SPECIFICATIONS FOR

VANDERHOOF AIRPORT RUNWAY 07-25 TURN PADS

CONTRACT NO. 2026-07

ISSUED FOR TENDER

SEPTEMBER 2026

THE DISTRICT OF VANDERHOOF

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PART 1 - GENERAL

1. RELATED SECTIONS

.1 Section 01 52 00 – Temporary Facilities.

.2 Section 01 35 13.13 – Special Procedures for Airport Facilities.

2. WORK COVERED BY CONTRACT DOCUMENTS

Work of this Contract comprises of the construction of the Vanderhoof airport runway 07-25 turn pads. General Work to be undertaken includes but is not limited to the following:

.1 Apply for permits; locates of underground utilities; survey; site preparation; install, maintain, and remove temporary facilities; quality control; etc.

.2 Prepare and submit project schedule, shop drawings, submittals, etc.

.3 Maintain a clean work area, free of Foreign Object Debris (FOD)

.4 Operate and complete the work in accordance with the Plan of Construction Operations (PCO).

.2 Work for Work Areas includes but is not limited to the following:

.1 Topsoil stripping and stockpile on-site for re-use

.1 Common excavation and use on-site and disposal off-site

.2 Granular excavation and stockpile on-site for re-use

.3 Supply and install combigrid on subgrade

.4 Place and compact engineered fill (if required)

.5 Supply and installation of compact granular sub-base and granular base.

.6 Provisional - supply and install geogrid

.7 Sawcut existing threshold edge for asphalt paving tie-in

.8 Supply and place tack and prime coats

.9 Hot Mix Asphalt Paving (HMAC)

.10 General grading for drainage and finish surface preparation

.11 Install new edge lights (owner supplied) and pullpits with new electrical cable and conduits

.12 Protection of existing underground utilities and airfield lighting

.13 New Paint Markings on runway and turn pads

3. CONTRACT METHOD

.1 Construct Work under a unit price contract.

4. WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from the Consultant.

.2 Co-ordinate work with that of other Contractors as applicable. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor or Contract, report promptly to the Consultant, in writing, any defects which may interfere with proper execution of Work.

5. WORK SEQUENCE

.1 Maintain fire access/control.

.2 Construct Work in stages as detailed in the PCO document and on the PCO drawings to provide for continuous airport usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

6. CONTRACTOR USE OF PREMISES

.1 Co-ordinate use of premises as outlined in the Plan of Construction Operation.

.2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.3 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.

.5 At completion of operations the condition of the existing facilities are to be restored to a condition equal to or better than that which existed before new work started.

7. OWNER OCCUPANCY

.1 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

8. OWNER FURNISHED ITEMS

.1 Owner Responsibilities:

.1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.

.2 Arrange and pay for delivery to site (Airport property) in accordance with Progress Schedule.

.3 Inspect deliveries jointly with Contractor.

.4 Arrange for replacement of damaged, defective or missing items.

.5 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.

.2 Contractor Responsibilities:

.1 Designate submittals and delivery date for each product in progress schedule.

.2 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.

.3 Receive and unload products at site.

.4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.

.5 Handle products at site, including uncrating and storage.

.6 Protect products from damage, and from exposure to elements.

.7 Assemble, install, connect, adjust, and finish products.

.8 Provide installation inspections required by public authorities.

.9 Repair or replace items damaged by Contractor or subcontractor on site.

.10 Install, maintain, and remove low-profile barricades c/w steady burn red lights, temporary runway closure markings, etc. as detailed in the PCO. Barricades and markers are to be secured with sandbags; sandbags are to be provided by the Contractor

9. EXISTING SERVICES

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

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

.3 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.

.4 Submit schedule to and obtain approval from the Owner 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. Requests for power shutdowns and locates shall be submitted, in writing, a minimum of seventy-two (72) hours prior to scheduled work. Requests shall indicate scope of work, area, circuits affected, as well as the date and time of requested shut down.

.5 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

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

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

.8 Construct barriers to be in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

10. DOCUMENTS REQUIRED

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

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed Shop Drawings.

.5 List of Outstanding Shop Drawings.

.6 Change Orders.

.7 Other Modifications to Contract.

.8 Field Test Reports.

.9 Copy of Approved Work Schedule.

.10 Health and Safety Plan and Other Safety Related Documents.

.11 Other documents as specified.

PART 2 - PRODUCTS

1. NOT USED

PART 3 - EXECUTION

1. NOT USED

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies requirements for project meetings including the pre-construction, progress and safety meetings as required by the Contract Documents or as required by the Engineer or The District.

2. ADMINISTRATIVE

.1 The Engineer shall schedule and administer project meetings throughout the progress of the work.

.2 The Engineer shall record the meeting minutes including significant proceedings and decisions.

.3 Meeting minutes shall be distributed within three days after meetings and transmitted to meeting participants and affected parties not in attendance.

.4 Representatives of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

.5 The Contractor shall schedule and administer their own safety meetings as per their Safety Plan throughout the progress of the work and provide copies to the Engineer.

3. PRECONSTRUCTION MEETING

.1 Immediately upon issuance the Letter of Award the Engineer will schedule a meeting of parties in the contract to discuss and resolve administrative procedures, responsibilities and schedule.

.2 Senior representatives of the Owner, the Engineer, Contractor, major Subcontractors, field inspectors, supervisors, and Airport Safety/Security representative will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 3 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of work and progress scheduling.

.3 Schedule of submission of shop drawings and samples. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 – Temporary Facilities.

.5 Delivery schedule of specified equipment.

.6 Site security in accordance with the Plan of Construction Operations drawings.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.8 Owner provided products.

.9 Record drawings in accordance with Section 01 78 00 – Closeout Submittals.

.10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.11 Monthly progress claims, administrative procedures, photographs, hold backs.

.12 Appointment of inspection and testing agencies or firms.

.13 Insurances, transcript of policies.

.14 Record Drawings.

4. PROGRESS MEETINGS

.1 During course of Work, the Engineer will schedule weekly progress meetings.

.2 The Contractor, major Subcontractors involved in the Work, the Engineer and/or representative(s), The District Project Manager are requested to be in attendance.

.3 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Review safety concerns

.4 Field observations, problems, conflicts.

.5 Problems which impede construction schedule.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

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

.12 Other business.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 00 – Summary of Work

.2 Section 01 33 00 - Submittal Procedures.

.3 Plan of Construction Operations

1.2 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.5 Master Plan: summary-level schedule that identifies major activities and key milestones.

.6 Milestone: significant event in project, usually completion of major deliverable.

.7 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.8 Project Planning, Monitoring and Control System: overall system operated by the Engineer to enable monitoring of project work in relation to established milestones.

1.3 REQUIREMENTS

.1 Ensure Schedules are practical and remain within specified Work Schedule.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.4 SUBMITTALS

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

.2 Submit to the Engineer within 5 working days of Award of Contract, a Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Revised and resubmit schedules as required by Engineer, or at a minimum bi-monthly.

.4 Provide schedule in PDF format. Also provide requested number of paper copies of schedules for distribution to the Engineer and other affected parties.

1.5 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

.2 The Contractor shall refer to Section 01 11 00 – Summary of Work, and the Plan of Construction Operations document and drawings for location of work, time frames, type of work allowed and airport operation requirements.

1.6 PROJECT SCHEDULE

.1 Ensure detailed Project Schedule includes minimum milestone and activity types as follows:

.1 Shop Drawings, Submittals, Samples, Permits
.2 Mobilization / Demobilization
.3 Construction Activities (Removals, Earthworks, Granular, HMAC Paving, Electrical)
.4 Testing and Commissioning (as required)

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

.1 Discuss Project Schedule, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on schedule.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies general requirements and procedures for the Contractor's submissions of shop drawings, product data, samples and mock-ups to the Engineer for review.

1.2 ADMINISTRATIVE

.1 Submit to the Engineer 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 the Engineer. 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 Submittals shall be in a reproducible or electronic form acceptable to the Engineer. Facsimile versions of submittals are not acceptable.

.7 Notify the Engineer, in writing at time of submission, identifying deviations from requirements of the Contract Documents stating reasons for deviations.

.8 Verify field measurements.

.9 The Contractor's responsibility for errors and omissions in submission is not relieved by the Engineer's review of submittals.

.10 The Contractor's responsibility for deviations in submission from requirements of the Contract Documents is not relieved by the Engineer review.

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

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of British Columbia, Canada.

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

.4 Allow five (5) business days for the Engineer's review of each submission.

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

.6 Make changes in shop drawings as the Engineer may require, consistent with the Contract Documents. When resubmitting, notify the Engineer in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter containing:

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

.8 Submissions include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by the Contractor's authorized representative certifying approval of submissions, verification of field measurements and

compliance with
the Contract Documents.

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.9 After the Engineer's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as the Engineer may reasonably request.

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

.12 Submit electronic copy of test reports for requirements requested in specification Sections and as requested by the Engineer.

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

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

.13 Submit electronic copy of certificates for requirements requested in specification Sections and as requested by the Engineer.

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

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

.14 Submit electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by the Engineer.

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

.15 Submit electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by the Engineer.

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

.16 Submit electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by the Engineer.

.17 Delete information not applicable to project.

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

.19 If upon review by the Engineer, no errors or omissions are discovered or if only minor corrections are made, copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.4 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to the Engineer's site office.

.3 Notify the Engineer 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 the Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Engineer prior to proceeding with Work.

.6 Make changes in samples, which the Engineer may require, consistent with the Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 MOCK-UPS

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

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of the Contract, submit Workers' Compensation Board status.

.2 Submit certificate of insurance immediately after award of the Contract.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

Movement of equipment and other special procedures that must be considered when construction is being carried out while the airport facility is in use.

1.2 RELATED SECTIONS

.1 TP 312E, 4th Edition (included by reference).

.2 TP 312E, 5th Edition (included by reference).

.3 Plan of Construction Operations (PCO) drawings.

1.3 MEASUREMENT FOR PAYMENT

.1 No measurement for payment shall be made under this section.

.2 Separate payment will not be made to move and replace the low profile barriers, temporary runway closure markers, delineator barrels / posts or signs during construction.

1.4 GENERAL PROTECTION

.1 Do not disrupt airport business except as permitted by The Owner or Engineer.

1.5 MOVEMENT OF EQUIPMENT AND PERSONNEL

.1 In areas of airport not closed to aircraft traffic:

.1 Obtain Engineer's approval on scheduling of Work.

.2 Control movements of equipment and personnel as directed by Engineer.

.3 All movement to and from construction sites is under control of the security escort.

.4 All construction activity is monitored by the security escort.

.5 All instructions from the security escort regarding airport rules, safety and conduct while on airside are to be obeyed immediately.

.6 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.7 All movement to and from construction sites must be kept clean of dust, debris relating to the contractors' personnel and equipment.

1.6 UNSERVICEABLE AREAS

.1 All construction traffic to and from the construction sites must be under the direct escort of the airside security escort.

.2 The Contractor will install, maintain, move (as required) and remove delineator posts, and delineator barrels and low profile barriers with steady burning red lights to delineate closed or unserviceable areas. All posts, barrels and barriers with steady red lights, and will be supplied by the Contractor. Damaged posts, barrels, barriers and lights are to be replaced by the Contractor at no additional cost.

.3 Mark closed / unserviceable / construction areas as shown in PCO.

.4 Open flames and inflammable fuels are not permitted.

.5 Park equipment not in use and stockpile/store materials as indicated in the Plan of Construction Operations.

1.7 AIRPORT FACILITIES

.1 Coordinate with The District for permits and procedures to locate and / or disclose the underground facilities such as cables, pipes and ducts.

.2 The Contractor shall be responsible for identifying all existing surface and underground structures and utility installations that may affect the work or may be damaged during construction. Notify the Engineer of work areas sufficiently in advance of operations so that located and marked underground facilities can be reviewed with The District prior to excavation.

PART 2 EXECUTION

2.1 APPLICATION

.1 Closure barricades / barriers shall be placed in advance of all work to be executed and be acceptable to the Engineer. Closure barricades / barriers adjacent any runway / taxiway must be of standard dimensions and placed in accordance with the Plan of Construction Operations and TP 312E, 4th / 5th Edition.

.2 Provide barricades around deep excavations, areas of drop off adjacent to airside pavement, and as required by the Plan of Construction Operation.

.3 Prevent barrels, posts and barriers from moving due to wind and jet blast. The low profile barriers shall be secured in place by filling with water, or other methodologies as approved by The District. The Contractor shall inspect all barrels, posts and barriers regularly to ensure they are secured in place.

.4 The Contractor shall be responsible for affixing steady burning red lights to the barrels and barriers, ensuring that all steady burning red lights are operational 24-7.

.5 Remove from site all such work after use.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for protection of the environment during the execution of the Work.

1.2 REFERENCES

.1 Definitions:

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

.2 Reference Standards:

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 FIRES

.1 Fires and burning of rubbish on site are not permitted.

1.5 HAZARDOUS MATERIALS

.1 If hazardous or contaminated material is encountered it must be reported to the Engineer immediately.

.2 Hazardous materials must be stored, used and disposed of in a proper manner by trained personnel. Copies of related documentation must be forwarded to the Engineer.

1.6 DRAINAGE

.1 Provide temporary drainage and pumping as required, keeping all excavations and the site free from water.

.2 The Contractor shall ensure that water from rainfall does not collect in excavations.

.3 Ensure water that is pumped into a waterway, sewer or drainage system is free of suspended material.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

.5 Provide erosion and sediment controls.

.6 **Environmental Protection Plan (EPP) / Construction Drainage Plan (CDP)**:

.1 The Contractor shall prepare and provide an Environmental Protection Plan (EPP) / Construction Drainage Plan (CDP)for approval by the Engineer, prior to the start of construction.

.2 The Plan shall indicate proposed methods to reduce the environmental impact of the construction including locations and methods to provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.3 The Plan shall also indicate proposed methods to prevent discharge of water containing suspended materials into watercourses, sewer and drainage system as per Local Erosion and Sediment Control Guidelines. This includes sawcut slurry and pavement cleaning prior to painting.

1.7 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

.1 Provide temporary enclosures where indicated by the Engineer.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.4 All spills of any nature must be reported to the Engineer and cleaned up immediately to the satisfaction of the Engineer.

.5 Any suspected contamination during excavation shall be reported immediately to the Engineer.

.6 Report emergency spills immediately to The District of Vanderhoof. Spills of deleterious substances should be immediately contained and cleaned up in accordance with federal and provincial regulatory requirements, as well as the Contractor's Environmental Protection Plan (EPP) and Spill Response Plan, or as directed by the Engineer.

.1 Contractor shall maintain, in adequate supply, sufficient spill response material at the work site.

1.8 SMOKE / DUST CONTROL

.1 The Contractor is to take into consideration that the release of smoke / dust from construction equipment within the airport property is not permitted as smoke / dust will obstruct the airport operations.

.2 For the execution of the specified work, the Contractor is to utilize only such equipment and construction procedures that will prevent the release of smoke / dust to the environment.

1.9 NOTIFICATION

.1 The Engineer will notify the Contractor in writing of observed non-compliance with Federal, Provincial, or Municipal environmental laws or regulations, permits, and other elements of the project EPP.

.2 Contractor: after receipt of such notice, inform the Engineer of proposed corrective action and take such action for acceptance by the Engineer.

.3 The Engineer will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to the Contractor for such suspensions.

1.10 ENFORCEMENT

.1 Protection of the environment is considered to be of prime importance during any works on The District properties. The Contractor will adhere to the environmental protection measures outlined in any applicable permits.

.2 Progress payments will not be made to the Contractor while any requirements for Environmental Protection are outstanding.

.3 Directions given by the Engineer with respect to action to be taken to correct environmental deficiencies must be acted upon immediately. The Engineer reserves the right to order the Contractor to cease all operations until adequate measures have been taken. No claims by the Contractor for delay of contract or additional costs will be permitted related to environmental protection measures.

.4 In the event that deficiencies in work are not corrected, then the Engineer will take the necessary action for correction purposes and will deduct the cost thereof from any monies due to the Contractor.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

.3 Do not bury rubbish and water materials onsite. Dispose of off-site in accordance with applicable laws and regulations.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements or references to the appropriate section for field and laboratory testing services to be provided by the Contractor during the execution of the work.

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

.1 Particular requirements for inspection and testing designated by the Engineer to be carried out by a testing laboratory are specified under various sections of the specifications.

.2 The Contractor shall meet or exceed the minimum Quality Control testing requirements meeting all applicable codes and standards in these Contract specifications.

1.3 REFERENCES

.1 Not Applicable.

1.4 MEASUREMENT FOR PAYMENT

.1 No separate payment will be made for quality control services. Contract Unit prices shall include all testing laboratory services, labour, materials, tools, equipment, etc. as required by the Contractor to complete the quality control testing as required by applicable code and standards, and as specified under the various sections.

.2 Where tests or inspections by the Contractor designated testing laboratory reveal work not in accordance with contract requirements, the Contractor shall pay costs for additional tests or inspections to verify acceptability of corrected work by the Engineer.

1.5 CONTRACTOR'S RESPONSIBILITIES

.1 Quality control testing and testing laboratory services shall consist of but not limited to the following:

- .1 Soil and aggregates density and moisture content testing.
- .2 Density/compaction testing.
- .3 Hot mix asphalt concrete quality control and product acceptance testing including asphalt coring of finished product.
- .4 Miscellaneous electrical testing.
- .5 All testing as specified under the various sections of the specifications.

.2 Furnish labour and facilities to:

- .1 Provide access to work to be inspected and tested.

.2 Facilitate inspections and tests.

.3 Make good work disturbed by inspection and test.

.4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and accepted by the Owner.

1.6 INSPECTION

.1 Allow the Engineer access to the Work. If part of the Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by the Engineer instructions, or law of the Place of Work.

.3 If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 The Engineer will order part of Work to be examined if Work is suspected to be not in accordance with the Contract Documents. If, upon examination such work is found not in accordance with the Contract Documents, correct such Work and pay cost of examination and correction.

1.7 INDEPENDENT INSPECTION AGENCIES

.1 Professional Independent Inspection/Testing Agencies licensed to practice in the Province of British Columbia shall be engaged by the Contractor for purpose of inspecting and/or testing portions of the Work.

.2 Provide equipment required for executing inspection and testing by independent agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with the Contract Documents.

.4 If defects are revealed during inspection and/or testing, independent agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Engineer at no cost to the Engineer. Pay costs for retesting and re-inspection.

1.8 ACCESS TO WORK

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

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

1.9 PROCEDURES

.1 Notify appropriate agency and the Engineer in advance of requirement for tests, in order that attendance arrangements can be made.

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

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

1.10 REJECTED WORK

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

.2 Make good other the Contractor's work damaged by such removals or replacements promptly.

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

1.11 REPORTS

.1 Make available copies of all test results to the Engineer and Contractor simultaneously.

.2 Submit 2 copies of interim and final inspection / test reports to the Engineer.

.3 Provide copies to subcontractor of work being inspected or tested.

1.12 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

1.13 MILL TESTS

.1 Submit mill test certificates as required in specification Sections.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for temporary (construction) facilities during the execution of the Work.

1.2 MEASUREMENT FOR PAYMENT

.1 Temporary facilities shall include for any start-up costs, submittal plans, all survey, as-built survey and record drawings, environmental, mob/demob of equipment, movement of equipment, materials, etc. for phase changes, materials, trailers/offices, generators, quality control, trailer mounted generator/light stands for night operations (if required), barricades, barrels, posts and red lighting setup, temporary runway closure markings, and maintenance, signage and movement and maintenance, utility locates, hydrovac, cleaning including sweeper/vacuum trucks, construction of temporary construction access and material stockpile locations and restoration (as required) at project completion and other items required to complete the work not specifically separated by a line item on the Schedule of Quantities and Unit Prices.

.2 Separate payment will not be made to move and replace the barricades, barrels, posts, markings, and signage during construction.

.3 Any damaged barricades, barriers, posts, markings and lights are to be replaced by the contractor at no additional cost.

1.3 SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be used by Contractor, number of trailers to be used (if required), avenues of ingress/egress to area and details of remediation.

.2 Indicate use of supplemental or other staging area.

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

.4 Remove from site all such work after use.

.5 Provide and maintain adequate access to project sites.

.6 Clean roads, runways, taxiways and apron areas where used by Contractor's equipment and as directed by the Engineer. See Specification Section 01 74 11 Cleaning.

1.5 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

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

1.6 CONSTRUCTION PARKING

.1 Designated parking space will be made available at the Contractor's staging area. Maintain and administer these spaces as directed.

.2 Provide and maintain adequate access to project site.

1.7 SECURITY

.1 If required by the Contractor, provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

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

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

.3 Provide adequate weather tight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

1.9 CONTRACTOR'S SITE OFFICE (IF REQUIRED)

.1 Contractor to provide site trailer/office as required by their forces.

1.10 ENGINEER'S SITE OFFICE (IF REQUIRED)

.1 A separate site office for the Engineer's use is not required for this project.

1.11 SANITARY FACILITIES

.1 Provide sanitary facilities for work force, in accordance with governing regulations and ordinances.

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

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

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

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

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

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

.5 Location, grade, width, and alignment of construction and hauling roads: subject to acceptance by the Engineer.

.6 Lighting to assure full and clear visibility for full width of haul road and work areas during night work operations should they be necessary.

.7 Dust control is to be adequate to ensure safe operation at all times.

.8 Provide snow removal (if required) during period of Work.

.9 Remove, upon completion of work, haul roads designated by the Engineer.

1.13 CLEAN-UP

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

.2 Clean dirt or mud tracked onto paved or surfaced roadways. Runway, taxiways, and aprons utilized for movement of construction vehicles and equipment must be cleaned and sweeped thoroughly prior to the reopening of airfield pavements for traffic.

.3 Store materials resulting from demolition activities that are noted as salvageable for The District.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies the general requirements for Material and Equipment that are to be installed as part of the Work by the Contractor.

1.2 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, the Engineer reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by the Contractor in event of non-conformance.

1.3 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make a reasonable effort to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

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

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout construction.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

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

.2 In event of failure to notify the Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Engineer reserves the right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in a weatherproof enclosure.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Remove and replace damaged products at own expense and to satisfaction of the Engineer.

.6 Touch-up damaged factory finished surfaces to the Engineer's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

.7 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.

.8 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.

.9 Store material and equipment in accordance with supplier’s instructions.

1.6 TRANSPORTATION

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

1.7 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify the Engineer in writing, of conflicts between specifications and manufacturer's instructions, so that the Engineer will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Engineer to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify the Engineer if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. The Engineer reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with the Engineer, whose decision is final.

1.9 SUBSTITUTION

.1 No substitutions will be permitted without prior written approval of the Engineer.

.2 Proposals for substitution may only be submitted after award of contract. Such request must include statements of respective costs of items originally specified and the proposed substitution.

.3 Proposals will be considered by the Engineer if:

.1 Materials selected by bidder from those specified, are not available.

.2 Delivery date of materials selected from those materials specified would unduly delay completion of contract; or

.3 Alternative material to those specified, which are brought to the attention of and considered by the Engineer as equivalent to the material specified and will result in a credit to the Contract amount.

.4 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on project. Pay for design or drawing changes required as result of substitution.

.5 Amounts of all credits arising from approval of substitutions will be determined by the Engineer and Contract Price will be reduced accordingly.

1.10 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.11 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 CONSTRUCTION EQUIPMENT AND PLANT

.1 On request, prove to the satisfaction of the Engineer that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.

.2 Maintain construction equipment and plant in good operating order.

1.13 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of the Engineer.

1.14 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by the Engineer, with minimum of disturbance to airport operations.

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

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This section specifies the requirements for construction survey layout of the project.

1.2 REFERENCES

.1 Specification Section 01 11 00 – Summary of Work

.2 Specification Section 01 52 00 – Temporary Facilities

.3 Specification Section 01 78 00 – Closeout Submittals

1.3 QUALIFICATIONS OF SURVEYOR

.1 The Contractor shall supply a competent fully equipped survey crew(s) acceptable to the Engineer to carry out work as listed below. Unsuitable or unqualified personnel shall be removed from the project and replaced immediately with qualified personnel.

1.4 MEASUREMENT FOR PAYMENT

.1 No separate payment will be made for pre-construction, construction, and as-built surveys. All surveying costs to be included in total lump sum cost for Civil General Requirements.

1.5 SURVEY REFERENCE POINTS

.1 Horizontal and vertical control points are designated on drawings.

.2 Locate, confirm, and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to the Engineer.

.4 Report to the Engineer when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Costs to replace geodetic bench marks or legal survey pins as a result of Contractor negligence will be deducted from the Contractor's payment. In particular, legal pins shall be laid out and re-instated by a competent registered Nova Scotia Land Surveyor.

1.6 GENERAL REQUIREMENTS

.1 All layout of the Work shall be the responsibility of the Contractor.

.2 The Engineer will furnish the Contractor with a complete set of paper construction drawings. The Contractor shall provide the Engineer with a copy of all vertical control

grades as established from the information provided. Should the Contractor's survey utilize a control points network, the Contractor shall provide to the Engineer a copy of coordinates and elevations of the control points in both CAD and paper format.

.3 If at any time during the progress of the Work any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Work, the Contractor shall stop working on that portion of the Work and notify the Engineer. If the Contractor proceeds with the Work after a discrepancy is discovered, he does so at his own risk. The Contractor shall make allowances in his work schedule for delays of this nature and shall not claim or be paid for stand by or shut down.

.4 The Engineer will provide CAD file(s) to the Contractor.

.1 These CAD file(s) are the intellectual property of Tetra Tech Canada Inc., and the District of Vanderhoof. They shall be used solely for the intended project and shall not be distributed, shared, or revised without written consent of Tetra Tech, and the District of Vanderhoof.

.2 CAD file(s) are provided as a courtesy with permission from Tetra Tech and the District of Vanderhoof. The digital information conveyed is for Contractor convenience, and shall not be relied upon for construction or survey layout.

.3 The Contractor shall protect, indemnify and save harmless Tetra Tech and the District of Vanderhoof from any loss, cost, damage or expense arising from any claim that is in any way associated with the use of these electronic files.

1.7 CONSTRUCTION SURVEY LAYOUT

.1 The Contractor shall provide stakes and/or marks showing project station and offset from taxiway centerline, terrain removal cuts/finished grades, access roads, trenching alignments, pullpits, etc as required to properly identify locations and make the necessary changes for construction.

.2 The Contractor shall provide stakes and/or marks showing project station and offset from centreline of runway/taxiway/ditch/road, as required to properly identify critical changes in transverse / longitudinal slopes or grade breaks in addition to the intervals specified.

.1 The Contractor shall be responsible to survey as required prior to removals, stripped surface, rock surface, subgrade surface, granular sub-base and base, topsoil and hydroseed surfaces to satisfy Measurement for Payment clauses.

.2 The interval for setting grades for terrain removal subgrade shall be 20 m in the longitudinal direction and 10 m in the transverse direction and at each change in transverse or longitudinal slope and/or the width as agreed to by the Contractor and the Engineer.

.3 The interval for setting grades for subgrade, granular material, and asphalt pavement construction shall be 5 m in the longitudinal direction and 5 m in the transverse direction and at each change in transverse or longitudinal slope and/or the width as agreed to by the Contractor and the Engineer.

.4 A survey of the completed subgrade elevation shall be provided to the Engineer for comparison with design prior to placing any fill material.

.5 Survey elevations for taxiway grade layout shall provide 0.01m accuracy.

.6 Survey elevations for terrain removal shall provide 0.01m accuracy.

.7 Survey elevations for engineered/structural fill may be provided with a GPS or total station to achieve 0.01m accuracy.

.8 Table 1 consists of survey layout for underground pipes/culverts and miscellaneous items to be provided by the Contractor and/or items required as per contract. Layout requirements may be changed as mutually agreed upon with the Contractor and the Engineer.

Table 1 – Survey Layout Provisions

ITEM	LOCATION LAYOUT	OFFSET LAYOUT	ELEVATION	COMMENTS
Storm/Subdrain Pipes	Ö	Ö	Ö	Offset stakes with grades referenced to pipe inverts
Trenching	Ö	Ö	Ö	Location stake and/or offsets

1.8 CONTRACTOR'S RESPONSIBILITIES

.1 Should the Contractor discover or suspect any apparent error or omission in the Drawings, Specifications, stakes, marks, engineering tests, or other measurements done or provided by the Engineer, the Contractor shall immediately bring such apparent error or omission to the attention of the Engineer. The Engineer will make corrections and interpretations as may be necessary for the fulfilment of the intent of the Drawings and Specifications.

.2 The Contractor shall be responsible for transferring the information from the Drawings, Specifications, or other measurements provided by the Engineer for performance of the Work in accordance with the Contract Documents.

.3 Final checking of grades shall be done in the presence of the Engineer. This does not relieve the Contractor from providing as-built survey data.

1.9 EXISTING SERVICES

.1 Before commencing work, coordination with The District to establish location and extent of service lines in area of Work.

1.10 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

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

.3 All survey CAD files, layers, and feature codes must be submitted for review as a submission prior to project commencement. The Closeout Submittal, per Specification Section 01 78 00, shall follow the accepted format.

.4 The District Land Surveys Standard and Infrastructure Database is an option for the CAD file formatting. The Contractor may request this manual prior to project start so all submitted data may meet these standards.

1.11 SUBMITTALS

.1 Submit name and resume/CV of the proposed survey crew(s) for review and acceptance. The District/Engineer will provide review and acceptance following the stipulations of the Contract Documents.

.2 Submit for review and acceptance, a feature code proposal for the interim survey submissions, as well as, a separate and complete feature code and layering convention for the various quantity and as-built survey surfaces. These shall at minimum include lineal metre, square metre, and cubic metre line items.

.3 Throughout the duration of the project the Contractor shall submit interim as-built/quantity digital survey information to the Engineer fir review. Interim submission shall be made at the following milestones:

.1 Each progress claim for confirmation of payment quantities.

.2 The return-to-service or opening of any area of work for the incorporation of constructed infrastructure as assets in The District databases.

.4 Interim submissions shall include:

.1 .xml files containing surfaces utilized for quantity calculation

.2 CAD and/or Civil 3D digital file in most current software version as accepted by Engineer.

.3 CAD/Civil 3D surfaces, only ONE data file shall be accepted per bid item applicable. For example, Line Item”2.01 Asphalt Removal and Dispose Off-Site”, ONE submission of bid item 2.01 will be accepted per month for the duration of the project. It is the Contractor’s responsibility to coordinate this work to meet the month end cut –off date(s).

.4 CAD/Civil 3D files shall contain the name of bid item, using above example, the words “2.01 2.01 Asphalt Removal and Dispose Off-Site” shall show in the file name.

.5 If requested, ASCII points file containing all survey data, feature codes, elevations, coordinates, file name to include date of submission.

.6 ONE submission of all quantities per monthly period will be accepted.

.7 Submittal data must be in a format acceptable to the Engineer.

.5 Submit for review and acceptance, a feature code proposal for the Closeout Submittals, per Specification Section 01 78 00. This submission should follow that of a typical Nova Scotia Land Surveyor topographic survey.

.6 The Contractor shall submit a complete set of mark-up drawings and CAD drawings to the Engineer. See Specification Section 01 78 00 Closeout Submittals for requirements for record documentation.

1.12 SUBSURFACE CONDITIONS

.1 Promptly notify the Engineer in writing if subsurface conditions at the Place of Work differ materially from those indicated in the Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should the Engineer determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This Section specifies the requirements for the cleaning of the project site and the completed work during the time of Work and at the completion of the work.

1.2 REFERENCES

.1 Not Applicable.

1.3 MEASUREMENT PROCEDURES

.1 No separate payment will be made for cleaning. Unit rates shall include all labour, materials, tools, equipment, etc. as required by the Contractor to provide cleaning as required for all construction activities.

1.4 GENERAL

.1 Conduct cleaning and disposal operations to comply with The District procedures, local ordinances and anti-pollution laws.

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

.3 Dust control shall be exercised as required to effectively eliminate dust; and as directed by the Engineer. The Contractor shall supply the necessary water truck(s) as required for dust control purposes. Water is mandatory during concrete removal stages of the project.

.4 The District will complete inspections of the airside pavements surrounding the work area during their field checks and prior to the Contractor leaving the site. The Contractor shall be responsible for cleaning of any of the construction areas identified by The District .

1.5 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including other than that caused by the Owner or other Contractors.

.2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.3 Provide on-site garbage containers at airside and groundside staging area with secure lids for collection of waste materials and debris.

.4 Dispose of waste materials and debris off site in accordance with municipal bylaws.

.5 Prevent materials and rubbish from blowing onto aircraft manoeuvring areas and becoming a hazard to aircraft operations.

.6 Contractor shall provide continuous cleaning of dust, gravel and debris as necessary to prevent damage to aircraft for all travel on the apron including travel to and from the access gate.

.7 The Contractor must provide at least one sweeper/vacuum truck at all times to ensure the access routes to and from the construction areas are kept free of dust and debris. Sweeper truck to follow all traffic to and from the construction area, especially across open and operational taxiways.

.8 The Contractor must demonstrate that he has sufficient equipment (pressure sprayers, vacuums, brushes, mechanical sweepers, sweeper/vacuum truck) and manpower to clean the asphalt/concrete debris and slurry during saw cutting operations. The Contractor must also contain the slurry from flowing out of the specific site area during work operations and not discharge into storm water system.

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

1.6 FINAL CLEANING

.1 Remove all waste products, surplus materials, barricades, and return to pre-existing condition the Work area. Remove waste products and debris, and leave Work area clean.

.2 Pavement Surfaces:

.1 All pavements shall be swept and cleaned of mud, concrete/sawcut slurry, curing compound or other deleterious materials prior to painting and final inspection.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This Section specifies the requirements for the preparation of Project Record Documents by the Contractor for submission to the Engineer at the completion of the Work.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Substantial Performance Meeting:

- .1 Convene meeting one week prior to contract completion with the contractor's representative and the Engineer to:
  - .1 Verify Project requirements.
  - .2 Review manufacturer's installation instructions and warranty requirements.
- .2 Engineer to establish communication procedures for:
  - .1 Notifying construction warranty defects.
  - .2 Determine priorities for type of defects.
  - .3 Determine reasonable response time.
- .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 MEASUREMENT FOR PAYMENT

.1 No separate payment will be made for closeout submittals. Unit rates and lump sum price bid contract items shall include all labour, materials, tools, equipment, etc. as required by the Contractor to provide closeout submittals as required for all contract activities.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 FORMAT

.1 Drawings:

- .1 Hard copy and scanned versions of red lined record drawings.
- .2 Provide CAD files dwg. format via email or on flash drive.

1.6 CONTENT - PROJECT RECORD DOCUMENTS

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

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

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

1.7 RECORD DOCUMENTS AND SAMPLES

.1 Engineer will provide one set of white prints for record drawing purposes.

.2 Maintain, in addition to requirements in the General Conditions, at site for the Engineer one record copy of:

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.
.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.3 Store record documents and samples in field office apart from documents used for construction.

.4 Label record documents and file accordingly.

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

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

.1 Do not use record documents for construction purposes.

.6 Keep record documents and samples available for inspection by the Engineer.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of drawings and provide to Engineer as requested.

.2 Maintain project record drawings and record accurately deviations from Contract document and ensure they are accessible to The District and the Engineer at all times.

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

.4 Record information concurrently with construction progress.

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

.5 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to on site survey datum.

.2 Present all information in SI Metric units.

.3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure. Contractors shall pay the cost of uncovering and making good facilities, systems and services, which have been covered over or backfilled, before specified record measurements have been obtained by the Contactor and approved by the Engineer.

.4 Field changes of dimension and detail.

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

.6 Field changes of dimension and detail.

.7 Changes made by change orders or field order.

.8 Details not on original Contract Drawings.

.9 References to related shop drawings and modifications.

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

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

.2 Changes made by Addenda and change orders.

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

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

.9 Contractor's responsibility for errors and omissions in submission is not relieved by the Engineer's review of submissions.

1.9 FINAL SURVEY

.1 All surveys will be conducted to the equivalent standards of a licensed British Columbia Land Surveyor.

.2 On completion of the project, the contractor shall conduct a comprehensive topographical survey of all constructed/finished surfaces, manholes, storm pipes, inset lights, paint markings and all other appurtenances related to the project as applicable.

.3 All survey work will be done in accordance with the current District Standard.

.4 Refer to the current District Standard for details associated with responsibility, survey control, survey accuracy, monuments, survey submission, formats, reporting and Survey file structure.

.5 Refer to the current District CAD Standards for digital format, layer naming, feature codes etc. prior to initiating record survey. Final record drawing/quantity submission to the Engineer for the project shall contain:

.1 ASCII points file containing all survey data, feature codes, elevations, coordinates, file name to include date of submission.

.2 CAD and/or Civil 3D digital file in most current software version as accepted by Engineer.

.3 CAD/Civil 3D surfaces to contain breaklines of different topographical features, polygons and any other pertinent information used to determine quantities.

.6 The asphalt surface shall be at a 10m longitudinal x 5m transverse grid, plus any changes in grades, plus tie-ins to existing, plus shots extending beyond the edge of asphalt tie-ins both sides to 10 metres (2 shots) unless specified otherwise.

.7 All finished hard surface surveys shall be completed with a spirit level or Total Station capable of millimeter accuracy. GPS is acceptable for horizontal control but will not be acceptable for determining vertical control.

1.10 DELIVERY SCHEDULE

.1 Accompany Record submissions with a transmittal letter containing:

.2 Date.

.3 Project Title and Number.

.4 Contractor's name and address.

.5 Identification and quantity of each record drawing.

.6 Other pertinent data.

.7 The delivery format for surveys shall be in accordance with the current District Standard, as well as other direction provided by the Engineer.

.8 The schedule for record submissions will be determined by The District during the project start-up phase, based on the scope of the project, and may be subject to change based on the progressing scope of the project. See Section 01 71 00 – Construction Survey for further information.

.9 Within three weeks of substantial completion, or as otherwise agreed, the Contractor shall deliver the comprehensive topographical survey as listed under section 1.9.

.10 Allow ten working days for the Engineer's/District's review of each submission.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This specification covers the general and specific requirements for aggregates incorporated in various portions of the work.

2. RELATED SECTIONS

.1 Section 32 11 23 – Aggregate Base Course

.2 Section 32 12 16 - Asphalt Paving

.3 Section 01 33 00 - Submittal Procedures.

3. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.2 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.3 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.4 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

.6 ASTM D1557 [02e1], Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft lbf/ft3 (2,700 kN m/m3)).

.7 ASTM D1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.4 CSA

.1 CSA-A23.2-1A Sampling aggregates for use in concrete

.2 CSA-A23.2-12A Relative density and absorption of coarse aggregate.

.3 CSA-A23.2-6A Relative density and absorption of fine aggregate.

.4 CSA-A23.2-16A/17A Resistance to degradation of small-size coarse aggregate by abrasion and impact in the Los Angeles machine.

.5 CSA-A23.2-9A Soundness of aggregate by use of magnesium sulphate

.6 CSA-A23.2-2A Sieve analysis of fine and coarse aggregate.

.7 CSA-A23.2-5A Amount of material finer than 80µm in aggregate.

4. SOURCE ACCEPTANCE

.1 Inform the Owner of proposed source of aggregates and provide current satisfactory test data on proposed source of aggregates at least two weeks prior to delivery of aggregate to the site.

.2 If, in the opinion of the Owner, materials from proposed source(s) do not meet, or cannot reasonably be processed to meet specified requirements, procure alternative source.

.3 Should change of material source be proposed during work, advise the Owner and provide current satisfactory test data on proposed aggregate source at least two weeks prior to delivery of aggregate to the site.

.4 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified when incorporated into work.

5. SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Allow continual sampling by the Owner during production.

.3 Provide the Owner with access to source and processed material for sampling.

.4 Install sampling facilities at discharge end of production conveyor, to allow the Owner to obtain representative samples of items being produced. Stop conveyor belt when requested by the Owner to permit full cross section sampling.

.5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements if so required.

.6 For existing stockpiles of material submit results of Quality Control testing to Owner at least two weeks prior to delivery of aggregate to the site.

.7 For material produced during the course of the work, submit the results of Quality Control testing within 24 hours of completion of the test.

.8 Submit samples of aggregates (minimum 50 kg) as requested by the Owner for Quality Assurance testing. Provide the Owner with access to aggregate sources if requested.

6. WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular materials from landfill to local facility as specified in Waste Reduction Workplan.

7. TEST METHODS

.1 The latest edition of the test methods in Table 1 will be used to determine material characteristics unless otherwise specified.

TABLE 1

	Name of Test	CSA/ASTM Designation for PCC Pavement	ASTM Designation for HMAC Pavement
.1	Sampling Aggregates for Use in Concrete	CSA - A23.2 - 1A	
.2	Relative Density and Absorption of Coarse Aggregate	CSA - A23.2 - 12A	ASTM C127-09
.3	Relative Density and Absorption of Fine Aggregate	CSA - A23.2 - 6A	ASTM D854-06
.4	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	CSA - A23.2 - 16A	ASTM C131-06
.5	Soundness of Aggregate by Use of Magnesium Sulphate	CSA - A23.2 - 9A	ASTM C88-05
.6	Sieve Analysis of Fine and Coarse Aggregate	CSA - A23.2 - 2A	ASTM C136-06

TABLE 1			
	Name of Test	**CSA/ASTM Designation for PCC Pavement**	**ASTM Designation for HMAC Pavement**
7	Amount of Material Finer than 80 μm in Aggregate	CSA - A23.2 - 5A	ASTM C117-04
.8	Sieve Analysis of Mineral Filler for Road and Paving Materials	ASTM D546	ASTM D546
.9	Sand Equivalent Value of Soils and Fine Aggregate	ASTM D2419	ASTM D2419
.10	Plasticity Index of Soils	ASTM D4318	ASTM D4318
.11	Liquid Limit of Soils	ASTM D4318	ASTM D4318

PART 2 - PRODUCTS

1. GENERAL

.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 D4791.

.1 Greatest dimension to exceed five times least dimension.

.3 Particles having at least one freshly fractured face are considered as crushed fragments.

.4 Fine Aggregates for purposes of standard CSA tests, shall be all mineral matter passing the 5 mm sieve including mineral fillers.

.5 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Natural sand.

.2 Manufactured sand.

.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.6 Coarse Aggregates for the purposes of standard CSA tests, shall be all mineral material retained on the 5 mm sieve.

.7 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock.

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

.3 Light weight aggregate, including slag and expanded shale.

2. MATERIALS

.1 Aggregates shall satisfy all the requirements of this specification and unless specified otherwise shall be:

.1 Crushed Aggregate

.1 Crushed rock composed of hard, uncoated fragments, products from rock formations or boulders of uniform quality.

.2 Crushed gravel composed of hard, durable, uncoated particles, produced from naturally formed deposits.

.2 Screened Aggregate

.1 Aggregates shall be composed of clean, hard, durable uncoated particles and shall satisfy all requirements for the material required.

.2 Unless otherwise directed by the Owner in consultation with the Design Manager, specifications for various aggregate types are as follows:

.1 Crushed gravel shall conform to the following:

	PERCENT PASSING BY WEIGHT (NOMINAL GRAVEL SIZE)		
Metric Sieve Sizes	75 mm	19 mm	25mm
80 mm			
75mm	100		
38 mm	60 – 100		
25 mm	–		100
19 mm	35 – 80	100	95 – 100
9.5 mm	26 – 60	60 – 90	55 – 80
4.75 mm	20 – 40	40 – 70	35 – 65
2.36 mm	15 – 30	27 – 55	28 – 52
1.18 mm	10 – 20	16 – 42	
0.600 mm	5 – 15	8 – 30	13 – 35
0.300 mm	3 – 10	5 – 20	9 – 26

0.150 mm	–		6 – 18
0.075 mm	0 – 5	2 – 8	4 – 10

.1 75 mm Crushed Gravel:

.1 Minimum percent fractured shall be 20 percent. (2 Faces)

.2 Maximum 45 percent loss when tested in accordance with CSA A23.2–16A and CSA A23.2–17A.

.2 25 mm Crushed Gravel:

.1 Minimum percent fractured shall be 60 percent. (2 Faces)

.2 Maximum 45 percent loss when tested in accordance with CSA A23.2–16A and CSA A23.2–17A.

.3 19 mm Crushed Gravel:

.1 Minimum percent fractured shall be 60 percent. (2 Faces)

.2 Maximum 45 percent loss when tested in accordance with CSA A23.2–16A and CSA A23.2–17A.

3. SOURCE QUALITY CONTROL

.1 General

.1 Quality Control shall be the responsibility of the Contractor. Quality Assurance tests performed by the Owner shall not be considered Quality Control tests.

.2 The Contractor shall use professional engineering services and a testing laboratory certified by CCIL in accordance with CSA A283, Category I or II, and licensed to practice in the Province of Alberta to assess and where necessary, modify the aggregate materials being produced to ensure their end use meets all specification requirements.

.3 Advise the Owner 4 weeks in advance of proposed change of material source.

.4 Inspection or testing by the Owner shall not in any way relieve the Contractor of the responsibility for providing aggregates that meet the specification in all respects.

.2 Testing Frequency

.1 The Contractor shall provide current aggregate test results as per Table 3.

TABLE 3		
Test	**Standard**	**Minimum Frequency**
SIEVE ANALYSIS: Crushed or Screened Aggregate or Sand	ASTM C136	One per 1000 tonnes of aggregate produced
SIEVE ANALYSIS: Pit-run Aggregate or Sand	ASTM C136	One per 1000 tonnes of aggregate produced
PERCENT FRACTURE	See Note 1	One per 5000 tonnes of aggregate produced
L.A. ABRASION	ASTM C131	One per 10,000 tonnes of aggregate produced

.1 Note 1: The percent of fractured material will be determined by examining the fraction retained on the 5 mm sieve and dividing the mass of the fractured particles having two or more fractured faces by the total mass retained on the 5 mm sieve.

PART 3 - EXECUTION

1. PREPARATION

.1 Handling

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.2 Stockpiling

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by the Owner. Do not stockpile on completed pavement surfaces.

.2 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.3 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.4 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the Owner within 24 h of rejection.

.5 Stockpile materials in uniform layers of thickness as follows:

.1 Max 1.5 m for coarse aggregate and base coarse materials.

.2 Max 1.5 m for fine aggregate and sub-base materials.

.3 Max 1.5 m for other materials.

.6 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.7 Do not cone piles or spill material over edges of piles.

2. CLEANING

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in neat compact stockpiles as directed by the Owner.

.3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies the requirements for the removal of topsoil indicated by the Contract documents or as directed by the Owner.

2. RELATED SECTIONS

.1 Section 31 22 14 Airfield Excavation and General Grading

.2 Section 32 91 19.13 – Topsoil Placement and Grading.

3. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

4. MEASUREMENT FOR PAYMENT

.1 Measurement for payment shall be at the tendered unit price per cubic metre as per the Schedule of Quantities and Unit Prices.

.2 Payment at the tendered unit price shall include:

.1 Full compensation for all work required to excavate, load, haul, stockpile, dispose off-site, cleanup and all other work incidental to this section.

.3 For measurement of excavated materials, cross sections shall be taken by the Contractor before and after excavation and delivered in format acceptable to the Engineer. No measurement will be made of excavated material in stockpiles.

.4 No measurement will be made of excavation beyond limits in Contract Documents or as agreed to with the Engineer.

5. DEFINITIONS

.1 Topsoil: The top layer of soil composed of a mixture of mineral particulates, micro-organisms and organic matter that provides a suitable medium for supporting plant growth. The depth of topsoil shall be equivalent to 100 - 300 mm below the original ground surface unless indicated otherwise.

.2 Unsuitable: Materials containing vegetable or organic materials, such as muck, peat, organic silt or sod and/or very weak and compressible materials.

PART 2 - 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.

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

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

2. STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable Provincial and Municipal requirements, the Contractor's Environmental Protection Plan, and Section 01 35 43 - Environmental Procedures.

.2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.3 Handle topsoil only when it is dry and warm.

.4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.

.5 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.

.6 Strip topsoil to required depths as indicated or as directed by the Owner.

.1 Avoid mixing topsoil with subsoil.

.7 Haul, place, and level topsoil to be reused at the location specified by the Owner.

3. PREPARATION OF GRADE

.1 Verify that grades are correct. Notify the Owner if discrepancies occur. Do not begin work until instructed by the Owner.

.1 Grade area only when soil is dry to lessen soil compaction.

.2 Grade soil establishing contours as per the Contract Drawings and documents and eliminating uneven areas and low spots, ensuring positive drainage.

4. PLACING OF TOPSOIL

.1 Place and level topsoil in accordance with Section 32 91 19.13 – Topsoil Placement and Grading.

5. CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Leave areas stripped of topsoil trimmed and leveled suitable for next phase of work.

.3 Leave site in tidy, well drained conditions free of standing water once placing and leveling of the topsoil is competed.

.4 Remove material that has spilled onto pavement surfaces or haul routes.

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

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the requirements for excavation, disposal of material, construction of common fill areas, and preparation of pavement subgrade in accordance with the specifications and conforming to lines, grades, dimensions and typical cross sections indicated by the Contract Documents or as established by the Owner.

1.2 MEASUREMENT FOR PAYMENT

.1 Payment for common excavation and fill placement shall be at the unit price bid and will be measured in cubic metres calculated from cross sections taken in areas of excavation.

.2 Payment for subgrade preparation and compaction in square metres.

.3 In areas of excavation, take initial cross sections after topsoil stripping prior to excavation of material to be incorporated into work on airport property.

.4 No separate payment will be made for drainage and dewatering during construction.

.5 Payment at the unit price bid shall be full compensation for all work required to excavate, load, haul, stockpile, place, compact, level, cleanup, dust control, and other work incidental to this section.

1.3 REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 American Society for Testing and Materials International, (ASTM).

- .1 ASTM C117, Test Method for Materials Finer Than 75-Φm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136, Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D422, Method for Particle-Size Analysis of Soils.
- .4 ASTM D4318, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.3 Canadian General Standards Board (CGSB).

- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.4 DEFINITIONS

.1 Excavation shall include the following:

.1 Excavation and disposal of muck or other unsuitable materials.

.2 Excavation for the preparation and construction of the subgrade of roadways, runways, taxiways and aprons.

.3 Excavation for subcuts.

.4 Excavation for the backfill of subcuts.

.5 Excavation for the construction of drainage ditches.

.6 Excavation of material for ditch blocks and ditch checks.

.7 Excavation for construction of approaches, entrances and parking areas for vehicles and aircraft.

.8 Excavation for the general grading of areas adjacent to roadways, runways, taxiways and aprons.

.9 Excavation for the backfill of holes or false grading to correct surface irregularities.

.10 The trimming and cleanup of all materials or excavation areas.

.11 Trimming and rounding of slopes.

.12 Free haul distance: distance that excavated material is to be hauled without compensation.

.13 The construction of detours or other suitable provision to accommodate traffic, either pedestrian, vehicular or aircraft over or around any part of the work being performed.

.14 Maintaining the work in a finished condition until it has been accepted as completed by the Owner.

.2 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock Excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m^3.

.2 Common Excavation: excavation of materials of whatever nature, which are not included under definition of rock excavation, including dense tills, hardpan and frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.

.3 Unclassified excavation: excavation of deposits of whatever character encountered in work.

.3 Compaction classes: two classes of soil are recognized for compaction purposes; cohesionless and cohesive soil:

.1 Cohesionless soil:

.1 Soils which have less than 20% passing 0.075 mm sieve, when tested to ASTM C117, regardless of plasticity of fines.

.2 Soils containing between 20% to 50% passing 0.075 mm sieve and having liquid limit less than 25 and plasticity index less than 6 when tested to ASTM D4318.

.2 Cohesive soil: soil not having properties to be classified as cohesionless.

.4 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.5 Waste material: excavated material unsuitable for use in work or surplus to requirements to be disposed as directed.

.6 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.7 Pavement structure: combination of layers of unbound or stabilized granular sub-base, base, and asphalt or concrete surfacing.

.8 Subgrade elevation: Elevation immediately below base or subbase, whichever is lower.

.9 Subcut: Excavation within or below the subgrade to length, width, and depth established by the Owner.

.10 Common Fill: Material derived from usable excavation and placed above original ground or stripped surface up to subgrade elevation.

.11 Subgrade: In fills, the material confined between subgrade elevation and original ground, and between sideslopes; in cuts, the material below subgrade elevation confined between sideslopes.

.12 Stripping: Material composed of organic, unsuitable for common fill regardless of moisture content.

.13 Unsuitable materials:

.1 Weak and compressible materials under pavement areas.

.2 Frost susceptible materials under pavement areas.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Dispose of excavated waste materials off-site.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Materials: to acceptance of the Owner.

.2 Material used for common fill not to contain more than 3% organic matter by mass.

2.2 GEOTEXTILE AND GEOGRID

.1 Refer to Section 31 32 19.01 – Geotextiles.

.2 Refer to Section 31 32 19.13 – Geogrid Soil Stabilization.

Part 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

.1 Refer to Section 31 14 13 – Soil Stripping and Stockpiling.

3.2 EXCAVATING

.1 General:

.1 Advise the Owner at least 7 days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as indicated or as directed by the Owner.

.3 Ensure drainage of excavated areas and maintain crowns and cross slopes to provide surface drainage. Do not allow standing water to occur on the excavated or fill surface at any time.

.4 Provide ditches as the work progresses to provide drainage.

.5 All deposits of frost susceptible and unsuitable materials shall be removed below subgrade to the length, widths and depths as directed by the Owner, and such unsuitable materials shall be replaced with acceptable backfill material and compacted in place. Notify the Owner when unsuitable materials are uncovered.

.1 The Owner will require timely placement of backfill material, if such action is deemed essential to minimize deterioration or degradation of exposed materials.

.6 Treat ground slopes at grade points, where subgrade is on transition from excavation to embankment or earth to rock, as indicated or as directed by the Owner.

.7 Dispose of waste material as specified in the Contractor's Waste Reduction Work Plan.

.2 Do not disturb foundation materials of adjacent pavements or structures which are to remain in place.

.3 Side Ditches:

.1 Construct side ditches to depths and widths indicated in contract documents or as directed by the Owner, to permit ready flow of surface water.

.2 Ditches in airfield cuts will be constructed as soon as possible to provide drainage in the cut to prevent softening of the subgrade.

.3 Maintain and keep ditches open and free from debris at all times.

.4 Provide drainage control devices in ditches to minimize flow rates and prevent erosion.

.4 Unsuitable or surplus material:

.1 Disposal of unsuitable or excess material shall be at locations as indicated in the Contract Documents or as directed by the Owner.

.5 Owner Supplied Gravels:

.1 Owner to designate location and extent of gravel stockpiles.

.2 Contractor is responsible for maintenance of all haul roads. No separate payment will be made.

3.3 COMPACTION

.1 General:

.1 Shape and roll alternately to obtain smooth, even and uniform compacted layers.

.2 When necessary apply water during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

.3 Any soft, weak, or otherwise unsuitable material discovered at any stage of the work shall be excavated to the depth and extent designated by the Owner. The material shall be replaced by suitable material.

.4 Quality control testing of materials will be carried out by the testing laboratory designated by the Contractor, at a higher frequency.

.5 Should the surface become rutted or disturbed for any reason prior to or during the placing of the next layer, the Contractor shall re-grade and re-compact the subgrade at his own expense.

.6 Place and compact to full width in layers not exceeding 200 mm loose thickness. The Owner may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone or rock fragments larger than 100 mm.

.7 Break soil down to a size suitable for compaction and mix for uniform moisture and soil conditions to full depth of layer.

.8 Compact each layer to at least a minimum of 98% Modified Proctor Maximum Dry Density ASTM D1557.

.9 During performance of the work, sufficient water shall be added or the soil shall be aerated to bring the moisture content to within ± 2% of optimum required for compaction.

.10 The moisture content shall be maintained at ± 2% of the optimum moisture content as defined by ASTM D1557 until the next layer is placed.

3.4 FINISHING AND TOLERANCES

.1 Ditches:

.1 Blade finished ditch subgrade surfaces in cut and fill areas free from ruts, depressions, rock in excess of 75 mm and debris. Hand finish areas that cannot be finished satisfactorily by machine.

.2 Finished ditch subgrade to be within 30 mm of design elevations, but not uniformly high or low.

.2 Pavement and Shoulder Subgrade:

.1 Fine grade finished subgrade to be free from ruts, depressions, rock in excess of 75 mm, and debris and attain a tight dense surface.

.2 Following fine grading, static rolling subgrade surface using a smooth drum type roller can be done (if needed), to help attain a tight dense condition.

.3 Finished subgrade to be within 30 mm of design elevations, but not uniformly high or low.

.4 Finished subgrade surfaces to be free from depressions exceeding 30 mm in 5 m.

3.5 PROOF ROLLING

.1 For proof rolling, use fully loaded dual axle dump truck with an effective single axle load of 18,000 lbs (80 kN).

.2 The Owner may authorize use of other acceptable proof rolling equipment.

.3 Proof roll top of subgrade upon completion of compaction, fine grading work, and density testing to verify compliance with density and moisture specification.

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

.5 Where proof rolling reveals areas of unstable subgrade, proceed as follows:

.1 Investigate material in unstable area to a depth of about 600 to 750 mm below subgrade elevation, or as directed by the Owner. If the material below the subgrade surface is deemed to be suitable, redo subgrade preparation to a depth necessary to achieve requirements of this section. After completion of rework, proof roll subgrade again.

.2 If the investigation reveals unsuitable material, remove such material to the depth and extent as directed by the Owner. Use of geotextile and geogrid in the bottom of the excavation shall be at the discretion of the Owner.

.3 Backfill area of excavation with common material in compliance with the compaction and moisture content requirements of this section. Proof roll subgrade again.

.4 The use of Geotextile and Geogrid as a means to help correct areas of unstable subgrade shall be at the discretion of the Owner and shall only be used after all methods noted in this section have been attempted. Unauthorized use of geotextile and geogrid shall be at the Contractors' expense.

3.6 MAINTENANCE

.1 Maintain finished surfaces in a condition in accordance with this Section until succeeding material is applied.

.2 Acceptance of finished subgrade by the Owner does not relieve the Contractor of his responsibility to provide a subgrade meeting the requirements of this Section until succeeding material is applied.

.3 Maintain work area such that dust does not create a safety hazard to the airport.

END OF SECTION

PART 1 - GENERAL

1. RELATED REQUIREMENTS

.1 31 22 14 – Airfield Excavation and General Grading

2. REFERENCE STANDARDS

.2 ASTM International

.1 ASTM D 1248-05, Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.

.2 ASTM D 4101-10, Standard Specification for Polypropylene Injection and Extrusion Materials.

.3 ASTM D 4218-96(R2008), Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique.

.4 ASTM D 5262-07, Standard Test Method for Evaluating the Unconfined Tension Creep Behaviour of Geosynthetics.

.5 ASTM D 6637-10, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

.2 Drexel University - Geosynthetic Research Institute (GRI)

.1 GRI GG2-87(R2005), Geogrid Junction Strength.

.3 United States Environmental Protection Agency (EPA) / Office of Water

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices or requirements of authorities having jurisdiction.

3. MEASUREMENT AND PAYMENT

.1 Supply and installation of geogrid (provisional item) shall be measured in square meters (m2) of finished surface area.

.2 Payment at the tendered unit price shall be full compensation for furnishing all materials, preparation, delivery, storage, laying the geogrid and for all labour, equipment, tools, and other work incidental to this section.

.3 Overlap of geogrid shall be considered incidental to surface area covered.

.4 No separate payment for repairs to damaged geogrid.

4. ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Samples:

.1 Submit samples 4 weeks prior to beginning Work.

.1 One 3 m length from full roll width of geogrid material, if requested by the Owner

.2 Certificates:

.1 Submit copies of mill test data and certificate 4 weeks prior to start of Work.

5. DELIVERY, STORAGE AND HANDLING

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

.2 During delivery and storage, protect geogrids from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

PART 2 - PRODUCTS

1. MATERIAL

.1 Geogrid shall be Tensar SS-1 (BX1100) geogrid, or accepted equivalent.

PART 3 - EXECUTION

1. EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for soil stabilization installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Engineer.

.2 Inform Engineer of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have beenremedied and after receipt of written approval to proceed from Engineer.

2. INSTALLATION

.1 Place geogrid material by unrolling onto graded surface in manner and locations indicated and retain in position in accordance with manufacturer's written recommendations.

.2 Place geogrid on sloping surfaces in one continuous length from toe of slope to upper extent of geogrid.

.3 Overlap each successive strip of geogrid 600 mm over previously laid strip or as recommended by the manufacturer.

.4 Seams shall be tied with cable ties every 1500 mm or as recommended by the manufacturer.

.5 Join successive strips of geogrid as indicated by manufacturer.

.6 Protect geogrid from displacement, damage or deterioration before and during placement of overlay soil layers.

.7 After installation, cover with overlay layer within four hours of placement.

.8 Replace damaged or deteriorated geogrid to acceptance of the Owner.

.9 Where structures penetrate the geogrid, ensure that the integrity of the geogrid is maintained

.10 Remove and replace damaged or deteriorated material. The damaged are shall be overlain with new geogrid with a minimum one metre overlap. Secure overlap as in Part 3, Section 1.6.

.11 Place and compact soil layers in accordance with Section Section 31 22 14 – Airfield Excavation and General Grading.

.12 Cover material shall be end dumped on the ground adjacent to the geogrid and carefully pushed or spread on to the geogrid by a dozer or other tracked machinery.

.13 A minimum depth of 200 mm shall be maintained at all times between the geogrid and the construction equipment.

.14 Cover material shall be spread in the direction of the geogrid overlap.

.15 Cover material placement shall be place immediately on geogrid exposed to ultraviolet radiation. No more than 8.0 m of geogrid is to be left uncovered at any one time.

.16 On unprotected geogrid, stones weighing more than 45 kg shall not be allowed to roll down slope.

.17 For protected and unprotected geogrid, height of drop for stones less than 115 kg shall be less than 1 m and stones greater than 115 kg shall be placed with no free fall. If stones greater than 115 kg must be dropped, field trails shall be performed to determine the maximum height of safe drop without damaging the geogrid.

3. CLEANING

.1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

4. PROTECTION

.1 Vehicular traffic not permitted directly on geogrid.

.2 Do not overload soil or aggregate covering on geogrid.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specified requirements for supply and installing Geotextile (Combigrid) as indicated by the Contract Documents or as directed by the Engineer.

2. SECTION INCLUDES

.1 Materials and installation of polymeric geotextiles used in drainage structures and roadbeds purpose of which is to:

.1 Separate and prevent mixing of granular materials of different grading.

.2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.

3. RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 31 22 14 – Airfield Excavation and General Grading.

4. MEASUREMENT PROCEDURES

.1 Refer to Schedule of Quantities in Contract documents

.2 Measurement for payment shall be at the tendered unit price per square metre as per the Schedule of Quantities and Unit Prices.

.3 Payment at the tendered unit price shall include:

.1 Full compensation for the supply, handling, placement, trimming, and securing of non-woven geotextile fabric in accordance with the Contract Documents and as directed by the Engineer.

.2 Includes placement over prepared subgrade or other surfaces beneath granular fill, drainage structures, or riprap.

.3 Includes all overlaps, fastening, anchoring, and field cutting as required to fit irregular shapes or transitions.

.4 Includes protection of fabric from UV exposure, wind displacement, and damage from equipment traffic.

.5 No separate measurement will be made for overlapping or trimming

5. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.2 ASTM D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.3 ASTM D4716, Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.4 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-4.2 No. 11.2, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).

.2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geo membranes.

.1 No. 2, Methods of Testing Geosynthetics - Mass per Unit Area.

.2 No. 3, Methods of Testing Geosynthetics - Thickness of Geotextiles.

.3 No. 6.1, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.

.4 No. 7.3, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

.5 No. 10, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.4 Canadian Standards Association (CSA International)

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

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

6. SUBMITTALS

.1 Obtain written acceptance from the Engineer for geotextile before installation of material in the work.

.2 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.3 Submit to the Engineer copies of mill test data and certificate at least two weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.

.4 The Contractor shall submit to the Engineer two weeks prior to delivery onsite, a mill certificate or affidavit signed by an authorized official of the company manufacturing the fabric.

.5 The mill certificate or affidavit shall attest that the typical physical properties of the fabric meet the minimum chemical, physical, and manufacturing requirements stated in this specification.

.6 The mill certificate shall identify all roll and batch numbers and shall correspond to rolls delivered to the site.

.7 Each roll of geotextile shall be marked with a permanently legible tag, or similar identification label showing the product number of the geotextile material, date of manufacture, and a batch number.

7. DELIVERY, STORAGE AND HANDLING

.1 During delivery and storage, protect geotextile from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

.2 Contractor to supply and deliver all geotextile to the site in sufficient quantities to cover the area designated in the Contract Documents and as requested by the Engineer.

.3 Geotextile shall be stored on the site at locations accepted by the Engineer.

.4 Geotextile shall be placed on dunnage during storage.

.5 Geotextile shall be covered at all times during storage by an opaque tarp, regardless of the nature of covering supplied by the manufacturer.

.6 Geotextile materials brought from the storage site to the placement site shall be used immediately, or protected with an opaque tarp

8. WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with the Contract Documents.

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

PART 2 - PRODUCTS

1. MATERIAL

.1 Geotextile fabric shall be Combigrid 4040, or accepted equivalent. Fabric shall be non-woven construction, supplied in rolls.

.2 Geotextile fabric shall consist of polymeric filament or yarns such as polypropylene, polyethylene, polyester, or other polymers excluding polyamides, formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals, resistant to ultraviolet light and heat exposure, and shall be indestructible by micro-organisms and insects.

.3 Where sections of geotextile are joined, seam strength shall meet the minimum tensile strength requirements for the class of geotextile, unless otherwise specified in the Contract Documents.

.4 Seams of the geotextile shall be sewn with thread of the material meeting the material requirements for the geotextile.

.5 Factory seams: sewn in accordance with manufacturer's recommendations.

.6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

1. INSTALLATION

.1 Where geotextile is to be placed on natural ground, prepare surface by removing debris which would interfere with placement of geotextile. Remove all boulders and sharp objects.

.2 Place material by unrolling on to graded surface and retain in position with weight.

.3 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with.

.4 Place geotextile material smooth and free of tension stress, folds, wrinkles, and creases.

.5 When using pegged seams on sloping surfaces, place geotextile in one continuous length from toe of slope to upper extent of geotextile to avoid horizontal seams.

.6 Pin successive strips of geotextile with securing pins.

.7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.8 Remove and replace damaged or deteriorated material. The damaged area shall be overlain with new geotextile with a minimum 1.0 m overlap. Secure overlap as per this section.

.9 After installation, cover with overlying layer within 4 hours of placement.

.10 Replace damaged or deteriorated geotextile to acceptance of the Engineer.

.11 Protect geotextile from displacement or damage until and during placement of overlaid material layers.

.12 Where structures penetrate the geotextile, ensure that the integrity of the geotextile is maintained.

.13 Place and compact soil layers in accordance with Section 31 22 14 – Airfield Excavation and General Grading.

2. PLACEMENT OF COVER MATERIAL

.1 Cover material shall be end dumped on the ground adjacent to the geotextile and carefully pushed or spread on to the geotextile by a dozer or other tracked machinery.

.2 A minimum depth of 200 mm shall be maintained at all times between the geotextile and the construction equipment.

.3 Cover material shall be spread in the direction of the geotextile overlap.

.4 Cover material placement shall be place immediately on geotextile exposed to ultraviolet radiation. No more than 8.0 m of geotextile is to be left uncovered at any one time.

.5 On unprotected geotextile, stones weighting more than 45 kg shall not be allowed to roll down slope.

.6 For protected and unprotected geotextile, height of drop for stones less than 115 kg shall be less than one metre and stones greater than 115 kg shall be placed with no free fall. If stones greater than 115 kg must be dropped, field trials shall be performed to determine the maximum height of safe drop without damaging the geotextile.

3. CLEANING

.1 Remove construction debris from project site and dispose of debris in an environmentally responsible and legal manner.

4. PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for loading, hauling, placing and compacting gravel as Granular Sub-base to lines, grades and cross sections indicated by the Contract Documents or as established by the Engineer.

1.2 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials.

.2 Section 31 22 14 – Airfield Excavation and General Grading.

1.3 REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

.5 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.6 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft^3) (2,700kN-m/m^3).

.7 ASTM D1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.4 MEASUREMENT OF PAYMENT

.1 Payment for supply and installation of Granular Sub-base Course material shall be at the unit price bid per cubic metre based on specified thickness and areas as constructed and approved by the Engineer.

.2 No payment shall be made for overbuild of Granular Sub-base Course beyond neat lines shown on the drawings.

.3 Payment at the tendered unit price shall be full compensation for the supply, processing, stockpiling, loading, hauling, placing, adding water, drying, compacting, maintaining, cleanup any other work incidental to this section.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular material from landfill to local facility as approved by the Engineer.

PART 2 PRODUCTS MATERIALS

.1 Granular sub-base material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 75 mm Crushed Gravel.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1, CAN/CGSB-8.2.

.2 .3 Other Properties as follows:

.1 Liquid Limit: to ASTM D4318, Maximum 25.

.2 Plasticity Index: to ASTM D4318, Maximum 6.

.3 Los Angeles degradation: to ASTM C131. Max% Loss by mass: 45.

PART 3 EXECUTION

3.1 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by the Engineer.

.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, properly shaped and compacted and free from ice and snow.

.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 Have sufficient graders, water trucks, and rollers onsite to meet the specified spreading and compaction requirements for the amount of material hauled in each shift.

.8 Organize equipment such that the material hauled in one day is spread and compacted that same day.

.9 Do not leave windrows un-spread overnight.

.10 Do not commerce spreading and compacting crushed material until the hauled material is bladed into a uniform continuous windrow.

.11 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. The Engineer may authorize thicker lifts (layers) if specified compaction can be achieved.

.12 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.13 Remove and replace portion of layer in which material has become segregated during spreading.

.14 Segregation of aggregates shall be avoided and the material as spread shall be free from pockets of large or fine material. Segregated materials shall be remixed until uniform.

3.2 COMPACTION

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

.2 Compact Granular Sub-base Course to a minimum of 98 % of Modified Proctor Maximum Dry Density (ASTM D1557).

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

.4 When necessary apply water during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

.5 When it is impracticable with larger types of compaction equipment to obtain the required degree of compaction in areas where working space is limited, the Contractor shall provide and use mechanical hand compaction equipment in order to achieve the require density.

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

.7 The moisture content shall be maintained at the optimum moisture content as defined by ASTM D1557 until the next layer is placed.

3.3 PROOF ROLLING

.1 For proof rolling use a legally loaded dual rear truck with an effective single axle load of 18,000 lbs (or 80 kN).

.2 Obtain approval from the Engineer 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 Engineer will determine the 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:

.1 Remove sub-base and subgrade material to depth and extent as directed by the Engineer.

.2 Backfill excavated subgrade as directed by the Engineer.

.3 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.

3.4 SITE TOLERANCES

.1 Finished Granular Sub-base to be within ± 20 mm of established grade and cross section, but not uniformly high or low.

.2 Contractor to submit topographic survey of completed surface for acceptance prior to proceeding with subsequent lifts/materials.

.3 Correct surface irregularities greater than ± 20 mm by adding or removing material until surface is within specified tolerances.

3.5 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 Engineer.

.2 Acceptance of finished Granular Sub-base by the Engineer does not relieve the Contractor of his responsibility to provide a finished Granular Sub-base meeting the requirements of this section until succeeding material is applied.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials

1.2 MEASUREMENT PROCEDURES

.1 Measure granular base course in compacted cubic meters in place by cross section and calculated by average end area method of material incorporated into Work and accepted by Engineer. No payment shall be made for overbuild of Granular Base Course beyond neat lines shown on the drawings.

.2 Payment at the tendered unit price shall be full compensation for the supply, processing, stockpiling, loading, hauling, placing, moisture conditioning, compacting, maintaining, cleanup and other work incidental to this section.

1.3 REFERENCES

.1 As set out in Section 31 05 16 – Aggregate Materials

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and incorporate aggregates directly into the work or stockpile in accordance with Section 31 05 16 - Aggregate Materials at a location determined in conjunction with the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 19 mm Crushed Gravel.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2, CAN.

.3 25 mm Crushed Gravel.

.4 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2, CAN.

PART 3 EXECUTION

3.1 SEQUENCE OF OPERATION

.1 Place granular base after sub-base surface is inspected and approved by the Engineer.

.2 Placing

.1 Construct granular base to depth and grade in areas indicated.

.2 No frozen material is permitted to be placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Have sufficient graders, water trucks, and rollers on site to meet the specified spreading and compaction requirements for the amount of material hauled in each shift.

.5 Organize equipment such that the material hauled in one day is spread and compacted that day.

.6 Do not leave windrows unspread overnight. Material to be placed and compacted on the same day that it is hauled to site.

.7 Do not commence spreading and compacting crushed material until the hauled material is bladed into a uniform continuous windrow.

.8 Begin spreading base material on crown line or on high side of one-way slope.

.9 Place material using methods which do not lead to segregation or degradation of aggregate.

.10 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Owner may accept thicker lifts (layers) if specified compaction can be achieved.

.11 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.12 Remove and replace or remix that portion of layer in which material becomes segregated during spreading as directed by the Owner.

.13 Segregation of aggregates shall be avoided and the material as spread shall be free from pockets of large or fine material. Segregated materials shall be remixed until uniform.

.3 Compacting

.1 Compact to density not less than 100% Modified Proctor Maximum Dry Density in accordance with ASTM D1557.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers accepted by Owner.

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

.6 The moisture content shall be maintained at the optimum moisture content as defined by ASTM D1557 until the next layer is placed.

3.2 PROOF ROLLING

.1 For proof rolling use a legally loaded dual axle truck with an effective single axle load of 18,000 lbs (or 80 kN).

.2 Obtain acceptance from the Owner to use non-standard proof rolling equipment.

.3 Proof roll at level in granular base course as indicated. If non-standard proof rolling equipment is accepted, Owner 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:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by Owner.

.2 Backfill excavated subgrade with acceptable common material and compact in accordance with Section 31 22 14 - Airfield Grading.

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

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Owner and replace with new materials in accordance with this section and as directed by Owner at no extra cost.

.7 Supply and install geotextile and/or geogrid reinforcement as directed by the Owner.

3.3 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.

.2 Contractor to submit topographic survey of completed surface for acceptance prior to proceeding with subsequent lifts/materials.

.3 Correct surface irregularities greater than plus or minus 10 mm by adding or removing material until surface is within specified tolerances.

3.4 PROTECTION

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

.2 Acceptance of finished Granular Base Course by the Engineer does not relieve the Contractor of his responsibility to provide a finished Granular Base Course meeting the requirements of this Section until succeeding material is applied.

.3 Granular base surface is to be free of contamination and deleterious materials upon completion of the Work. The Contractor is responsible for maintaining the granular base surface until demobilized from site.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies the requirements for the supply and application of asphalt tack coat as indicated by the Contract Documents or as directed by the Owner.

2. SECTION INCLUDES

.1 Materials and application of asphalt tack coat to an existing asphalt or concrete surface prior to asphalt paving.

3. RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 32 12 16 - Asphalt Paving.

4. MEASUREMENT OF PAYMENT

.1 Measurement for payment shall be at the tendered unit price per square metre as per the Schedule of Quantities and Unit Prices.

.2 Payment at the tendered unit price shall include:

.1 Full compensation for the supply, loading, hauling, application, quality control and all other incidentals necessary to complete the work.

.2 Full compensation for sweeping, cleaning using water (drying or time for drying), and tacking of sawcut edges.

5. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM D140, Standard Practice for Sampling Bituminous Materials.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-16.2, Emulsified Asphalts, Anionic Type, for Road Purposes.

6. SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Sample asphalt tack coat material to: ASTM D140.

.3 Provide access on tank truck for Owner to sample asphalt material to be incorporated into Work, in accordance with ASTM D140.

.4 Provide one (1) 4 litre sample of asphalt emulsion per 5,000 litres of asphalt emulsion delivered, if requested by the Owner.

7. QUALITY ASSURANCE

.1 Upon request by the Owner , submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this section.

8. DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with ASTM D140.

.2 Provide, maintain and restore asphalt storage area.

9. WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.

.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:

.1 Designed, equipped, maintained and operated so that asphalt material can be:

.1 Maintained at even temperature.

.2 Applied uniformly on variable widths of surface up to 5 m.

.3 Applied at readily determined and controlled rates from 0.2 to 5.4 L/m^2 with uniform pressure, and with an allowable variation from any specified rate not exceeding 0.1 L/m^2.

.4 Distributed in uniform spray without atomization at temperature required.

.2 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.

.3 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.

.4 Equipped with an easily read, accurate and sensitive device which registers temperature of liquid in reservoir.

.5 Equipped with accurate volume measuring device or calibrated tank.

.6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.

.7 Equipped with nozzle spray bar, with operational height adjustment.

.8 Cleaned if previously used with incompatible asphalt material.

PART 3 - EXECUTION

1. APPLICATION

.1 Obtain the Owner 's acceptance 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. Mix thoroughly by pumping or other method accepted by the Owner.

.4 Apply asphalt tack coat evenly to pavement surface at rate as directed by the Owner, between 0.4 and 0.6L/m^2 but not to exceed 0.7 L/m^2.

.5 Paint contact surfaces of existing pavement, 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°C or when rain is forecast within two hours of application.

.7 Apply asphalt tack coat only to surfaces that are expected to be overlaid on same day.

.8 Apply asphalt tack coat only on unfrozen surface.

.9 Evenly distribute localized excessive deposits of tack coat by brooming as directed by the Owner.

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

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

.12 Re-tack contaminated or disturbed areas as directed by the Owner.

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

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies the requirements for the supply and application of asphalt prime coat as indicated by the Contract Documents or as directed by the Engineer.

2. SECTION INCLUDES

.1 Materials and application of asphalt prime to granular base surface prior to asphalt paving and application of asphalt prime to cement treated base prior to concrete paving.

3. RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 32 12 16 – Asphalt Paving.

4. MEASUREMENT PROCEDURES

.1 Asphalt Prime Coat shall be measured in square metres of plan area of surface primed as specified and accepted by the Engineer.

.2 Payment at the tendered shall be full compensation for supply and placing asphalt prime and all work incidental to this section.

.3 No additional payment for sand blotter or reapplication of asphalt prime coat that fails to cure.

5. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM D140, Standard Practice for Sampling Bituminous Materials.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-16.1, Cutback Asphalts for Road Purposes.

.2 CAN/CGSB-16.2, Emulsified Asphalts, Anionic Type, for Road Purposes.

6. SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Sample asphalt prime coat materials in accordance with ASTM D140.

.3 Provide access on tank truck for the Engineer to sample asphalt material to be incorporated into Work, in accordance with ASTM D140, if requested by the Engineer.

.4 Provide one (1) 4 litre sample of asphalt emulsion per 5,000 litres of asphalt emulsion delivered, if requested by the Engineer.

7. QUALITY ASSURANCE

.1 Submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section in accordance with Section 01 33 00 - Submittal Procedures.

8. DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials to ASTM D140.

.2 Provide, maintain and restore asphalt storage area.

9. WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Divert unused asphalt materials from landfill to local facility accepted by the Engineer.

.3 Divert unused aggregate materials from landfill to local facility accepted by the Engineer.

PART 2 - PRODUCTS

1. MATERIAL

.1 Asphalt material: to CAN/CGSB-16.2 grade: SS-1.

.2 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.

.3 Water: clean, potable, free from foreign matter.

2. EQUIPMENT

.1 Pressure distributor to be:

.1 Designed, equipped, maintained and operated so that asphalt material can be:

.1 Maintained at even temperature.

.2 Applied uniformly on variable widths of surface up to 5 m.

.3 Applied at controlled rates from 0.2 to 5.4 L/m^2 with uniform pressure, and allowable variation from any specified rate not exceeding 0.1 L/m^2.

.4 Distributed in uniform spray without atomization at temperature required.

.2 Equipped with meter registering meters of travel per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.

.3 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.

.4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.

.5 Equipped with accurate volume measuring device or calibrated tank.

.6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.

.7 Equipped with nozzle spray bar, with operational height adjustment.

.8 Cleaned if previously used with incompatible asphalt material.

PART 3 - EXECUTION

1. APPLICATION

.1 Obtain the Engineer's acceptance of granular base surface before applying asphalt prime.

.2 Heat asphalt prime to between 25 and 55 ºC for pumping and spraying.

.3 Dilute asphalt emulsion with clean water at 1:1 ratio for application. Mix thoroughly by pumping or other method accepted by the Engineer.

.4 Apply diluted asphalt prime to granular base at rate as directed by the Engineer, not to exceed 1.35 L/m^2.

.5 For Cement Stabilized Base, apply at a rate of approximately 1.35 L/m^2 with uniform pressure, and allowable variation from any specified rate not exceeding 0.1 L/m^2. Use hand application methods for areas not accessible by distribution truck to ensure a complete coverage of the stabilized surface.

.6 Apply on dry surface unless otherwise directed by the Engineer.

.7 Apply asphalt prime only on unfrozen surface.

.8 Do not apply prime when air temperature is less than 5 ºC or when rain is forecast within 2 hours.

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

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

.11 Prevent overlap at junction of applications.

.12 Do not prime surfaces that will be visible when paving is complete.

.13 Apply additional material to areas not sufficiently covered as directed by the Engineer.

.14 Keep traffic off primed areas until asphalt prime has cured.

.15 Permit prime to cure before placing asphalt paving.

2. USE OF SAND BLOTTER

.1 If asphalt prime fails to penetrate within 24 hours, spread sand blotter material in amounts required to absorb excess material.

.2 Allow sufficient time for excess prime to be absorbed or as directed by the Engineer.

.3 Apply second application of sand blotter as required.

.4 Sweep and remove excess blotter material.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies the requirements for producing and placing hot mix asphalt concrete to the lines, grades and dimensions shown in the Contract Documents or as directed by the Owner.

2. SECTION INCLUDES

.1 Materials and installation for asphalt concrete paving for roads and airport aprons.

3. RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 31 05 16 – Aggregate Materials.

.3 Section 32 12 13.16 – Asphalt Tack Coat

.4 Section 32 12 13.23 – Asphalt Prime Coat.

4. MEASUREMENT FOR PAYMENT

.1 Hot Mix Asphalt Concrete Paving shall be at the unit price bid and will be measured in tonnes of asphalt concrete actually incorporated into the work, based on accepted weigh tickets submitted as the asphalt concrete mix is delivered to the paving site.

.2 No payment shall be made for overbuild of Hot Mix Asphalt Concrete Paving beyond neat lines shown on the drawings.

.3 Payment at the tendered unit price for Hot Mix Asphalt Concrete Paving shall be full compensation for the mix design(s), production and supply of aggregates, supply of Asphalt Binder, production and transportation of hot mix asphaltic concrete mix, preparation of the surface to be paved, application of tack coat, placement and compaction of the mixture, finishing, quality control plan and testing, coring and supply of cores for quality assurance and compaction testing, cleanup, and all other work, equipment, and materials incidental to complete the work as specified.

5. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 American Association of State Highway and Transportation Officials (AASHTO)

.1 AASHTO M320, Standard Specification for Performance Graded Asphalt Binder.

.2 AASHTO R29, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.

.3 AASHTO T245, Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

.4 AASHTO T283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage.

.3 Asphalt Institute (AI)

.1 AI MS2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.4 American Society for Testing and Materials International, (ASTM)

.1 ASTM C117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.

.3 ASTM C128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.

.4 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.5 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C1252, Standard Method for Un-compacted Void Content.

.7 ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.

.8 ASTM D995, Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

.9 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.10 ASTM D2041, Test Method for Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures.

.11 ASTM D2726, Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens.

.12 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

.13 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.14 ASTM D6927, Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures.

.15 ASTM D 6928 Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.

.16 ASTM D7428 Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.

.5 Canadian General Standards Board (CGSB)

.1 CAN / CGSB-8.2, Sieves Testing, Woven Wire, Metric.

.2 CAN / CGSB-16.3, Asphalt Cements for Road Purposes.

6. PRODUCT DATA

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit asphalt concrete mix design and trial mix test results reviewed and signed by a BC Registered Professional Engineer to the Owner for review at least two (2) weeks prior to beginning Work. Prove optimum asphalt cement content with a minimum of five (5) points of curves relating asphalt cement content to density, stability, air voids, flow, voids in mineral aggregate (VMA), and voids filled with asphalt (VFA) versus asphalt cement content (% by weight of total mix).

7. SAMPLES

.1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit the following to the Owner at least two (2) weeks prior to commencing paving operations.

.1 Mix Design

.1 Mix Design by Marshall method, as outlined in the latest edition of the Asphalt Institute Manual (MS-2), including all laboratory testing results. Mix formulas only are not acceptable. A qualified and independent testing laboratory engaged by the Contractor shall be employed to prepare a mix design and job mix formulae.

.2 Asphalt Cement

.1 Viscosity – temperature chart for asphalt cement to be supplied showing Kinematic Viscosity in centistokes (mm^2/s), temperature range 105 to 175°C.

.2 Proposed source of asphalt cement and manufacturers test data.

.3 Submit six (6) – 4 L containers of asphalt cement, if requested by the Owner.

.3 Aggregates

.1 Proposed source of aggregates.

.2 Submit 50 kg samples of coarse and fine aggregates, if requested by the Owner.

.3 Submit aggregate processing Quality Control test results.

.4 Plant Scale Certificate

.1 Submit a copy of the plant scale certificate(s).

.5 During paving operations submit the following samples as specified.

.1 Asphalt cement: One (1) – 1 litre container of asphalt cement per 2000 tonnes of asphalt placed, if requested by the Owner.

.2 The Manufacture's test data and certification that the asphalt cement meets the requirements of this specification.

.3 Printed temperature record of asphalt mix produced on a daily basis.

.4 Scale tickets recording mass of asphalt delivered and incorporated into the work on a daily basis.

8. PAVING PLAN

.1 The Contractor shall submit a paving plan at least two weeks prior to commencing paving operations.

.2 This plan shall detail:

.1 Proposed paving equipment.

.2 A plan illustrating the sequence of asphalt paving and proposed mat joints.

.3 Contingency plans to deal with the interruption in asphalt concrete supply, breakdown in equipment and inclement weather during paving operations.

.4 Modifications to the production and paving operation to accommodate production rates lower than the recommended minimum contained in this specification.

.3 Acceptance of the plan by the Owner will not relieve the Contractor of any responsibility in attaining a defect free product.

9. QUALITY CONTROL PLAN

.1 Quality Control (QC) and all QC testing is the responsibility of the Contractor.

.2 QC is defined as the sum total of activities performed by the HMAC producer and/or the Contractor to make sure that the HMAC product meets specification requirements. This includes materials handling and construction procedures, calibration and maintenance of equipment, production process control and any sampling, testing, and inspection that is done for these purposes.

.3 The Contractor's QC Plan shall contain appropriate information regarding the sampling and testing that will be performed by the Contractor's personnel. The sampling and testing plan should contain testing information which will be used by the Contractor to maintain control of the production and placement of the asphalt concrete and to ensure a product that complies with the specifications.

.4 The Contractor's QC Plan shall contain a detailed testing plan outlining the characteristic or quality to be inspected, the test method to be used, the frequency, the sampling location, and designation of responsibility. Every quality shall define the tolerances that are allowed or specified. A sample of a "Quality Control Sampling and Testing Plan" is included in Part 2, Section 2.4 – Sampling and Testing.

.5 Quality Control reports shall be submitted daily to the Owner.

10. DELIVERY, STORAGE AND HANDLING

.1 Deliver and stockpile aggregates in accordance with Section 31 05 16 – Aggregate Materials. Stockpile minimum 100% 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.

PART 2 - PRODUCTS

1. MATERIALS

.1 Asphalt cement: to AASHTO M320 – PG 58-31.

.2 Aggregates:

.1 Materials

.1 Aggregate shall satisfy all requirements of Tables 1 and 2 of this specification and unless otherwise specified shall be:

.1 Crushed rock composed of hard, uncoated, cubical fragments, produced from rock formations or boulders of uniform quality; or

.2 Crushed gravel composed of hard, durable, uncoated particles, produced from naturally formed deposits.

.2 Fine aggregates shall consist of natural sand and/or manufactured material derived from crushing stone, or gravel. All particles shall be clean, durable, moderately sharp and free from coatings of clay, silt or other deleterious materials and shall contain no organic matter.

.3 Natural sand and/or blend sand shall be limited to 15% maximum of the aggregate blend.

.2 Physical Requirements

.1 Physical requirements of aggregates shall be within limits shown on Table 2.

.2 Do not use aggregates having known polishing characteristics in mixtures for surface courses.

.3 Irrespective of compliance with the physical requirements, aggregates may be accepted or rejected based on past field performance.

.3 Gradation

.1 Gradation of aggregates blended to job mix formula to be within the limits shown in Table 1 when tested to ASTM C117 and ASTM C136 and giving smooth curve without sharp breaks when plotted on semi-log grading chart.

.2 Coarse aggregate is aggregate retained on 5 mm sieve and fine aggregate is aggregate passing 5 mm sieve.

.3 Process aggregate and stockpile fine aggregate separately from coarse aggregate.

.4 Mineral Filler

.1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.

.2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.

.3 Mineral filler to be dry and free flowing when added to aggregate.

.5 Blend Sand

.6 Shall be a blend of the following:

.1 Screenings produced in crushing of quarried rock, boulders or gravel.

.2 Add blend sand when necessary to meet job mix aggregate gradation or as directed, to improve mix properties.

.3 Blend sand to be sufficiently dry to be free flowing when added to aggregate.

Table 1
Percent Passing Designated Sieve

Sieve Size (mm)		**New Limits**	
Metric	Imperial	Base	Surface
20	19	100	
16	16	80-95	100

12.5	12.5	67-85	82-95
10	9.5	58-78	70-85
5	4.75	40-60	50-65
2.5	2.36	27-47	35-50
1.25	1.18	18-37	23-40
0.630	0.600	12-30	15-30
0.315	0.300	8-23	10-23
0.160	0.150	5-15	6-16
0.080	0.075	3-8	3-8

Table 2
Physical Tests for Hot Mix Aggregate

Physical Test	Fine Aggregate	Coarse Aggregate	Notes
Los Angeles Abrasion ASTM C131 Gradation "B" Max % Loss	----	25	
Percent Crushed Minimum * (Minimum 2 fractured faces)	----	80	For Surface Course
	----	70	For Base Course
Sand Equivalent ASTM D2419 Minimum	50	----	
Micro Deval ASTM D7428, % Loss	18	16	
Absorption ASTM C127 Max % by Mass	----	1.75	
Loss by Washing ASTM C117 Max % Passing Sieve	----	1.5	For Surface Course Only
		2.0	For Base Course Only
Flat & Elongated Particles Ratio greater than 5:1 Max % by Mass	----	15	

Table 2
Physical Tests for Hot Mix Aggregate

Physical Test	Fine Aggregate	Coarse Aggregate	Notes
Fine Aggregate Angularity (Uncompacted Void Content), Min. %	45	----	For Surface Course Only
Liquid Limit ASTM D4318 (maximum)	25	----	
Plasticity Index ASTM D4318 (maximum)	0	----	

* The percent of crushed material will be determined by examining the fraction retained on the 5 mm sieve and dividing the mass of the crushed particles by the total mass retained on the 5 mm sieve.

2. EQUIPMENT

.1 Pavers: automatic grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated. Provide two pavers for echelon paving and one back-up paver of equal capability.

.2 Rollers: sufficient number, minimum of three per paver of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:

.1 Minimum drum diameter: 1200 mm.

.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms.

.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.

.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.4 Use only trucks which can be weighed in single operation on scales supplied.

.5 Hand tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

.2 Tamping irons having mass not less than 12 kg and bearing area not exceeding 310 cm^2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by the Owner, may be used instead of tamping irons.

.3 Straight edges, 4.5 m in length, to test finished surface.

3. MIX DESIGN

.1 Mix design to be provided by contractor and approved by the Owner.

.2 Mix design to be developed by testing laboratory approved by the Owner.

.3 Design of mix by Marshall Method as outlined in the latest edition of the Asphalt Institute Manual (MS-2), to the following requirements.

.1 Compaction blows on each face of test specimens: 50.

.2 Mix physical requirements.

Marshall Method Mix Criteria	Base Course	Surface Course
Stability ASTM D6927 (kN @ 60°C) Minimum	8	10
Flow ASTM D6927 (mm)	2 – 4	2 – 4
Air Voids ASTM D3203 (%)	4.0 - 4.5	3.5 – 4.0
Voids in Mineral Aggregates (%, Minimum)	13	14
Voids Filled with Asphalt (%)	65 - 78	65 – 78
Tensile Strength Ratio (%, Minimum) AASHTO T283	70	75

.3 Notes:

.1 Percent voids in mineral aggregate to be calculated on the basis of the ASTM bulk specific gravity for the aggregate.

.2 The portion of asphalt cement lost by absorption into the aggregate particles must be allowed for when calculating percent air voids.

.3 For AASHTO T 283, include the freeze cycle.

.4 Do not change job mix without prior acceptance of the Owner. When change in material source proposed, new job-mix formula to be accepted by the Owner.

4. SAMPLING AND TESTING

.1 During the progress of the work tests will be carried out on materials and workmanship in order to ensure compliance with the requirements of the specifications. Quality Control testing shall be done by the Contractor.

.2 Quality Control Testing

.1 The Contractor shall use Professional Engineering Services and a qualified testing laboratory, licensed to practise in the Province, for Quality Control testing. The Contractor shall provide and maintain equipment and qualified personnel to perform all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the work. The Contractor shall bear the cost of all Quality Control sampling and testing services.

.2 The frequencies of Quality Control testing are to be indicated on a Quality Control Sampling and Testing Plan. Results of all Quality Control tests shall be made available to the Owner at any time, and two (2) copies of the tests shall be given to the Owner at the end of each day.

.3 The following is a sample of a blank "Quality Control Sampling and Testing Plan" for production and placement of asphalt concrete pavement.

- SAMPLE-					
QUALITY CONTROL SAMPLING AND TESTING PLAN					
Characteristic	Test Method	Frequency	Sample Location	Responsibility	Tolerance
Asphalt Content					
Aggregate Gradation					
Relative Compaction					
Asphalt Temperature					
Mix Temperature					
Mix Moisture					

PART 3 - EXECUTION

1. PLANT AND MIXING REQUIREMENTS

.1 Batch and continuous mixing plants:

.1 To ASTM D995.

.2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Do not load frozen materials into bins.

.3 Feed cold aggregates to plant in proportions to ensure continuous operations.

.4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.

.5 Before mixing, dry aggregates to moisture content not greater than 0.5% by mass or to lesser moisture content if required to meet mix design requirements.

.6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.

.7 Store hot screened aggregates in manner to minimize segregation and temperature loss.

.8 Heat asphalt cement and aggregate to mixing temperature directed by Owner. Do not heat asphalt cement above 160°C, maximum temperature indicated on temperature-viscosity chart.

.9 Make available current asphalt cement viscosity data at plant. With information relative to viscosity of asphalt being used, the Owner to approve temperature of completed mix at plant and at paver after considering hauling and placing conditions.

.10 Maintain temperature of materials within 5°C of specified mix temperature during mixing.

.11 Mixing time:

.1 In batch plants, both dry and wet mixing times for not less than 10 seconds. Continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30 s or more than 75 s.

.2 In continuous mixing plants, mixing time as directed by the Owner but not less than 45 s.

.3 Do not alter mixing time unless directed by the Owner.

.2 Dryer drum mixing plant:

.1 To ASTM D995.

.2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.

.3 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.

.4 Meter total flow of aggregate by an electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate and asphalt entering mixer remain constant.

.5 Provide for easy calibration of weighing systems for aggregates without having material enter mixer.

.6 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved. Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time. Difference between this value and amount shown by plant computer system to differ by not more than plus or minus 2%.

.7 Make provision for conveniently sampling full flow of materials from cold feed.

.8 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate from cold feed prior to entering drum.

.9 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.

.10 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each day to the Owner.

.11 Mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer to be less than 1%.

.3 Temporary storage of hot mix:

.1 Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.

.2 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:

.1 Permissible variation in aggregate gradation from job mix (percent of total mass):

Sieve Designation		% Passing by Mass	
Metric (mm)	**Imperial (mm)**	**Individual Sample**	**Average of Last 5 Samples**
>5		± 5.0	± 3.0
5	4.75	± 5.0	± 3.0
2.5	2.36	± 4.0	± 2.5
0.63	0.60	± 3.0	± 2.0
0.315	0.300	± 3.0	± 2.0
0.160	0.150	± 2.0	± 1.5
0.080	0.075	± 1.5	± 1.0

.2 Asphalt Content Tolerance: Allowable variation from accepted design asphalt content shall be ± 0.3 % by mass of mix.

.3 Air Void Content Tolerance: Allowable variation from accepted design air void content shall be ± 1.0 %.

.4 Mixing Temperature Tolerance: Allowable variation from design mixing temperature shall be ± 5°C.

.6 Addition of anti-stripping agent:

.1 If required, only liquid anti-strip additive accepted by the Owner will be allowed.

2. PREPARATION

.1 When paving over existing asphalt surface, clean pavement surface. When levelling course is not required, patch and correct depressions and other irregularities to approval of the Owner before beginning paving operations.

.2 Apply prime coat in accordance with Section 32 12 13.23 – Asphalt Prime Coat and Section 32 12 13.16 – Asphalt Tack Coat prior to paving.

.3 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 Owner approves artificial lighting for paving.

.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 Owner, but not less than 135°C.

4. TEST STRIP

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

.2 For airfield pavement, construct test strip in non-critical area to resolve anticipated problems with equipment, mix behaviour or compaction, prior to starting paving operation.

.3 Establish optimum rolling pattern by taking nuclear densometer readings and observations to:

.1 Determine sequence and number of passes.

.2 Determine correct operating characteristics of vibratory rollers.

.3 Determine maximum density of asphalt mix.

.4 Ensure smooth surface finish.

.5 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 94% of density obtained with specimens prepared from samples of mix being used.

5. PLACING

.1 Obtain the Owner's approval of existing surface and tack coat or prime coat prior to placing asphalt.

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

.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5°C.

.2 When temperature of surface on which material is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 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 individual strips no longer than 500 m.

.5 On airport runways and taxiways, aprons and parking lots commence spreading at high side of pavement or at crown and span crowned centerlines with initial strip.

.6 Place surface course using a minimum of two pavers in echelon. Alternatively submit, to the Owner for approval, alternate method(s) of placing asphalt concrete paving

.7 Spread and strike off mixture with self-propelled mechanical finisher.

.1 Construct longitudinal joints and edges true to line markings. The Owner will establish lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.

.2 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.

.3 Maintain constant head of mix in auger chamber of paver during placing.

.4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.5 Correct irregularities in alignment left by paver by trimming directly behind machine.

.6 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.

.7 Do not throw surplus material on freshly screeded surfaces.

.8 When hand spreading is used:

.1 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.

.2 Distribute material uniformly. Do not broadcast material.

.3 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.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 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 Compact HMAC to a density not less than 94% of the maximum theoretical density to ASTM D 2041.

7. JOINTS

.1 General:

.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 3 m.

.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150 mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100°C prior to paving of adjacent lane.

.1 For airfield runway paving, avoid cold joint construction in mid-30 m of runway.

.2 If cold joint cannot be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, clean to provide sludge-free edge and tack face with thin coat of hot asphalt of adjacent lane.

.3 Overlap previously laid strip with spreader by 50 mm.

.4 Construct butt joints as indicated.

8. FINISH TOLERANCES

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

.2 Finished asphalt surface not to have irregularities exceeding 5 mm 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. All repair methods to be submitted to the Owner for acceptance.

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

.4 Asphalt pavement not meeting the specified compaction, thickness or finish tolerances shall be subject to removal and replacement, at the Contractor's expense, as directed by the Owner.

.5 Skin patches or other thin layer repairs or surface treatments are not acceptable repair methods for final asphalt surfaces.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies the requirements for the supply and application of paint lines and pavement markings as a new application and to replace markings removed or altered by the rehabilitation.

2. RELATED WORK

.1 Section 01 74 11 - Cleaning

3. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 CGSB1-GP-12c, Standard Paint Colours.

.3 CGSB1-GP-71, Method of Testing Paints and Pigments.

4. SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Samples are not required. Submit certified test reports as required by paragraph 2.1.

5. MEASUREMENT FOR PAYMENT

.1 Measurement for payment shall be at the tendered lump sum price as per the Schedule of Quantities and Unit Prices.

.1 Payment at the tendered lump sum price shall include:

.2 Full compensation for layout, new pavement markings to match existing paint, glass beads, and all equipment and labour necessary to complete the work.

.3 No payment will be made for reworking of paint markings that are deemed not compliant to the contract documents

PART 2 - PRODUCTS

1. MATERIALS

.1 Paint (Permanent):

.1 Low VOC solvent based traffic paint (waterborne paint is not permitted).

.2 Colour: to CGSB1-GP-12C:

.1 Yellow 505-308

.2 Black 512-301

.3 White 513-301

.4 Red 509-301

.2 Methods of Testing Paints and Pigments to CAN/CGSB –1-GP-71.

.3 Glass reflective beads:

.1 FAA Specification TT-B-1325D Type 3 Glass Beads or approved Canadian equivalents.

PART 3 - EXECUTION

1. EQUIPMENT REQUIREMENTS

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

.2 All equipment for use in the work shall be approved by the Engineer and shall include a mechanical marking machine and such auxiliary hand painting equipment as may be necessary to satisfactorily complete the work.

.3 The mechanical marker shall be an approved atomizing spray-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall be designed so as to apply markings of uniform cross sections and clear cut edges without running or spattering.

.4 Suitable adjustments shall be provided on the sprayer(s) of a single machine or by furnishing additional equipment for painting the width required.

.5 A glass bead dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made.

2. CONDITION OF SURFACES

.1 All pavements shall be swept and cleaned of mud, concrete/sawcut slurry, curing compound or other deleterious materials prior to painting and final inspection.

.2 Pavement surface shall be clean and dry during application of paint. Areas to be painted shall be clean, free from curing compound, ponded water, frost, ice, dust, oil, grease, rubber tire deposits and other foreign matter.

3. APPLICATION

.1 The Contractor shall be responsible for setting the marks required to complete the work. Survey methods for setting out the marks shall be in a manner acceptable to the Engineer.

.2 All paint lines and pavement markings require 2 separate coats of paint.

.3 Unless otherwise approved by the Engineer, apply paint only when air temperature is above 10°C, wind speed will not cause over-spray and no rain is forecast within next 4 hours.

.4 Apply paint at a rate of not less than 0.37 l/m^2 per single coat of paint.

.5 Apply second coat of paint, after the first coat has dried and as per manufacturer's recommendations.

.6 Apply paint to the locations and dimensions indicated in the Contract Documents or as directed by the Engineer.

.7 Do not thin paint unless approved by the Engineer.

.8 Symbols and letters to conform to dimensions indicated.

.9 Paint lines to be of uniform colour and density with sharp edges.

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

.11 Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall not be applied to black paint or numerals or inscriptions. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made.

.12 Apply glass beads at rate of 0.85 kg/l of painted area.

4. TOLERANCE

.1 Paint markings to be within plus or minus +/- 5 mm of dimensions of adjoining markings.

.2 There shall be no overlap between the second and first coat. Both coats of paint shall be at the same width and alignment.

5. PROTECTION OF COMPLETED WORK

.1 Protect pavement markings until dry.

.2 Blowing of excess glass beads prior to reopening pavement surface required.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies the requirements for supply and placement of topsoil and subsequent final grading to the lines, grades and cross section indicated by the Contract Documents or as directed by the Engineer.

.2 Topsoil from existing stockpiles should be reused first before supplying new topsoil.

2. RELATED SECTIONS

.1 Section 31 14 13 Soil Stripping and Stockpiling

.2 Section 32 92 19.16 - Hydraulic Seeding.

3. MEASUREMENT FOR PAYMENT

.1 Topsoil and Finish Grading shall be measured in square metres of plan area within limits approved by the Owner.

.2 Payment at the unit price tendered shall be full compensation for surface preparation, placement of stripped topsoil, finish grading and all work incidental to this section.

.3 Payment shall be for the actual plan area topsoiled or design plan area which ever is less. No additional payment shall be made for areas that exceed the design quantity unless approved by the Owner.

4. REFERENCES

.1 All references to this Specifications, Standards, or Methods shall be understood to refer to the latest adopted revision, including all amendments.

.2 Agriculture and Agri-Food Canada

.1 The Canadian System of Soil Classification, Third Edition, 1998.

.3 Canadian Council of Ministers of the Environment

.1 PN1340, Guidelines for Compost Quality.

.4 Canadian Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations.

5. SUBMITTALS

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

.2 Quality control submittals:

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 1 - SOURCE QUALITY CONTROL.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

PART 2 - PRODUCTS

.1 Stripping material from the areas of construction site may be stockpiled, screened, and re-used as topsoil to supplement the requirement for imported topsoil. All stripped topsoil shall be reused prior to importing new.

.2 The contractor shall ensure the following requirements are met for new topsoil imported to site.

.3 Topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 % sand, minimum 7 % clay, and contain 4 to 10 % organic matter by weight.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Finished surface free from:

.1 Debris and stones over 25 mm diameter.

.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2 % of soil volume.

.4 Consistence: friable when moist.

2. SOIL AMENDMENTS

.1 Fertilizer:

.1 Fertility: major soil nutrients present in following amounts:

.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.5 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.6 Ph value: 6.5 to 8.0.

.2 Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5 mm.

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

.4 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.

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

.6 Limestone:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, 90 % passing 1.0 mm sieve, 50 % passing 0.125 mm sieve.

.7 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 Engineer 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 If Contractor intends to use the topsoil stripped and stockpiled from the site, it is Contractors responsibility to screen the topsoil if required to ensure compliance with specifications.

.4 Soil testing by recognized testing facility for PH, P and K, and organic matter.

.5 Testing of topsoil will be carried out by testing laboratory designated by the Engineer.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 - EXECUTION

1. SUPPLY AND/OR REUSE TOPSOIL

.1 Existing topsoil stripped and stockpiled is to be screened and reused prior to purchasing a new supply of topsoil. All screened material that is unusable shall be disposed of off-site.

2. 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 sediment and erosion control plan, specific to site, or that complies with requirements of authorities having jurisdiction, whichever is more stringent.

.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.

3. STRIPPING OF TOPSOIL

.1 Refer to Section 31 14 13 - Soil Stripping.

4. PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct. If discrepancies occur, notify the Engineer and do not commence work until instructed by the Engineer.

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

.3 Cultivate and scarify topsoil areas to a minimum depth of 150 mm.

.4 In areas of where subgrade compaction equals or exceeds 95% of Standard Proctor Maximum Dry Density or in areas where equipment used for hauling and spreading has compacted the subgrade, cultivate and cross cultivate to a minimum depth of 300 mm.

.5 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 50 mm above surface.

.3 Dispose of removed material off site.

.6 Cultivate entire area which is to receive topsoil to minimum depth of 150 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

5. PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after the Engineer has accepted subgrade and the screened or imported topsoil.

.2 Spread topsoil during dry weather.

.3 Spread topsoil over unfrozen subgrade free of standing water.

.4 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.5 Spread topsoil in uniform layers to the following minimum depths after compaction and settlement.

.1 150 mm for seeded areas.

.6 Manually spread topsoil/planting soil around obstacles.

6. FINISH GRADING

.1 Fine grade entire topsoiled area to contours and elevations as indicated or directed by the Engineer.

.2 Ensure transitions from slopes to level areas are smooth and even.

.3 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.4 Consolidate (roll) topsoil to required bulk density using equipment approved by the Engineer.

.1 Leave surfaces smooth, uniform and firm against deep footprinting.

7. ACCEPTANCE

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

8. SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required where directed by the Engineer off site.

9. CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

.3 Clean up immediately soil or debris deposited onto pavement surfaces.

END OF SECTION

PART 1 - GENERAL

1. DESCRIPTION

.1 This section specifies the requirements for supply and application of seed by hydraulic (hydroseeding) method in areas indicated by the Contract Documents or as directed by the Owner.

2. RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 32 91 19.13 - Topsoil Placement and Grading.

3. MEASUREMENT FOR PAYMENT

.1 Hydroseeding shall be measured in square metres of plan area within limits as supplied by the Owner.

.2 Payment at the tendered unit price shall be full compensation for supply and application of seed mixture or hydroseed mixture including seed and fertilizer, mulch, tackifier, water, cleanup and all other work incidental to this section.

.3 Payment shall be for the actual plan areas hydroseeded or design plan areas which ever is less. No additional payment shall be made for areas, which exceed the design quantity unless approved by the Owner.

4. SUBMITTALS

.1 Product Data.

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 At least two weeks prior to commencing work submit to the Owner product data and certification that the products meet the requirements for this section:

.1 Seed.

.2 Mulch.

.3 Tackifier.

.4 Fertilizer.

.3 Submit in writing to the Owner 10 days prior to commencing work:

.1 Volume capacity of hydraulic seeder in litres.

.2 Amount of material to be used per tank based on volume.

.3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

5. 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.

6. DELIVERY AND STORAGE

.1 Deliver and store grass seed in original containers showing:

.1 Analysis of seed mixture.

.2 Percentage of pure seed.

.3 Year of production.

.4 Net mass.

.5 Date when tagged and location.

.6 Name and address of distributor.

.2 Deliver wood fibre mulch and tackifier in moisture-proof containers indicating manufacturer, content and net air-dry mass.

.3 Supply fertilizer to the contract site in shrink wrapped or other suitable moisture proof containers, with guaranteed chemical analysis clearly shown on each container.

.4 Provide to the Owner before and as a condition of use, a shipping bill issued by the supplier of the material, designating the supplier, the manufacturer, the type of material, and a certification of the net weight or volume of material in each container.

.5 Protect all materials as required during transportation and storage.

.6 Store the materials onsite only where and as directed and approved by the Owner.

.7 Take precautions to prevent damage of stored materials by vandalism or weathering.

.8 Any material which has become wet or otherwise damaged during delivery or storage, or does not meet the requirements specified shall be rejected and the Contractor shall immediately remove rejected material from the project area.

7. SCHEDULING

.1 Schedule hydraulic seeding to coincide with preparation of soil surface.

8. WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused fertilizer from landfill to official hazardous material collections site approved by the Owner.

.2 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 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.

.1 Grass mixture:

.1 Mixture composition:

.1 35% - Creeping red fescue

.2 35% - Chewing fescue

.3 10% - Hard fescue

.4 10% - Perennial rye

.5 10% - Sheep’s fescue

.2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:

.1 Type I mulch:

.1 Made from wood cellulose fibre.

.2 Organic matter content: 99 - 100 %.

.3 Value of pH: 4.8.

.4 Potential water absorption: 320 %.

.5 The material used for mulching shall be a natural wood fibre specially prepared for use in hydroseeding equipment.

.6 Contain no growth or germination inhibiting properties.

.7 Capable of dispensing in water to form a homogeneous slurry.

.8 Capable of farming an absorptive mat ground cover allowing water percolation.

.3 Tackifier:

.1 The tackifier shall be one of:

.1 Free flowing non-corrosive biodegradable organic powder produced from a natural plant gum.

.2 Water dilatable liquid dispersion containing polyvinyl acetate tepolymer emulsion.

.3 Approved equivalent by the Owner.

.4 Water: free of impurities that would inhibit germination and growth.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and "Fertilizers Regulations".

.2 Complete synthetic, slow release with 35 % of nitrogen content in water-insoluble form.

.6 Inoculants: inoculants containers to be tagged with expiry date.

PART 3 - EXECUTION

1. EQUIPMENT

.1 Cultivators: Capable of scarifying, discing or harrowing.

.2 Hydro Seeders: Capable of thoroughly mixing water, seed, fertilizer and pulverized wood fibre and of uniformly spraying the mix at designated rate.

.3 Rollers: Of suitable size and mass.

.4 Equipment for hydroseeding, mulch and fertilizing shall be capable of mixing the seed, fertilizer, mulch and tackifier as herein described, and evenly distributing the mixtures for efficient treatment of the selected areas.

.5 The equipment shall have a build-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix a slurry of materials in the amounts specified.

.6 The slurry tank shall have working capacity of at least 4500 litres, and the pump shall be capable of maintaining a continuous, non-fluctuating stream of solution. Distribution lines shall be of large enough diameter to prevent blockage, and the discharge lines shall be equipped with appropriate nozzles.

.7 The equipment shall be capable of hydroseeding to the extremities of all areas designated for hydroseeding.

2. WORKMANSHIP

.1 Do not spray onto structures, signs, guide rails, fences, plant material, utilities and other than surfaces intended.

.2 Clean-up immediately, any material sprayed where not intended, to satisfaction of the Owner.

.3 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.

.4 Protect seeded areas from trespass until plants are established.

.5 Do not seed when prepared topsoil is covered with frost, snow or standing water. Proceed with seeding operations only during favourable weather conditions in accordance with sound horticultural practices.

.6 Clean areas or items as requested by the Owner.

3. PREPARATION OF SURFACES

.1 Fine grade areas to be seeded free of humps and hollows. Ensure areas are free of deleterious and refuse materials.

.2 Cultivated areas identified as requiring cultivation to depth of 25 mm.

.3 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

.4 Obtain the Owner's approval of grade and topsoil depth before starting to seed.

4. PREPARATION OF SLURRY

.1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to the Owner. Supply equipment required for this work.

.2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.

.3 After all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

5. SLURRY APPLICATION

.1 Hydraulic seeding equipment:

.1 Slurry tank.

.2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.

.3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.

.4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".

.2 Slurry mixture applied per hectare.

.1 Seed: 300 kg.

.2 Mulch: 1,350 kg.

.3 Tackifier: 340 kg.

.4 Water: as required to form recommended slurry.

.5 Fertilizer: 275 kg.

.3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.

.1 Using correct nozzle for application.

.2 Using hoses for surfaces difficult to reach and to control application.

.4 Blend application 300 mm into adjacent grass areas or sodded areas or previous applications to form uniform surfaces.

.5 Re-apply where application is not uniform.

.6 Remove slurry from items and areas not designated to be sprayed.

.7 Protect seeded areas from trespass satisfactory to the Owner.

.8 Remove protection devices as directed by the Owner.

.9 Hand broadcast seeding is unacceptable under any conditions except for isolated repair work.

.10 Spread fertilizer evenly at rate specified.

.11 Thoroughly harrow the site after fertilizing, on areas flatter than 3 horizontal to 1 vertical.

.12 Sow the seed at the rate specified for the seed type, in 2 directions, 50 % in one direction and remaining 50 % of seed at right angles to first seeding pattern.

.13 Protect all newly seeded areas as required.

.14 Thoroughly mix seed, fertilizer, mulch and tackifier and uniformly distribute the mixture with the hydroseeder over the area indicated or designated by the Owner.

6. ACCEPTANCE

.1 Seeded areas will be accepted by the Owner provided that:

.1 Seeded areas are free of rutted, eroded, bare or dead spots.

.2 Areas have been mown at least twice.

.3 Areas have been fertilized.

.2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

7. CLEANING

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

END OF SECTION

SPECIFICATIONS FOR

Electrical –

Vanderhoof Airport
Vanderhoof, BC

New Runway Turn Pads

Issued for Tender

August 2026

ELECTRICAL SPECIFICATIONS

Division 26 – Electrical

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Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 28 – Grounding – Secondary

.2 Section 26 05 43.01 – Installation of Cables in Trenches and Ducts

.3 Section 33 65 76 – Direct Buried Underground Cable Ducts

.4 Section 34 43 10 – Airfield Lighting – General

1.2 GENERAL INSTRUCTIONS

.1 The "Instructions to Bidders", "The General Conditions", (and addenda thereto) form an integral part of this division and shall be read in conjunction herewith. All addenda or corrections issued during the time of bidding become part of the contract documents, and shall be covered in the Contractor's bid.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2006), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.3 Underground Systems: To C22.3, No. 7, except where specified otherwise.

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-[2000], The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

.3 Transport Canada, TP312, 5th Edition, Aerodrome Standards and Recommended Practices.

1.4 DEFINITIONS

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

1.5 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.6 MEASUREMENT FOR PAYMENT

.1 Electrical work shall be measured as Lump Sum or unit price Items as described in unit price table. Payment at the tendered Lump Sum or unit price shall be full compensation for supply of all materials and labour required to complete the work as described in the Contract Documents.

.2 Record Drawings and O&M Manuals

.1 Payment shall be on a lump sum basis for full completion and submittal of the red-line record drawings and O&M Manuals.

.2 Red-line drawings to be submitted as mark-up prints or scanned PDF documents.

.3 O&M Manuals shall be a record of new equipment supplied, included data sheets, approved shop drawings, as-built information, and vendor supplied operations and maintenance instructions. O&M Manuals shall be supplied in both hard copy (3 binders, with tabbed dividers) and PDF formats.

.3 Site Clean-up / Restoration

.1 Payment shall be on a lump sum basis and shall include all clean-up related to electrical work undertaken on site, including removal of construction debris, cleaning of surfaces and equipment, and restoration of all surfaces and equipment affected by electrical construction activities.

.2 All trenching/excavation/backfill areas shall be restored by a layer of topsoil, seed, and mulch.

.4 Electrical Mobilization / Demobilization / General Conditions

.1 Payment of lump sum price bid shall include for Mobilization / Demobilization / General Conditions, and all other costs not covered under separate unit price items.

.2 Partial payment for this item will be made once per month as work progresses. The partial payments will be made as follows:

.1 When 25% of the original contract amount is earned, 25% of the amount bid for this item will be paid.

.2 When 50% of the original contract amount is earned, 50% of the amount bid for this item will be paid.

.3 When 75% of the original contract amount is earned, 75% of the amount bid for this item will be paid.

.4 When 100% of the original contract amount is earned, 100% of the amount bid for this item will be paid.

1.7 INTERPRETATION OF DRAWINGS

.1 The drawings and specifications provide together a complete and workable facility, with all components in satisfactory and operating condition. These drawings and specifications shall form a basis for the bid price and shall be used to provide a complete electrical installation as directed in each or both documents. Do not scale from electrical drawings.

.2 All notes on drawings, which make exception to these specifications, have precedence except addenda where specific reference is made.

1.8 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings:

.1 Submit drawings stamped for all major electrical equipment being supplied under this contract. All engineering drawings must be stamped by an engineer registered to practice in British Columbia. Shop drawings shall be submitted to the engineer/owner for review, prior to installation.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 For unit sub-stations and other equipment, as required, submit shop drawings showing manufacturer’s recommended concrete foundation/base for the equipment.

.6 Submit 3 copies of 216 x 279 mm minimum size drawings and product data to engineer/owner. Alternatively, shop drawings may be submitted in PDF electronic document format.

.7 All shop drawings must be certified by the manufacturer and carefully checked by the Trade Contractor noting all changes required and shall bear the Trade Contractor's approval stamp and signature. Shop drawings must be clearly labelled as to job, contractor and manufacturer. All stamps and labelling shall appear on the front of the shop drawings in order to reproduce properly. Drawings shall incorporate a minimum 100 mm x 75 mm space to accept the Engineer's review stamp.

.8 The Electrical Consultant's review of shop drawings is for general design only, and does not relieve the Trade Contractor, Trade Sub-Contractor or suppliers from their responsibilities for errors, proper fittings, construction of the work and furnishing of materials. The review shall not be construed as approving departures from the contract document requirements, where such departures are not specifically noted in a covering letter accompanying such drawings. Any work done prior to the return of properly reviewed shop drawings is done at the risk of the Contractor.

.9 Note that a MINIMUM of seven (7) working days is required by the Electrical Consultant to process shop drawings. The Trade Contractor is, therefore, requested to submit all shop drawings with this in mind in ample time in order to avoid unnecessary delay of shipment of materials or construction.

.10 If changes are required, notify engineer/owner of these changes before they are made.

.3 Quality Control: in accordance with Section 01 45 00 - Quality Control.

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to local inspection authorities for special approval before delivery to site. Cover all costs for special approval.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to engineer/owner.

.4 Record Drawings

.1 Engineer will provide two sets of white prints for record drawing purposes.

.2 Maintain project record drawings and record accurately deviations from Contract documents.

.3 Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set, and submit both sets to Engineer.

.4 Record the following information:

.1 Any existing cables, services, etc., encountered which vary from those shown on contract drawings as existing;

.2 Horizontal location of underground cables and appurtenances referenced to permanent surface improvement;

.3 Field changes of dimension and detail.

.4 Changes made by Change Order or Field Order.

1.9 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices (British Columbia Certification) in accordance with authorities having jurisdiction respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Refer to additional contractor qualifications and experience requirements as indicated in section 34 43 10 – Airfield Lighting – General, item 1.7 – Qualifications, and also as listed on the project tender form.

.3 Site Meetings:

.1 In accordance with Contract Documents.

.4 Health and Safety Requirements: Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Occupational Health and Safety Regulation for the Province of British Columbia.

.5 Electrical Permit: Coordinate and pay for all required electrical permits.

1.10 NOT USED

1.11 SYSTEM STARTUP

.1 Instruct owner/engineer in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.12 WORKMANSHIP STANDARDS

.1 All phases of the electrical installation shall be executed in a satisfactory workmanlike manner and shall present a neat mechanical appearance when completed. The work considered unsatisfactory to the Engineer shall be corrected at the Contractor's expense.

.2 Keep on the job during its progress, a competent foreman, holding a First Class Journeymen Certificate, and necessary assistants, all satisfactory to the Airport Authority. The foreman shall not be changed, except with the consent of the Engineer, unless he proves to be unsatisfactory and ceases to be an employee of the Contractor.

.3 The foreman shall represent the Contractor in his absence and all directions given to him shall be held as being given to the Contractor. Give efficient supervision to the work, using skill and attention.

1.13 CHANGES IN WORK

.1 The Engineer, without invalidating the contract, may alter, add to or deduct from the work, the contract sum being adjusted accordingly. All such changes shall be governed by the conditions of the original contract.

.2 All changes involving costs shall be approved by the Engineer prior to any actual work being proceeded with.

.3 All supplemental cost proposals by the Contractor shall be accompanied by a complete itemized breakdown of labour and materials. NO EXCEPTIONS will be made. At the Engineer’s request, Contractor's estimating sheets for supplemental cost proposals shall be submitted. Labour must be broken out and allocated to each item of work included in the Notice of Change. Submissions must itemize all material used and shall show labour units assigned to each item of material.

.4 Location of any device may be changed to within three (3) metres of the position indicated on the drawings, without an extra, providing the Contractor is advised of the change in ample time to avoid removal of any equipment or material installed.

1.14 SUBSTITUTIONS

.1 Not withstanding the General Conditions, the following shall apply.

.2 No substitutions will be permitted without prior written approval by Engineer.

.3 Proposals for substitutions may be submitted ONLY AFTER award of contract. Such request must include statements of respective costs of items originally specified and proposed substitutions.

.4 Substitution proposals will be considered by the Electrical Consultant ONLY IF:

.1 Products selected by the Trade Contractor from those specified are not available.

.2 Delivery date of products selected from those specified is not available for reasons beyond the Trade Contractor's control, which he could not reasonably have anticipated, and provided that the Trade Contractor diligently verified availability at the commencement of the contract, or

.3 Alternative products to those specified, which are brought to the attention of and considered by the Electrical Engineer as alternative to those specified, will result in a credit to the contract amount.

.5 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other works on the project.

.6 All credits arising from approval of substitutions will be credited to contract in such amounts as may be determined by the Design Manager and contract price will be adjusted accordingly.

1.15 PERMITS, CODES, AND INSPECTIONS

.1 Submit to the Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay the associated fees.

.3 Consultant will provide the drawings and specifications required by the Electrical Inspection Department and Supply Authority at no cost.

.4 Notify Consultant of the changes required by the Electrical Inspection Department prior to making changes.

.5 Installation shall comply with the requirements of the latest edition of the Canadian Electrical Code and all relevant by-laws of a local electrical authority.

.6 Obtain all permits required and, after completion of the work, furnish to the Engineer a Certificate of Final Inspection and Approval from the Inspection Department. Take out all permits required at the beginning of the work.

1.16 SCHEDULING

.1 Project work will be governed by the fact that the other disciplines will be conducting work at the same time as the electrical work is being undertaken. Include in the tender amount all costs associated with the required scheduling. All necessary power shutdowns must be co-ordinated with the Owner.

.2 Requests for power shut downs shall be submitted in writing a minimum of forty-eight (48) hours prior to scheduled shutdown. Requests shall indicate scope of work, area, circuits, panels affected, as well as the date and time of requested shutdown.

1.17 WORK COORDINATION

.1 Where location of work depends upon equipment being installed by others, confirm location of all such equipment with the trade concerned prior to installing any conduit, outlets, etc. Where equipment is being supplied that is being built-in with work of other Contractors, supply the equipment or necessary dimensions to the respective trades concerned.

.2 Give the work personal supervision, lay out own work, do all necessary levelling and measuring or employ a competent Engineer to do so. Figures, full size and detail drawings shall take precedence over scaled measurements off drawings. No plea as to the actions and directions of other than the Consultant will be accepted in justification of any error in construction where a departure is made from the drawings, specifications or contract; it shall remain the duty of the Contractor to take his own measurements of the work.

.3 Correct all work completed contrary to the intent of the drawings and specifications and bear all costs for same. Where the intent of the drawings and specifications is not clear, obtain clarification from the Consultant before proceeding with the work

.4 Prior to commencing work, check the drawings and specifications of other trades for conflicts with the electrical work. Any such conflicts shall be reported to the Consultant and a written ruling obtained before proceeding with this work. Failure to report such conflicts will result in the Contractor's responsibility to make whatever adjustments are required.

.5 All anchors, sleeves, inserts, etc. required for the electrical portion of the contract shall be installed at the proper time and when required to co-ordinate job progress with other trades.

1.18 OPERATING INSTRUCTIONS

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

- .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- .3 Safety precautions.
- .4 Procedures to be followed in event of equipment failure.
- .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

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

1.19 GUARANTEE

.1 Furnish a written guarantee/warranty countersigned and guaranteed by the Trade Contractor stating:

.1 That all work executed under this contract will be free from defects of workmanship and materials for a period of one (1) year from the date of final acceptance of this work, except for incandescent lamps, which shall be for a period of six (6) months.

.2 The above parties further agree that they will, at their own expense, repair and replace all such defective work and other work damaged thereby, which fails or becomes defective during the term of the guarantee/warranty provided that such failure is not due to improper usage.

.3 The period of the guarantee specified shall in no way supplant any other guarantee of a longer period but shall be binding on work not otherwise covered.

1.20 FINAL

.1 Specifically note that the Civil drawings shall be checked for device locations before junction boxes and conduits are roughed-in. If this is not done and that conflict occurs, the outlets and/or conduits shall be moved and any repairs made at the expense of the Trade Contractor.

.2 Points not specifically mentioned shall be in strict accordance with the Canadian Electrical Code and regulations of the Electrical Inspection Department from which the permit was obtained. The latest revisions and/or amendments to this code with applicable date restrictions shall also govern work on this contract.

.3 It is the intent that these drawings and specifications provide for an electrical installation complete and in operating condition and the contractor shall be responsible for supplying and installing all material and work necessary to accomplish this, except where specifically noted that such work or material is not included.

.4 These drawings and specifications are to be read in conjunction with the civil drawings and specifications and what may be called for in another shall be binding on this contract.

.5 Leave the work complete to the approval of the Owner.

1.21 SCOPE OF WORK

.1 The scope of work shall include, but not be limited to, the following:

.1 Install Owner Supplied Medium Intensity Taxiway Edge Lighting.

.2 Supply and installation of cables/conduit in trench as indicated on drawings.

.3 Installation of Owner Supplied series isolating transformers and primary connector kits. Supply and install primary/secondary cabling, secondary connector kits, (as applicable) and all other associated equipment and work.

.4 Supply and installation of pullpits.

.5 Calibration of existing edge light Constant Current Regulator (CCR) to accommodate the additional edge lighting loads, as required.

.6 Removal of existing obsolete electrical equipment, and return to owner or disposal off-site as directed by owner / engineer.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from local inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.2 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction / inspection authorities.

.2 Decal signs, minimum size 175 x 250 mm.

2.3 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors. Penatrox to be used on aluminum connections.

2.4 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, white face, black core, mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by owner/engineer prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.5 WIRING IDENTIFICATION

.1 For indoor wiring, identify wiring with permanent lamicoid indelible identifying markings, numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. (See further instruction in section, below).

.2 For airfield wiring, identify wiring with lamicoid cable tags as follows:

- .1 lamicoid 3 mm thick plastic engraving sheet, white face, black core, 20mm x 50mm, with 8mm high lettering
- .2 tag to be punched with a 6mm diameter hole for connection to cables with two (2) black tye-wraps
- .3 Identification to include circuit numbering, and include “(R)” for return leg of circuits, eg. “CCT#5 (R)”. Designations to be confirmed with owner/engineer, prior to manufacture of tags.
- .4 Label cables in all pullpits, and pull boxes. Labelling requirements include any straight through cable.
- .5 Where there are 2 or more transformers in a pulpit, each secondary conductor to fixtures are to be clearly identified with markers to clearly denote which plug is associated with which transformer.

.3 Maintain phase sequence and colour coding throughout.

.4 Colour coding: to CSA C22.1.

.5 Use colour coded wires in communication cables, matched throughout system.

2.6 CONDUIT AND CABLE (NON-AIRFIELD LIGHTING) IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Prime	Auxiliary

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

.4 Underground cables: Provide lamicoid tags, black face with white core, fastened to cables with black nylon ties, for all cables in pulpits to indicate the function/purpose of each cable, including the following:

.1 Each cable entering and leaving pulpit at every primary connector.

.2 All straight-through cable in pulpits.

2.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment “international orange” to EEMAC Y1-1 unless otherwise specified.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1 unless otherwise specified.

Part 3 Execution

3.1 INSTALLATION

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

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

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: Rigid PVC, size as indicated and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation and fire stop opening.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1400 mm.

.2 Wall receptacles:

.1 General: 300 mm.

.2 Above top of continuous baseboard heater: 200 mm.

.3 Above top of counters or counter splash backs: 175 mm.

.4 In mechanical rooms: 1400 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 300 mm.

.5 Wall mounted telephone and interphone outlets: 1500 mm.

.6 Fire alarm stations: 1500 mm.

.7 Fire alarm bells: 2100 mm.

.8 Television outlets: 300 mm.

.9 Wall mounted speakers: 2100 mm.

.10 Clocks: 2100 mm.

.11 Door bell pushbuttons: 1500 mm.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Megger 5kV circuits, feeder and equipment with a 5kV instrument.

.4 Reference Section 34 43 10 for detailed Megger Test Procedures to be utilized.

.6 Calibrate and adjust the settings of regulators as per manufacturer's recommendations. Ensure the supply voltage corresponds to the input tap. Check that the open circuit protector de-energizes the circuit within 2 or 3 seconds when load is disconnected.

.3 Carry out tests in presence of owner/engineer.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.8 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical

.2 Section 34 43 10 – Airfield Lighting – General

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

1.3 MEASUREMENT FOR PAYMENT

.1 Except for Ground Counterpoise (and only as broken out on the Schedule of Quantities), for which measurement for payment will be per section 26 05 43.01, no other separate pay items shall be applicable for grounding – secondary. Payment for all grounding work shall be included in the respective pay items for electrical equipment.

Part 2 Products

2.1 EQUIPMENT

.1 Rod electrodes: Ground Rods / Electrodes:

- .1 Copper clad steel, 19mm diameter x 3m long, or
- .2 Plate electrodes: 300mm x 300mm x 15mm copper plate. (Only use where it is not possible to install rod type electrode, and only with the acceptance of the engineer / owner.)

.2 Grounding conductors: bare stranded copper, soft annealed, #8 AWG, or as otherwise indicated.

.3 Insulated grounding conductors: green, type TW, #8 AWG.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermite welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.
- .7 Ground Bus (in all electrical manholes / vaults).

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including electrodes, conductors, connectors, and accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermite process, permanent mechanical connectors, or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.11 Ground secondary service pedestals.

.12 Install ground counterpoise 75mm above all cables / ducts in trench.

3.2 ELECTRODES

.1 Install rod electrodes and make grounding connections. Ground rods to be installed every 4^{th} edge lighting pullpit.

.2 Bond separate, multiple electrodes together.

.3 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service Equipment, Transformer, Airfield Lighting Fixtures, Pullpit Lids.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results for Electrical

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.3 SUBMITTALS

.1 Product data: submit manufacturer's printed product literature, specifications and datasheets.

- .1 Submit cable manufacturing data.

.2 Quality assurance submittals:

- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 MEASUREMENT FOR PAYMENT

.1 No separate payment for work is included under this section. Include costs in the appropriate lump sum or unit price item indicated in Section 26 05 00 – Common Work Results for Electrical.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.4 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One (1) galvanized hole straps to secure surface conduits 50 mm and smaller.

.2 Two (2) hole steel straps for conduits larger than 50 mm.

.3 Beam clamps to secure conduits to exposed steel work.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene 6 mm DIA.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Surface mount conduits.

.4 Use rigid galvanized steel, PVC, and EMT threaded conduit where specified.

.5 Use rigid PVC conduit underground.

.6 Minimum conduit size for lighting and power circuits: 19 mm.

.7 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.8 Mechanically bend steel conduit over 19 mm diameter.

.9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.10 Install fish cord in empty conduits.

.11 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Do not pass conduits through structural members except as indicated.

.5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

.1 Use cold mastic between sleeve and conduit.

.5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.6 Encase conduits completely in concrete per details on the drawings.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.

.1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical

.2 Section 26 05 21 – Wires and Cables (0-1000 V)

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling

.4 Section 33 65 76 – Direct Buried Underground Cable Ducts

.5 Section 34 43 10 – Airfield Lighting – General

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

.2 Insulated Cable Engineers Association, Inc. (ICEA)

1.3 MEASUREMENT FOR PAYMENT

.1 Supply & Installation of Cables

.1 Payment for installation of cables in existing/new ducts shall include:

.1 Supply and installation of cables of type specified. The Contractor shall note that cable supply shall include any extra cable necessary for cable loops, connections, fittings, splices, offsets, as well as all surplus cables brought above ground.

.2 Transition to/from polytube/duct.

.3 All other accessories necessary to complete the installation to the satisfaction of the engineer.

.2 Payment for these items shall be on the basis of lineal metre of installed cables measured horizontally along trenches and ducts from the cable source to the end use device. This cable length payment will be approximately equal to the length of trenching for the same device. It shall be this contractor's responsibility to factor the cost of all surplus cable, loops, and accessories required to make a complete system into his tendered price.

Part 2 Products

2.1 NOT USED.

Part 3 Execution

3.1 SITE PREPARATION AND STOCKPILING

.1 Remove obstructions from surfaces to be excavated.

.2 Stockpile granular materials in areas designated by Engineer.

.3 Protect granular materials from contamination.

3.2 TRENCHING

.1 Advise Engineer in advance of excavation operations.

.2 Excavate to depth indicated.

.3 Wall of trench to be vertical as much as possible so that a minimum of shoulder surface is disturbed.

.4 Dispose of surplus and unsuitable excavated material and rocks on site at an area approved by the Engineer.

.5 Bottom of trench to be level and free from loose, soft, or coarse aggregate and organic matter.

.6 When a boulder or rock is encountered, remove to a depth of at least 80 mm below the required cable depth and replace with granular bedding material.

.7 Trenches shall be excavated only to the extent that cables can be installed and the trench backfilled as per Item 3.3 in the same working day.

3.3 BACKFILLING

.1 Do not proceed with backfilling operations until the Engineer has inspected and given approval.

.2 Areas to be backfilled are to be free from debris.

.3 Place and compact granular and native backfill materials in continuous horizontal layers as indicated on drawings.

.4 At locations 200 mm above counterpoise, provide underground protective hazard tape as outlined in Item 2.3.1.

.5 If, during progress of work, granular materials do not meet approval, replace and retest at no extra cost to the Owner.

.6 Backfill and compact, level with adjacent finished surface.

3.4 DIRECT BURIAL OF CABLES

.1 After granular bedding is in place, lay cables, maintaining a minimum of 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.

.2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.

.3 Make termination and splice only as indicated, leaving at least 1000 mm of surplus cable in each direction.

.1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.

.2 All splices and terminations shall be in a pull pit.

.4 Minimum permitted radius at cable bends for rubber- or plastic-covered cables is 8 times diameter of cable, or in accordance with manufacturer's instructions.

3.5 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.1 Do not pull spliced cables inside ducts.

.2 Install multiple cables in duct simultaneously.

.3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.4 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.

.5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.6 After installation of cables, seal duct ends with duct sealing compound.

.7 All cables shall go through to pull pits, and all terminations shall be at pull pits.

.8 The bare copper counterpoise shall be laid outside and above the duct, as shown on the drawings.

.9 Primary cable piping to enter through bottom of pullpit.

.10 Pre-drill pull pits to accept installation of secondary cable duct.

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 5 gig-ohms.

.5 Pre-acceptance tests.

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 5000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.3 The above megger testing is to be undertaken non-destructively at 5000V. Circuits to be tested in a non-energized, fully functional configuration (with transformers connected, etc.).

.6 Provide owner/engineer with list of test results showing location at which each test was made, circuit tested and result of each test.

.7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results – Electrical

.2 Section 34 43 10 – Airfield Lighting – General

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following:

.1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

.2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence, and cleaning procedures.

1.4 MEASUREMENT FOR PAYMENT

.1 Trenching & Ducts

.1 The Contractor shall provide all trenching, backfilling, compaction and restoration as outlined in the drawings and specifications. Where multiple circuits/ducts are installed along the same route, a common “joint-use” trench shall be provided.

.2 Payment for the installation of trenching of required depth, including backfill and compaction, shall be on the basis of lineal metre of trench measured in the field. Such unit prices shall include all excavation of trenching, fill (if required), supply and installation of all materials, duct, pull strings, removal and disposal of excess excavated material, and reconditioning of disturbed surface.

.3 Earth excavation includes removal of rock and/or boulders up to 0.5 m^3.

.4 Native material shall be used for backfill except no rocks or stones greater than 50mm diameter are to be used.

.5 A 75 mm bedding of sand is to be provided at the bottom of all trenches, under the new electrical duct(s). A 75mm cover of sand is to be provided above all direct buried counterpoise cables, extending vertically to bedding sand.

.6 1 - #8 bare ground counterpoise wire shall be installed direct buried in trenches, and shall be included in the unit rate for the trenching. It shall be this contractor’s responsibility to factor in all costs for all grounding connections and extra counterpoise wire needed for zig-zagging.

.7 Pump excavation free of standing water and remove soft or foreign materials prior to placing bedding. Place bedding material to the full trench width and compact to minimum 95% Standard Proctor Maximum Dry Density.

.8 Provide the size and number of ducts specified on the drawings, and layout as detailed.

.9 Maintain 300mm separation between POWER and COMM ducts.

.2 Trenching & Ducts (Concrete Encased)

.1 The Contractor shall provide all trenching, compaction and restoration as outlined in the drawings and Specifications. Where multiple circuits/ducts are installed along the same route, a common "joint-use" trench shall be provided.

.2 Payment for the installation of concrete encased duct bank of required depth shall be on the basis of lineal metre of concrete encased trench measured in the field. Such unit prices shall include excavation of trenching, granular subbase fill compacted and graded to underside of granular base material, RPVC & fittings to CSA C22.2 No. 211.2 Rigid PVC (unplasticized) Conduit, pull strings, forming, duct cradles, removal and disposal of excess excavated material at on-site disposal site. Care shall be taken to avoid creating square corners in bottom of excavated trench. Duct to be placed and weighted / secured in trench to ensure consistent slope of duct to allow drainage and avoid floatation. Concrete formwork and concrete placement shall be done by experienced concrete personnel as accepted by the Engineer.

.3 Earth excavation includes removal of rock and/or boulders up to 0.5 m^3.

.4 Concrete encase ducts as detailed in the drawings and specifications, to the full width of the trench.

.5 1 - #8 insulated green ground counterpoise wire shall be installed in concrete encased duct banks, and shall be included in the concrete encased duct unit price. It shall be this contractor's responsibility to factor in all costs for all grounding connections.

.6 Pump excavation free of standing water and remove soft or foreign materials prior to placing concrete.

.7 Provide the size and number of ducts specified on the drawings, and layout as detailed.

.8 Where detailed, price shall include saw-cutting of existing pavement, to allow duct installation, concrete encasement, backfill, compaction, and reinstatement of surface to match pre-existing condition.

Part 2 Products

2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC duct: CSA C22.2 No. 211.2, with moulded fittings, for direct burial, sizes as indicated.

.2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, and adaptors same product material as duct, to make a complete installation.

.3 Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.

2.2 OTHER DUCTS

.1 Polytube: 50mm, or size as indicated.

2.3 SOLVENT WELD COMPOUND

.1 Solvent cement for PVC duct joints.

2.4 CABLE PULLING EQUIPMENT

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

2.5 WARNING TAPE

.1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW ".

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.

.2 Clean inside of ducts before laying.

.3 Ensure full, even support, every 1.5m throughout duct length.

.4 Slope ducts with 1 to 400 minimum slope.

.5 Ensure all duct joints are solvent welded.

.6 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.

.7 Pull through each duct a wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.

.1 Pull stiff bristle brush through each duct immediately before pulling-in cables.

.8 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.

.9 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.

.10 Install markers as required.

.11 Install bell ends on all ducts in all pull boxes.

.12 Notify the owner/engineer for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

3.3 DUCT DRAINAGE

.1 Where possible, drain ducts into pull boxes. Otherwise make five 3/8" drill holes in a row at the bottom of each duct whenever duct turns upwards to enter a pull box. Cover holes with a plastic or galvanized steel mesh to prevent soil entering ducts.

3.4 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical

.2 Section 34 43 13.19 – Elevated Edge Lighting

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA C22.2 No.179-09, Airport Series Lighting Cables.
- .2 CSA C22.2 No.180-FM1983(R2008), Series Isolating Transformers for Airport Lighting.
- .3 CSA C22.1, Canadian Electrical Code, Part 1, latest edition

.2 Transport Canada

- .1 Aerodrome Standards and Recommended Practices, TP312E, 5th Edition

1.3 SYSTEM DESCRIPTION

- .1 Install Owner Supplied Medium Intensity Taxiway Edge Lighting.
- .2 Supply and installation of cables/conduit in trench as indicated on drawings.
- .3 Installation of Owner Supplied series isolating transformers and primary connector kits. Supply and install primary/secondary cabling, secondary connector kits, (as applicable) and all other associated equipment and work.
- .4 Supply and installation of pullpits.
- .5 Calibration of existing edge light Constant Current Regulator (CCR) to accommodate the additional edge lighting loads, as required.
- .6 Removal of existing obsolete electrical equipment, and return to owner or disposal off-site as directed by owner / engineer.

1.4 SUBMITTALS

.1 Provide written confirmation of compliance with CSA standards. Where CSA certified equipment/material is not available, equipment/material to be submitted to local inspection authority for special approval, before delivery to site, and copy of CSA special approval acceptance documentation is to be provided as a submittal.

.2 Provide written confirmation of compliance with TP312, 5th Edition requirements, from a third party Independent Testing Agency (ITA).

1.5 MAINTENANCE MATERIALS

.1 Provide all maintenance materials (manuals) and any special tools required.

1.6 MEASUREMENT FOR PAYMENT

.1 New Pull Pit

.1 Payment at the tendered price shall be full compensation to complete the work including excavation, granular bedding, backfill, compaction, cable/duct entries, intercepting on existing cable/duct (where applicable), galvanized steel checker plate lid (with hub for fixture installation where used for fixture mounting, solid for pullpits not used for fixture mounting), bell ends, ground rods, supply and installation using the pullpits as shown on the drawings and described in the specifications.

.2 Testing and Commissioning

.1 Payment at the tendered price shall be full compensation for all testing and commissioning activities required for all of the various new/modified systems and equipment, and shall include the following:

.2 Megger testing of all new/modified airfield series circuits in the presence of the owner/engineer, and indicating that the circuits meet all requirements of the drawings and specifications. Existing circuits shall be tested before any alterations to the system are made, and after completion of works on the system.

.3 Functional testing of all airfield lighting equipment in the presence of the owner/engineer, and indicating that the new/modified equipment meets all operational requirements for brightness levels, start-up, proper operation, aiming/sequence, and are controllable by manual/remote control.

.4 Submittal of megger test and functional test check sheets, documenting the tests undertaken, and the test results.

.3 Removals of Obsolete Electrical Equipment

.1 Payment at the tendered price shall be full compensation for removals of electrical equipment made obsolete under this project, and shall include the following:

.2 Existing obsolete cables in ducts to be removed and disposed of off site.

.3 Existing direct buried obsolete cables to be abandoned in place. Cut and remove all portions of cable above ground.

.4 Existing obsolete pullpits to be removed and disposed of off site, with voids backfilled and compacted.

.5 Existing obsolete lighting fixtures and transformers to be removed and returned to owner.

.4 Underground Locates

.1 Payment for this item shall be on a lump sum basis and shall include all work and coordination to locate all existing underground utilities and facilities that are within the project limits, whether indicated on the project documents, or not. The contractor is advised that the project drawings may not be complete with respect to underground utilities and facilities.

.2 Work under this item shall include providing all locate sketches and information to the airport, for reference and updates to the base plans.

.5 Spare Parts

.1 Spare Parts will be accounted for under a cash allowance. After award of project, a list of spare parts to be priced will be supplied to the contractor. After list of parts pricing is received, the owner will select the spare parts to be supplied under the contract, and this will be accounted for under the cash allowance.

1.7 QUALIFICATIONS

.1 Airfield Lighting Systems are specialized high voltage electrical systems and work on these systems are to be undertaken by only those individuals with appropriate experience and qualifications in dealing with these systems.

.2 The airfield electrical contractor/sub-contractor and assigned electrical site superintendent shall have a minimum 3 projects within last 5 years working on airport electrical system projects (construction, minimum electrical project values of $100,000 each) and with the following airport lighting equipment / systems: constant current regulators, series circuit installation, elevated edge lighting, airfield signage.

.3 The electrical contractor/sub-contractor shall submit a detailed airport experience project listing, outlining how all of the above requirements are met by their company/staff, along with the tender documents.

Part 2 Products

2.1 PRIMARY CABLE

.1 Single conductor stranded soft drawn copper, #8 AWG, 5000 volt, combined cross linked polyethylene insulation and jacket: CSA C22.2 No.179.

2.2 PRIMARY PLUG RECEPTACLE CONNECTORS

.1 Primary plug and receptacle connector kit, straight type, one male plug, one female plug, for use with isolating transformer or use for separable straight splice of #8 AWG primary cable. Splice only in pulpits.

.2 Acceptable Product: Amerace Ltd. Model 54 Super Kit. (No Exceptions)

2.3 SECONDARY PLUG AND RECEPTACLE CONNECTORS

.1 Secondary male plug connector kit; factory assembled secondary using 2 - #10 or 2 - #12 AWG type SOW secondary cable.

.1 Acceptable Product: Amerace Ltd. 95MPR8-G

.2 Secondary female receptacle connector kit; factory assembled secondary using 2 - #10 or 2 - #12 AWG type SOW secondary cable.

.1 Acceptable Product: Amerace Ltd. 95MPR8-G

.3 Factory assembled secondary extension, minimum 1.2 m long, #12 AWG Type SOW, one - two conductor cable terminated with male connector on one end and female connector on other end, for long secondary runs between transformers and fixtures. Exact length to suit distance between light fixtures and transformer.

2.4 ISOLATING TRANSFORMER

.1 CSA C22.2 No180, rating as required for applicable fixture. Use for 5000 volt series circuits.

.2 Transformers and all connections to be completely waterproof and suitable for mounting in any type of pull pit.

.3 Transformers must be designed to allow continuous operation with the secondary open circuited, short circuited, or with a lamp in place.

.4 Transformers to be rubber encapsulated complete with factory-installed primary and secondary leads and shall conform to CSA C22.2 180-M. Ensure secondary lead is equipped with a Style 8 receptacle.

.5 Connections shall conform to Transport Canada K-255 and shall be suitable for 5 kV non-screened cable and shall match the transformer manufacturer.

.6 Transformer rating: as indicated, 6.6 A primary, 6.6 A secondary, sized to suit connected loads and as per below, 60 Hz.

.7 Manufacturer: Amerace CTAG Series, sized to suit (or approved alternate).

2.5 TRANSFORMER PULLPIT

.1 Rigid polyethylene or PVC to Transport Canada specification K-303.

.1 Approved Products: West Coast Engineering, Nova Pole (Large Round)

2.6 GROUND COUNTERPOISE WIRE

.1 Single conductor #8 AWG, soft drawn copper wire:

.1 Solid bare for direct burial as counterpoise for airfield lighting circuits in new trench.

.2 Stranded with green TW insulation for placing in duct or polytube as counterpoise for airfield lighting circuits buried beneath hard surfaces (or above ground), and for power circuit insulated bonding conductors.

2.7 GROUND ROD

.1 Copper clad steel 19 mm x 3000 mm long complete with ground connector.

2.8 OTHER MATERIAL

.1 Cable ties: nylon black, length as required.

.2 Conductor markers: as detailed on drawings.

.3 Conduit, rigid:

.1 PVC: size as indicated.

Part 3 Execution

3.1 GENERAL

.1 Install Airport Lighting underground circuitry in accordance with Canadian Electrical Code.

.2 Install new pull pits and polytube as shown on the drawings.

.3 Install the appropriate size isolating transformer(s) in each pull pit. Maximum 3 transformers per pull pit.

.4 Where there is more that one transformer in a pullpit, provide new engraved lamicoid cable tags secured with nylon cable ties for the secondary circuits. Label all cables as they enter and exit pull boxes.

.5 Provide engraved lamicoid cable tags secured with nylon cables ties on each isolating transformer secondary lead to indicate which light the transformer serves.

3.2 INSTALLATION ISOLATING TRANSFORMERS

.1 Install isolating transformers in pullpits, at locations indicated:

.1 In transformer pulpits or enclosures:

.1 Place suitable transformer(s) in pullpits / enclosures.

.2 Make connections to:

.1 Primary cable.

.2 Airfield lighting secondary cable.

.3 Ground counterpoise.

.3 Place back cover.

3.3 INSTALLATION OF TRANSFORMER PULLPITS

.1 Install transformer pullpits at locations indicated.

.1 Excavate to size and depth indicated.

.2 Cover bottom of excavation with layer of bedding material.

.3 Place pullpit so that cover is 50 mm below adjacent ground surface.

.4 Make holes in pullpit wall suitable for secondary tubing used (primary cable tubing shall enter through the bottom of the pullpit).

.5 Install incoming and outgoing tubing and/or conduit.

.6 Install drain conduit, where directed by engineer in the field, for connection to nearby drainage swale or ditch.

.7 Backfill with sand (bottom of pulpit) and common backfill material around pullpit and compact to same level and density as adjacent ground.

.8 Place cover on pullpit and lock, insert bolt.

3.4 INSTALLATION OF AIRPORT LIGHTING PRIMARY U/G CABLES

.1 Install airport lighting primary underground cables, as indicated on drawings.

- .1 Pull in ducts.
- .2 Run in conduits.

.2 Make connections using approved connectors as indicated.

- .1 Leave 1000 mm loop of loose cable at each connection, avoid mechanical tension on connector.
- .2 Install connector in accordance with manufacturer's instructions.

.3 Install markers on cable identifying circuit numbers in each pullpit.

3.5 INSTALLATION OF GROUND COUNTERPOISE

.1 Install with runs of series lighting primary cables, in trench, duct and/or tubing at locations as indicated:

- .1 Use 1conductor #8 SDBC wire with cables directly buried in trench or in protective tubing:
  - .1 Place counterpoise wire on top of additional 75 mm layer of bedding material above cables or tubing.
  - .2 Run counterpoise wire in straight line or in zig-zag pattern as indicated.

.2 Use 1 conductor #8 stranded with TW green insulation, with cables pulled in ducts and/or tubing under pavement.

.3 Use appropriate ground connector and connect counterpoise wire to:

- .1 Power supply system common ground.
- .2 Each light unit anchor and isolating transformer.
- .3 Each ground rod.
- .4 Other ground wires in same trench.
- .5 Pullpit covers (if metal).

3.6 INSTALLATION OF SECONDARY CABLES

.1 Install as indicated:

- .1 Run in conduits.

.2 Make connections using approved connectors as indicated.

- .1 In series lighting circuits, connect to isolating transformer secondary outlet.
- .2 Leave 60 cm loop of loose cable at connection to transformer.
- .3 Run loose cable end above ground to light unit location.
- .4 Backfill as indicated and compact to same level and density as adjacent ground.

3.7 TESTING

.1 Testing requirements:

.1 Assign tests to qualified personnel only.

.2 Provide necessary instruments and equipment to demonstrate that:

.1 Circuits are continuous, free of short circuits and unspecified grounds.

.2 Circuits are connected according to applicable wiring diagrams.

.3 Circuits perform designated functions in sequence and manner intended.

.4 Resistance to ground of leg of a new circuit, measured with 5 kV Megger is not less than 5 gig-ohms. Megger test using the following procedure:

.1 For each circuit, disconnect from source and separate the A + B legs.

.2 Discharge capacitance in the cabling both before and after testing.

.3 Megger each of the A + B legs of the circuit independently. Take reading after test voltage has been applied for a period of 1 minute.

.5 For work where new cabling is to be spliced into existing circuitry, the existing circuit(s) are to be tested BEFORE and AFTER modifications to the circuit take place. The readings AFTER modifications shall not be below the pre-construction reading. Megger test using the following procedure:

.1 For each circuit, disconnect from source and separate the A + B legs.

.2 Discharge capacitance in the cabling both before and after testing.

.3 Megger each of the A + B legs of the circuit independently. Take reading after test voltage has been applied for a period of 1 minute.

.6 Circuits are operable by:

.1 Energizing and operating each circuit at each brightness not less than 10times.

.2 Energizing and operating each circuit at full load for continuous period of not less than eight hours.

.2 Provide owner/engineer with list of test results indicating:

.1 Location at which test was made.

.2 Circuit number or designator of circuit tested.

.3 Individual test results.

.4 Submit at no cost to the Engineer, 2 copies of factory production test data as requested, with each shipment of material.

.1 Test reports shall show manufacturer's stock number, serial number, rating, quantity, manufacturer order number, date of manufacture, type of test, and duration.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Airport Lighting (General): Section 34 43 10 – Airport Lighting General

.2 Duct, Conduit Installation: Section 33 65 76 – Direct Buried Underground Cable Ducts

1.2 MEASUREMENT FOR PAYMENT

.1 New Edge Lights

.1 Payment for this item shall include the installation, and connection of the Owner Supplied edge light fixture as detailed on the drawings including fixture, frangible coupling, column, mounting stake or pullpit lid hub mounting, The contractor shall supply and install cable, secondary conduit/cable, grounding, all levelling / alignment / testing, and all other required accessories and work.

.2 Payment for these items shall be on a per-unit installed basis.

Part 2 Products

2.1 MEDIUM INTENSITY ELEVATED LIGHT - SERIES CIRCUIT

.1 Light units shall be pullpit lid or stake mounted as shown on drawings, complete with #12 AWG type SOW connecting cable with factory assembled male plug connector (Amerace type 91), support column, and clips and screws or hold clip ring for attachment of lens.

.2 Fixture shall be supplied complete with lens of photometric distribution to Transport Canada specifications and with 50 mm diameter frangible coupling. Fixture height as detailed on the drawings.

Taxiway Edgelight (LED)	color: blue (symmetrical)
	lamp: LED, 6.6A

.3 OWNER SUPPLIED

.4 All fixtures on shall be equipped with a 600mm long orange retro-reflective marker rod c/w a spring loaded rust resistant heavy duty mounting bracket. Bracket shall be attached to frangible coupling with stainless steel hose clamps only.

.5 Installation of fixtures shall include aiming, levelling and testing of all fixtures.

Part 3 Execution

3.1 LIGHT UNIT INSTALLATION

.1 Install at locations indicated or as directed by owner/engineer.

.2 Install to Section 34 43 10 - Airfield Lighting - General and as indicated:

.1 Pullpit lid or stake mounted, as indicated on drawings.

.3 Assemble in accordance with manufacturer's installation instructions. Connect isolating transformer secondary lead to light unit cord assembly by means of disconnecting plug and receptacle. Do not tape this connection.

.4 Level as recommended by manufacturer.

.5 Align fixture as directed by manufacturer instructions.

END OF SECTION