mm compacted thickness as indicated.

2. Maximum thickness after compaction: 25mm.

3. Use material other than bedding sand to compensate for depressions that exceed specified tolerances in surface of base.

4. Do not use joint sand for bedding sand.

7. SURFACE COURSE

1. Ensure bedding sand and granular base are not saturated prior to placement of unit pavers.

2. Install unit paving true to grade on the bedding sand, in location, layout and pattern as indicated.

3. Where required, cut units accurately without damaging edges.

4. Precast concrete paving slabs: to CSA-A231.1 Techo-Bloc Eva, Smooth, 60mm thick. Colour Champlain Grey
    a. Install paving slabs manufacturer specification joint spacing.
    b. Compact and level slabs with min. 22 kN force mechanical plate vibrator use minimum 19 mm thick plywood or neoprene pad under plate compactor and over slabs until units are true to grade and free of movement.
    c. Do not compact unit paving within 1 m of unrestrained edges.
    d. Fill spaces between pavers by sweeping in sand.
    e. Pass mechanical plate vibrator over unit paving to

achieve compaction of sand in joints. Ensure joints are full at completion of compaction.

f. At completion of each work day, ensure work within 1 m of laying face is left fully compacted with sand filled joints.
g. Surface of finished pavement: free from depressions exceeding 3 mm as measured with 3 m straight edge.
h. Sweep surface clean and check final elevations for conformance to drawings.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 32 12 16 – Asphalt Paving
2. REFERENCES
   1. Canadian General Standards Board (CGSB)
      a. CAN/CGSB-1.5 99, Low Flash Petroleum Spirits Thinner.
      b. CAN/CGSB 1.74-01, Alkyde Traffic Paint.
   2. Green Seal Environmental Standards (GS)
      a. GS-11-2008, 2nd Edition, Paints and Coatings.
   3. Health Canada / Workplace Hazardous Materials Information System (WHMIS)
      a. Safety Data Sheets (SDS).
   4. The Master Painters Institute (MPI)
      a. Architectural Painting Specification Manual - current edition.
3. ACTION AND INFORMATIONAL SUBMITTALS
   1. Product Data:
      a. Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish and limitations.
      b. Submit electronic copies of WHMIS MSDS
   2. Samples:
      a. Submit to the Consultant following material sample quantities at least 4 weeks prior to commencing work.
         i. Two 1 L samples of each type of paint.
4. CLOSEOUT SUBMITTALS
   1. Operations and Maintenance Data: submit information on materials relative to work of this Section for inclusion in operations and maintenance manual.
5. DELIVERY, STORAGE AND HANDLING
   1. Deliver, store and handle materials in accordance with manufacturer's written instructions.

2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

3. Storage and Handling Requirements:
    a. Store materials off in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    b. Replace defective or damaged materials with new.

4. Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials

PART 2 - PRODUCTS

1. MATERIALS

1. Paint:
    a. To MPI -EXT 2.1B, Alkyd zone/traffic marking.
    b. Paints: in accordance with MPI recommendation for surface conditions.
        i. Paints: maximum VOC limit 100 g/L to GS-11.
    c. Colour: to MPI listed, white, yellow.
    d. Upon request, the Consultant will supply qualified product list of paints applicable to work. Qualified paints may be used but the Consultant reserves right to perform further tests.

2. Thinner: to MPI listed manufacturer.

PART 3 - EXECUTION

1. EXAMINATION

1. Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.
    a. Visually inspect substrate in presence of the Consultant.

2. Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.

3. Proceed with Work only after unacceptable conditions have been rectified.

2. EQUIPMENT REQUIREMENTS

1. Paint applicator: approved pressure type mobile with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated.

3. APPLICATION

1. Pavement markings: Lay out pavement markings.

2. Unless otherwise approved by the Consultant, apply paint only when air temperature is above 10 degrees C, wind speed is less than 60 km/h and no rain is forecast within next 4 hours.

3. Apply traffic paint evenly at rate of 3 m² /L.

4. Do not thin paint unless approved by the Consultant.

5. Symbols and letters to dimensions indicated.

6. Paint lines: of uniform colour and density with sharp edges.

7. Thoroughly clean distributor tank before refilling with paint of different colour.

4. TOLERANCE

1. Paint markings: within plus or minus 12 mm of dimensions indicated.

5. CLEANING

1. Progress Cleaning:
    a. Leave Work area clean at end of each day.

2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment

3. Waste Management: separate waste materials for reuse and recycling

a. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

6. PROTECTION OF COMPLETED WORK

1. Protect pavement markings until dry.
2. Repair damage to adjacent materials caused by pavement marking application.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. REFERENCES

1. American Society for Testing and Materials International, (ASTM).
    a. ASTM A 53/A 53M-[02], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
    b. ASTM A 90/A 90M-[01], Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
    c. ASTM A 121-[99], Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
    d. A653/A653M-[03], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
    e. ASTM C 618-[03], Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
    f. ASTM F 1664-[01], Standard Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.

2. Canadian General Standards Board (CGSB).
    a. CAN/CGSB-138.1-[96], Fabric for Chain Link Fence.
    b. CAN/CGSB-138.2-[96], Steel Framework for Chain Link Fence.
    c. CAN/CGSB-138.3-[96], Installation of Chain Link Fence.
    d. CAN/CGSB-138.4-[96], Gates for Chain Link Fence.
    e. CAN/CGSB-1.181-[99], Ready-Mixed Organic Zinc-Rich Coating.

3. Canadian Standards Association (CSA International).
    a. CAN/CSA-A23.1/A23.2-[00(August 2001)], Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
    b. CAN/CSA-G164-[M92(R2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
    c. CAN/CSA-A3000-[98(R2002)], Cementitious Materials Compendium. Includes:

i. CAN/CSA-A23.5-[98], Supplementary Cementing Materials

4. Department of Justice Canada (Jus).
   a. Canadian Environmental Protection Act (CEPA), 1999, c. 33.

5. Health Canada/Workplace Hazardous Materials Information System (WHMIS).
   a. Safety Data Sheets (SDS).

6. The Master Painters Institute (MPI) - Architectural Painting Specification Manual - [March 1998].
   a. MPI # 18, Organic Zinc Rich Primer.

7. Transport Canada (TC).
   a. Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

2. ACTION AND INFORMATIONAL SUBMITTALS

1. Submit shop drawings prior to ordering materials.
2. Submit WHMIS MSDS - Material Safety Data Sheets

3. WASTE MANAGEMENT AND DISPOSAL

1. Remove from site and dispose of packaging materials at appropriate recycling facilities.
2. Place materials defined as hazardous or toxic in designated containers.
3. Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
4. Divert unused metal and wiring materials from landfill to metal recycling facility.
5. Divert unused concrete materials from landfill to local facility.
6. Unused paint or coating material must be disposed of at official hazardous material collections site.
7. Do not dispose of unused paint material into sewer

system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

8. Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

1. MATERIALS

1. Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
    a. Nominal coarse aggregate size: 20-5.
    b. Compressive strength: 20 MPa minimum at 28 days.
2. Chain-link fence fabric: to CAN/CGSB-138.1.
3. Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated on drawings.
4. Tension wire: to CAN/CGSB-138.2
5. Tie wire fasteners: steel wire
6. Tension bar: to ASTM A 653/A 653M, 5 x 20 mm minimum galvanized steel.
7. Gates: to CAN/CGSB-138.4.
8. Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.
    a. Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.
    b. Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.
    c. Overhang tops to provide waterproof fit, to hold top rails
    d. Turnbuckles to be drop forged.
9. Organic zinc rich coating: to CAN/CGSB-1.181.
10. Black Vinyl Coating

11. Grounding rod: 16mm diameter copperwell rod.

2. FINISHES

1. Galvanizing:
    a. For chain link fabric: to CAN/CGSB-138.1 Grade 2.
    b. For pipe: 550 g/m² minimum to ASTM A 90.
    c. For other fittings: to CAN/CSA-G164.

PART 3 - EXECUTION

1. GRADING

1. Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
    a. Provide clearance between bottom of fence and ground surface of 30 mm to 50mm.

2. ERECTION OF FENCE

1. Erect fence along lines as indicated.
2. Excavate post holes to dimensions indicated.
3. Space line posts 3 m apart, measured parallel to ground surface.
4. Space straining posts at equal intervals not to exceed 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade, is greater than 150 m.
5. Install additional straining posts at sharp changes in grade and where directed by the Consultant.
6. Install corner post where change in alignment exceeds 10 degrees.
7. Install end posts at end of fence and at buildings.
    a. Install gate posts on both sides of gate openings.
8. Place concrete in post holes then embed posts into concrete to depths indicated.

a. Extend concrete 25 mm above ground level and slope to drain away from posts.
b. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

9. Do not install fence fabric until concrete has cured minimum of 5 days.

10. Install brace between end and gate posts and nearest line post,
    a. Install braces on both sides of corner and straining posts in similar manner.

11. Install overhang tops and caps.

12. Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.

13. Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

14. Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.
    a. Knuckled selvedge at bottom.
    b. Twisted selvedge at top.

15. Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals.
    a. Give tie wires minimum two twists.

16. Install barbed wire strands and clip securely to lugs of each projection.

17. Install grounding rods as indicated.

3. INSTALLATION OF GATES

1. Install gates in locations as indicated

2. Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.

3. Install gate stops where indicated.

4. OPERATIONAL REQUIREMENTS
   1. Operational requirements include:
      a. Cleaning materials and schedules.
      b. Repair and maintenance materials and instructions.

5. TOUCH UP
   1. Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.
      a. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

6. CLEANING
   1. Clean and trim areas disturbed by operations.
      a. Dispose of surplus material and replace damaged turf with sod as directed by the Consultant.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. ACTION AND INFORMATIONAL SUBMITTALS

   1. Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
   2. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
   3. Indicate dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.
   4. Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

2. WASTE MANAGEMENT AND DISPOSAL

   1. Remove from site and dispose of packaging materials at a appropriate recycling facilities.
   2. Collect and separate for disposal packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

PART 2 - PRODUCTS

Basketball net system — Sport Systems

1. Posts
   a. BF04, 4 ½” OD. Goal Post.
2. Back Board
   a. 1750 Cast Aluminum Back Board
3. Hoop
   a. 240SG Basketball Goal

4. Netting
    a. Galvanized steel chain netting

PART 3 - EXECUTION

1. INSTALLATION

1. Assemble furnishings in accordance with manufacturer's instructions.

2. Install all furnishing, true, plumb, anchored as directed by the manufacturer

3. Touch-up damaged finishes to approval of Contract Administrator.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
   1. Section 31 22 13 Rough Grading
2. REFERENCES
   1. Agriculture and Agri-Food Canada
      a. The Canadian System of Soil Classification, Third Edition, 1998.
   2. Canadian Council of Ministers of the Environment
      a. PN1340-2005, Guidelines for Compost Quality.
   3. U.S. Environmental Protection Agency (EPA)/Office of Water
      a. EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
3. DEFINITIONS
   1. Compost:
      a. Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
      b. Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss on Ignition (LOI) test.
      c. Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminates.
      d. Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).
4. ACTION AND INFORMATIONAL SUBMITTALS
   1. Provide submittals in accordance with contract requirements.
   2. Quality control submittals:
      a. Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
      b. Certificates: submit product certificates signed by manufacturer certifying materials comply with

specified performance characteristics and criteria and physical requirements.

5. WASTE MANAGEMENT AND DISPOSAL

1. Separate waste materials for reuse and recycling in accordance with contract requirements.
2. Divert unused soil amendments from landfill to official hazardous material collections site approved by the Consultant.
3. Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

1. TOPSOIL

1. Topsoil for sodding: contractor to use existing materials stripped and stockpiled from the site prior to grading works. No amendments are required. Contractor is required to ensure the soil is free of debris and aggregate as outlined.
2. Topsoil for planting beds: mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
    a. Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7% clay, and contain 2 to 10 % organic matter by weight.
    b. Contain no toxic elements or growth inhibiting materials.
    c. Finished surface free from:
        i. Debris and stones over 50 mm diameter.
        ii. Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
    d. Consistence: friable when moist.

2. SOIL AMENDMENTS

1. Fertilizer:
    a. All recommendations for fertilizer will be based on topsoil sample testing results
    b. Fertility: major soil nutrients present in following amounts:

c. Nitrogen (N): 20 to 40 micrograms of available nitrogen per gram of topsoil.
d. Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
e. Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
f. Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
g. Ph value: 6.5 to 8.0.

2. Sand: washed coarse silica sand, medium to course textured.

3. Organic matter: compost Category A, B in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

4. Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.

5. Limestone:
   a. Ground agricultural limestone.
   b. Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

6. Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

3. SOURCE QUALITY CONTROL

1. Advise the Consultant of sources of topsoil and manufactured topsoil to be utilized with sufficient lead time for testing.

2. Contractor is responsible for amendments to supply topsoil as specified.

3. Soil testing by recognized testing facility for Ph, N, P and K, and organic matter.

4. Testing of topsoil will be carried out by testing laboratory

designated by the Consultant.
   a. Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

1. TEMPORARY EROSION AND SEDIMENTATION CONTROL
   1. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control drawings.
   2. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
   3. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
2. STRIPPING OF TOPSOIL
   1. Begin topsoil stripping of areas after area has been cleared of brush, weeds and grasses.
   2. Strip topsoil to depths as indicated.
      a. Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
   3. Stockpile in locations as directed by the Consultant.
      a. Stockpile height not to exceed 2 m.
   4. Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as directed by the Consultant.
   5. Protect stockpiles from contamination and compaction.
3. PREPARATION OF EXISTING GRADE
   1. Verify that grades are correct.
      a. If discrepancies occur, notify the Consultant and do not commence work until instructed by the Consultant.

2. Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

3. Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
    a. Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
    b. Remove debris which protrudes more than 75 mm above surface.
    c. Dispose of removed material off site.

4. Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
    a. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

4. PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

1. Place topsoil after the Consultant has accepted subgrade.

2. Spread topsoil in uniform layers not exceeding 150 mm.

3. For sodded areas keep topsoil 15 mm below finished grade.

4. Spread topsoil to following minimum depths after settlement.
    a. As indicated on drawings.

5. Manually spread topsoil/planting soil around trees, shrubs and obstacles.

5. FINISH GRADING

1. Grade to eliminate rough spots and low areas and ensure positive drainage.
    a. Prepare loose friable bed by means of cultivation and subsequent raking.

2. Consolidate topsoil to required bulk density using equipment approved by the Consultant.
    a. Leave surfaces smooth, uniform and firm against deep foot printing.

6. ACCEPTANCE

1. The Consultant will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

7. SURPLUS MATERIAL

1. Dispose of materials except topsoil not required where

directed by the Consultant.

8. CLEANING

1. Proceed in accordance with Contract requirements.
2. Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

---------- END OF SECTION ----------

PART 1 - GENERAL

1. RELATED REQUIREMENTS
    1. Section 32 91 19.13 Topsoil Placement and Grading
2. ACTION AND INFORMATIONAL SUBMITTALS
    1. Samples.
        a. Submit:
            i. Sod for each type specified.
                1. Install approved samples in one square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
            ii. Bio-degradable geotextile fabric.
        b. Obtain approval of samples by the Consultant.
3. QUALITY ASSURANCE
    1. Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
    2. Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
    3. Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.
4. SCHEDULING
    1. Schedule sod laying to coincide with preparation of soil surface.
    2. Schedule sod installation when frost is not present in ground.
5. WASTE MANAGEMENT AND DISPOSAL
    1. Separate and recycle waste materials in accordance with Section 02 41 13 Selective Site Demolition.
    2. Divert unused fertilizer from landfill to official hazardous material collections site approved by the Consultant.
    3. Do not dispose of unused fertilizer into sewer systems,

into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

1. MATERIALS

1. Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
    a. Turf Grass Nursery Sod types:
        i. Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
        ii. Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
        iii. Number One Named Cultivars: Nursery Sod grown from certified seed.
    b. Turf Grass Nursery Sod quality:
        i. Not more than 2 broadleaf weeds or 10 other weeds per 40 square metres.
        ii. Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
        iii. Mowing height limit: 35 to 65 mm.
        iv. Soil portion of sod: 6 to 15 mm in thickness.

2. Commercial Grade Turf Grass Nursery : sod that has not been grown as Turf Grass Nursery Sod crop.
    a. Mow sod at height directed by the Consultant within 36 hours prior to lifting, and remove clippings.

3. Sod establishment support:
    a. Wooden pegs: 17 x 8 x 200mm.

b. Biodegradable starch pegs: 17 x 8 x 200mm.

4. Water:
   a. Supplied by the Consultant at designated source.

5. Fertilizer:
   a. To Canada "Fertilizers Act" and "Fertilizers Regulations".
   b. Complete, synthetic, slow release with 65% of nitrogen content in water-insoluble form.

2. SOURCE QUALITY CONTROL

1. Obtain approval from the Consultant of sod at source.

2. When proposed source of sod is approved, use no other source without written authorization from the Consultant.

PART 3 - EXECUTION

1. PREPARATION

1. Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify the Consultant and do not commence work until instructed by the Consultant.

2. Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

3. Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated, to tolerance of plus or minus 8 mm, for Turf Grass Nursery Sod and plus or minus 15 mm for Commercial Grade Turf Grass Nursery, surface to drain naturally.

4. Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials off site.

2. SOD PLACEMENT

1. Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

2. Lay sod sections in rows, joints staggered. Butt sections

closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

3. Roll sod as directed by the Consultant. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3. MAINTENANCE DURING ESTABLISHMENT PERIOD

1. Perform following operations from time of installation until acceptance.

2. Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

3. Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which will smother grassed areas as directed by the Consultant.

4. Maintain sodded areas weed free 95%.

5. Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

4. ACCEPTANCE

1. Turf Grass Nursery Sod areas will be accepted by the Consultant provided that:
    a. Sodded areas are properly established.
    b. Sod is free of bare and dead spots.
    c. No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
    d. Sodded areas have been cut minimum 2 times prior to acceptance.

2. Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by the Consultant provided that:
    a. Sodded areas are properly established.
    b. Extent of surface soil visible when grass has been cut to height of 60 mm is acceptable.
    c. Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.
    d. Sodded areas have been cut minimum 2 times prior to acceptance.
    e. Fertilizing in accordance with fertilizer program

has been carried out at least once.

3. Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

5. MAINTENANCE DURING WARRANTY PERIOD

1. Perform following operations from time of acceptance until end of warranty period:
    a. Water sodded Turf Grass Nursery Sod and Commercial Grade Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

2. Repair and resod dead or bare spots to satisfaction of the Consultant.

3. Cut grass and remove clippings that will smother grass as directed by the Consultant to height as follows:
    a. Turf Grass Nursery Sod:
        i. 50 mm during normal growing conditions.
    b. Commercial Grade Turf Grass Nursery Sod :
        i. 60 mm during normal growing conditions.
    c. Cut grass at 2 week intervals or as directed by the Consultant, but at intervals so that approximately one third of growth is removed in single cut.
    d. Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
    e. Eliminate weeds by mechanical or chemical means to extent acceptable to the Consultant.

6. CLEANING

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

---------- END OF SECTION ----------