TECHNICAL SPECIFICATION FOR
Design and Installation of a
VHF Tower

PRIME CONSULTANT:

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A1E 5X7

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEG Newfoundland and Labrador
PERMIT HOLDER
This Permit Allows
TILLER ENGINEERING INC.
MIRC# 02255
To practice Professional Engineering
in Newfoundland and Labrador.
Permit No. as issued by PEG P0227
which is valid for the year 2019

Date: June 2019

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June 2019

SUMMARY OF WORK

Section 011100

Part 1 General

1.1 PRECEDENCE

.1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 The work covered under this specification consists of the installation of a 45.72m VHF Tower System located at Cuslett, Newfoundland and Labrador.

.2 The work to be done under this Specification shall include all labor, materials and equipment necessary to complete the installation to the full extent of the Specification and Drawings.

.3 Work shall include but not be limited to the following:

- .1 Installation of a 45.72m guyed VHF tower structure at Cuslett, Newfoundland and Labrador.
- .2 Transportation of all materials and equipment to the site.
- .3 Tower structure is currently dissembled into eight sections at St. John's, Newfoundland and Labrador.
- .4 Supply and installation of guys, guy hardware, cabling, ground system and all other materials required to meet the terms of this contract as based on Construction Installation Package referenced in Appendix B.
- .5 Engineering design, supply and installation of foundations and anchors based on utilization of 80% for future antennas. Design to be based on loads found in Structural Analysis report referenced in Appendix D.
- .6 Tower and anchor layout in accordance with approved engineering drawings. Actual layout shall be subject to the approval of Departmental Representative prior to commencement of any work.
- .7 Supply and installation of Cougar safety rail.
- .8 Supply and install guy markers and initial tension tags on all guy wires.
- .9 Installation of auxiliary facilities such as ladders and obstruction lighting system.
- .10 All antenna optimization, testing, and system commissioning. Contractor shall coordinate all work with Departmental Representative and provide report.
- .11 The safe dismantling and disposal of the existing tower including antennas and antenna systems, transmission lines, guys and anchor systems and ground system.
- .12 Removal of existing generator building and all identified concrete foundations to min 300mm below grade. All items located at Cuslett.
- .13 Clean up of site following completion of all work.

1.3 DEFINITIONS

.1 "Departmental Representative" means: Fisheries & Oceans Canada/Canadian Coast Guard. (CCG)

.2 "(Tower) Design Engineer" means: Contractor's Design Engineer of Record.

1.4 EXISTING SITE CONDITIONS

.1 The contractor should note that this work is to be performed on an existing site. Refer to the site survey and location maps appended to this specification for site details and new tower locations.

.2 Before tendering it is recommended that the Contractor familiarize themselves with the remote location, scope of work, site restrictions and temporary measures required to complete work as specified. **No after claim will be allowed** for any work or material necessary for proper execution and completion of the contract.

.3 Site is located at 46º-58'-27.9" N (Latitude) and 54°-09'-14.8" W (Longitude), at the Canadian Coast Guard site in Cuslett, NL. Refer to Appendix A for site layout map.

.4 Any dimensions given in this Specification or appended drawings are approximate and are for guidance only. Exact dimensions and layouts to be determined by the Contractor in the field.

.5 The site is accessible by 4WD vehicle using a public road.

.6 Contractors should note that there are restrictions at this location with regard.

- .1 The available space
- .2 Location of cable trenches
- .3 Location of buried power conductors
- .4 Location of buildings
- .5 Location of overhead power conductors
- .6 Access to anchors (guy lanes to be cleared of trees and brush)

.7 It shall be the Contractor's responsibility to locate and protect all buried cables and other underground or overhead structures. Any damage to such structures shall be the responsibility of Contractor. Where unknown services are encountered, Contractor to log location and advise Departmental Representative immediately.

.8 Geotechnical report is attached in Appendix E of this specification. The Contractor is reminded that the intention of these reports is to provide data applicable to borehole and test pit locations. Any interpolation or assumptions made relative to any locations other than the borehole and test pit locations, is the responsibility of the Contractor. Contractor is to advise the Departmental Representative if any discrepancies exist between the Geotechnical report and actual excavations.

1.5 CODES

.1 Perform work in accordance with the latest edition of CSA S37 Antennas, towers, and antenna-supporting structures and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Meet or exceed requirements of:

- .1 Contract documents,

.2 Specified standards, codes and referenced documents.

1.6 REQUIRED DOCUMENTS

.1 Contractor to maintain on job site, one copy of each of the following:

.1 Health and Safety Plan
.2 First Aid Kit
.3 Contract drawings and specifications
.4 Addenda
.5 Reviewed shop drawings
.6 Change orders
.7 Other modifications to contract
.8 Field test reports
.9 Copy of approved work schedule
.10 Manufacturers installation and applications instructions
.11 Contact information for Departmental Representative.
.12 Other items as requested

1.7 WORK SCHEDULE

.1 All work on the project shall be completed within the time indicated in the tender document.

.2 Design to be substantially completed by within 4 weeks of award. Installation to be completed within 12 weeks of award.

.3 Contractor is to provide an updated detailed schedule and commence work immediately upon award of contract and after review and approval of all submittals.

.4 The Contractor is to make every effort to ensure sufficient material and equipment is delivered to site at the earliest time possible upon award of the contract.

1.8 COST BREAKDOWN

.1 Before submitting first progress claims submit breakdown of Contract price in detail as directed by Departmental Representative. After approval by Departmental Representative, cost breakdown will be used as basis for progress payments.

1.9 CONTRACTOR USE OF PREMISES

.1 Contractor shall follow security procedures as established by Owner, within existing procedures at the site, and any project – specific requirements as directed by Departmental Representative.

.2 Maintain parking, storage of materials, construction trailers, etc., within the confines directed by the Departmental Representative.

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

.4 At completion of work restore area to its original condition. The Contractor must repair damage to ground and property. Remove all construction materials, residue, excess etc., and leave site in a condition acceptable to Departmental Representative.

1.10 PARTIAL OWNER OCCUPANCY

.1 Existing facilities to remain open and fully operational during the course of this project.

.2 Coordinate use of premises under direction of Departmental Representative.

1.11 PROJECT MEETINGS

.1 Departmental Representative will arrange and give notice of all project meetings. Contractor is responsible for any expenses related to attending these meetings.

.2 All project meetings will take place at site of work unless otherwise directed by the Departmental Representative.

.3 Prior to commencement of work there will be a Project “Kick-Off” Meeting. The Contractors Project Manager (at their own expense), the Departmental Representative will be in attendance. The meeting will be held in St. John’s, NL.

.4 Departmental Representative will be responsible for recording minutes and distribution.

.5 Contractor to have a responsible representative present at all job meetings and to the maximum extent possible, this should be the same person.

1.12 PROTECTION OF MATERIALS AND EQUIPMENT

.1 Store all materials and equipment to prevent theft or damage. Repair or replace all material or equipment damaged in transit or storage to the satisfaction of and to no cost to the Departmental Representative.

1.13 EXISTING SERVICES

.1 Where works involves breaking into or connecting to existing services, carry out work at times directed by Departmental Representative, by authorities having jurisdiction, with minimum of disturbance to operation.

.2 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.

1.14 ORAL AGREEMENT

.1 No oral order, objection, claim or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents and none of

the provisions of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than by a definitely agreed waiver or modification thereof in writing, and no evidence shall be introduced in any proceeding of any other waiver or modification.

1.15 TAXES AND PERMITS

.1 Contractor to obtain all Federal, Provincial and Municipal permits and pay all applicable taxes.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

SUBMITTAL PROCEDURES

Section 013300

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 45 00 - Quality Control.

1.2 ADMINISTRATIVE

.1 Submit to Departmental Representative 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 Work affected by submittal shall not proceed until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

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

.5 Review submittals prior to submission to Departmental Representative. 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 shall be considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

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

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review of submittals.

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

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The Contractor shall submit for review design and detail drawings in PDF format to the Departmental Representative. The Professional Engineer, responsible for the design, shall seal all drawings submitted to the Departmental Representative and must be registered to practice by the Association of Professional Engineers and Geoscientists of Newfoundland.

.2 Allow two (2) weeks for review of each submission by Consultant.

.3 After successful review, one copy of each submitted drawing will be returned to the Contractor either “Reviewed” or “Reviewed as Noted”. There after no change shall be made to the drawing without the permission of the Departmental Representative.

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

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

.6 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.

.7 Any work done prior to the return of the reviewed drawings shall be at the Contractor’s own risk. The Departmental Representative or his representative may issue a stop work order if any site work is started prior to approval of engineering drawings. Any costs associated with this shall be the Contractor’s responsibility.

.8 Drawings of the work produced by the Contractor and all rights and privileges associated therewith shall become the exclusive property of the Departmental Representative who will be free to make any use or reuse of said drawings which in the opinion of the Departmental Representative is reasonable and/or required in the Departmental Representative’s interest.

.9 The review of shop drawings by Consultant is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that Consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 MANDATORY CONSTRUCTION PLAN

.1 The Contractor shall submit a construction plan of sufficient detail to demonstrate that the contractor has considered all the challenges of the project and is prepared to undertake the works in a competent and professional manor in accordance with all legislation including:

.1 List of all subcontractors and the item of work they will be completing, including but not limited to Engineering, steel fabrication, galvanizing, painting, erection, etc.

.2 Project specific safety program

.3 Project environment protection plan

.4 Detailed demolition plan

.5 Tower Erection plan

.6 Detailed work schedule including all project milestones for design, fabrication, transport and installation

1.5 MANDATORY TECHNICAL SUBMISSION

.1 Sealed drawings which include details of the tower base foundation and guy anchors, showing all dimensions and steel reinforcement or rock anchor details. Drawings shall show concrete strength. Where rock bolts are used, installation and testing procedures shall be clearly indicated on the drawings. Generic copies of typical foundations are not adequate

.2 On acceptance of the Tender, the Contractor shall submit for review sealed design calculation report which include

.1 Reference design standard.

.2 All foundation analysis and calculations.

.3 Any other information requested by Departmental Representative

.3 Contractor shall maintain and update the work schedule. Each revision shall be submitted to the Departmental Representative for review.

1.6 AS BUILT DRAWINGS

.1 Upon completion of all work, and prior to release of contract holdback, the Contractor shall issue a full set of As Built drawings, which reflect any and all changes from the original contract drawings. These drawings shall be stamped AS BUILT DRAWINGS and shall be sealed by a Professional Engineer in accordance with the requirements of this specification. Submit electronically a full set of drawings (with Tower Engineer's stamp) in AutoCAD and PDF format including **ALL** product data on the lighting system and controller, antennas, Tx lines, etc.

.2 As built drawings shall show actual antenna arrangement including azimuths and elevations, anchor radius and drop, leg azimuth, etc.

.3 If no changes have been made to the original plan, the Contractor shall forward written confirmation of this, under the seal of the Professional Engineer accepting responsibility.

.4 As part of the final submission, a set of tension and pulse charts will be submitted for temperature range of –30º C to +30º C in 5ºC increments based on actual guy lengths, radius and anchor elevations.

1.7 INSPECTION REPORTS

.1 The Contractor is to submit a PDF copy of all quality control test reports required by this specification immediately upon completion of testing.

1.8 SAFETY PLAN

.1 The Contractor is to submit a project and site specific Safety Plan, including, climbing safety, rescue techniques, rigging procedures, equipment maintenance and inspections,

general work site safety, hazardous material safety (WHMIS), site security, public safety etc. and emergency response plans, for review prior to commencement of work on site.

1.9 SCHEDULES, PERMITS AND CERTIFICATES

.1 Upon award of contract, submit to Engineer a copy of the Work Schedule and various other schedules, permits, certification documents and project management plans as specified in other sections of the specifications.

.2 Submit copy of permits, notices, compliance certificates received by Regulatory Agencies having jurisdiction and as applicable to work.

1.10 CERTIFICATES AND TRANSCRIPTS

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

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

HEALTH AND SAFETY REQUIREMENTS

Section 013530

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.2 Province of Newfoundland and Labrador

.1 Occupational Health and Safety Act, R.S.N. 2012.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan: Within seven days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation.

.3 Submit Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction as requested.

.4 Submit copies of reports or directions issued by Federal, Provincial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit Material Safety Data Sheets (MSDS) to Departmental Representative.

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven days after receipt of plan. Revise plan as appropriate and resubmit plan to Engineer within two days after receipt of comments from Departmental Representative.

.8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.9 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications during emergency situations.

.10 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

1.4 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.5 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

.3 Design and construct all falsework as per CSA S269.1 (latest edition) and scaffolding as per SAS 269.2 (latest edition).

.4 Ensure no part of the work is subject to load(s) which endanger safety or will cause permanent deformations.

1.6 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 CONSTRUCTION SAFETY

.1 A first aid station must be maintained on site, available to workers at all times.

.2 Protect all utilities and services against damage or interruption. Any claims resulting from damage will be the Contractor’s responsibility. The possible location of any underground cables must be established and marked prior to any excavation.

.3 The Contractor shall prepare a written **Site/Project specific Safety Plan** outlining all procedures and safe work practices which must be followed by all personnel working on the construction site. This plan is to be developed in conjunction with all Sub-Contractors who will be working on site. It is the Contractor’s responsibility to become familiar with all safety laws and regulations applicable to the type of work to be undertaken. These safety laws and regulations shall be addressed in the safety plan as clear and specific safety rules, procedures and work practices. The Contractor shall ensure that all of his workers and his sub-contractors, as well as any other authorized persons working or circulating in the construction work area, have been briefed and are familiar with the safety rules and measures indicated in the Safety Plan and understand that these measures are mandatory at the construction site.

.4 Contractors’ Site/Project specific Safety Plan shall incorporate the following.

.1 Continuous attachment at all times while on the tower. No unattached climbing will be permitted at any time.

.2 Use of CSA approved; full body harness, belts, lanyards, trolleys, safety hats, safety boots, safety vest, and other equipment used to complete the job.

.3 Only experienced personnel with previous training and demonstrated experience working on similar structures and heights to work on the project.

.4 Not allowing personal to use equipment winches for transport of personnel.

.5 The ability for any worker to discuss issues that they feel affects workers safety.

.6 Tailgate/job assessment forms to be completed daily and made available upon request.

.7 Appropriate fall rescue plans and equipment.

1.8 SINAGE AND BARRIERS

.1 The contractor is to maintain necessary signage to ensure workers, people accessing the site and the general public are aware of any hazards or potential hazards. Barriers are to be provided as required by regulation to ensure access to work by the general public is restricted.

1.9 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labeling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada.

.2 Deliver copies of WHMIS data sheets to Departmental Representative on delivery of materials.

.3 All data sheets must be posted on site in a common area visible to all workers and subcontractors.

.4 Make all efforts to select and use materials (ie. adhesives, solvents, cleaners etc.) for the type and nature of work being performed which are the least hazardous products available, of low VOC content or low toxicity type products and emitting low noxious odours. Select products known to be friendly to the environment and to human health. Communicate this intent to all subcontractors, suppliers and manufacturers.

.5 Where the use be avoided of hazardous and toxic products cannot be avoided.

.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit WHMIS data sheets as per requirements above.

.2 Schedule in conjunction with the Departmental Representative, to carry out the work during “Off Hours” where workers and employees have left the site.

1.10 RESPONSIBILITY

.1 Inclusion of these safety requirements shall not constitute a relief of the Contractors responsibility but is a precaution against oversight and errors.

.2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.4 The Contractor is solely responsible for safety procedures necessary to; meet the requirements of these specifications and to ensure the safety of workers and the general public.

1.11 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, Occupational Health and Safety Regulations, C. Nfld.

.2 Comply with Occupational Health and Safety Regulations, 1996.

.3 Comply with Canada Labour Code Part II, Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

.4 Observe and enforce construction safety measures required by:

.1 Latest edition of the National Building Code of Canada.

.2 Provincial Worker's Compensation Board.

.3 Municipal statutes and ordinances.

.5 In the event of conflict between any provisions of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Engineer will advise on the course of action to be followed.

1.12 UNFORESEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Engineer verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have minimum 2 years' site-related working experience as Health and Safety associated with building construction.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work and report directly to and under the direction of the supervisor.

1.14 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.15 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.16 WORK STOPPAGE

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

END OF SECTION

ENVIRONMENTAL PROCEDURES

Section 013543

Part 1 General

1.1 SUMMARY

.1 This Section describes environmental protection requirements to be observed and enforced during the progress of this work.

.2 Inclusion of these environmental requirements shall not constitute a relief of the Contractor's responsibility but is a precaution against oversight or errors.

.3 The Contractor is solely responsible for all environmental protection procedures deemed necessary by the Contractor to meet the requirements of these Specifications. Contractor shall comply with all applicable Federal, Provincial and Municipal regulatory requirements.

.4 Contractor is fully responsible for all costs associated with required remediation occurring from Contractors work on site.

1.2 FIRES

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

1.3 DRAINAGE

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

.2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

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

1.4 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Minimize stripping of topsoil and vegetation.

1.5 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

.2 Waterways to be kept free of excavated fill, waste material and debris.

1.6 POLLUTION CONTROL

.1 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.2 Prevent dust and debris from demolition activities and other extraneous materials from contaminating air and waterways beyond application area.

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

.4 Contractor is to schedule work to avoid periods of heavy precipitation. Erosion control structures (temporary matting, geotextile filter fabric) are to be used, as appropriate, to prevent erosion and silt runoff.

.5 Contractor is to ensure all equipment is in good repair and no fuels or fluids are leaking from it. Equipment in disrepair will be removed from site. Basic petroleum spill clean-up equipment should be on site.

.6 No maintenance, beyond that of a required daily routine nature shall be performed on equipment while on site. No refueling to be completed within 30 meters of a water body.

.7 No bulk storage of fuel or hazardous products will be permitted on site.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

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

.2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

.4 Waste Management: separate waste materials for recycling in accordance with Section 02 41 16 – Structure Demolition.

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

END OF SECTION

QUALITY CONTROL

Section 014500

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.2 INSPECTION

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

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant or by inspection authority having jurisdiction.

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

.4 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies may be engaged by Departmental Repetitive for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

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

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

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

1.4 FOUNDATION INSPECTION

.1 The foundation placement is subject to inspection during the following project stages.

- .1 Testing of rock bolts if applicable.
- .2 Pre-pour inspection of rebar prior to concrete placement for gravity anchors and tower base footing.
- .3 Concrete placement
- .4 Grouting

.2 The Contractor shall advise the Departmental Representative **ONE WEEK** in advance of these activities. Every effort shall be made to allow completion of these activities within one full day on site.

.3 The Contractor shall have an independent testing firm obtain and test a minimum of three (3) concrete cylinders, per batch, as per the latest industry standards, for compressive strength for each structural anchor and base footing. An independent CSA certified testing firm shall conduct sampling and testing. This testing does not relieve the Contractor of their responsibility for ensuring concrete quality assurance. Contractor to arrange and pay for the testing. Testing reports to be submitted for review and approval prior to erection.

1.5 COMPLETION INSPECTION

.1 A completion inspection is to be carried out by the Consultant. The purpose of this inspection is to ensure that the work is completed as per the project specifications and industry standards. The completion inspection does not relieve the Contractor of his responsibility to execute the work in a quality fashion as per the project specifications and industry standards. The Contractor must ensure that his quality control personnel perform a complete inspection of the works prior to their crew leaving the site. It is expected that the Contractor has made a thorough check of all bolts, hardware, TX lines, tension and alignments as per requirements of CSA S37 18 standard or latest edition and reviewed the contract for full completion. The Contractor is to inform the Departmental Representative by letter that the installation is completed and is ready for inspection. The Contractor shall have sufficient crew on site during the inspection to correct deficiencies noted by the Consultant. Contractor to advise Departmental Representative ONE WEEK in advance to completion of the tower to permit scheduling of this inspection.

.2 The completion inspection by the Consultant will be the Departmental Representative's expense. All costs incurred by the Contractor during the acceptance inspection shall be at the Contractor's expense.

.3 All work must be completed and satisfactory prior to the Consultant's completion inspection. Any deficiencies should be reported prior to the inspection teams' mobilization to site. **The Contractor will be responsible for the costs of all repeat completion inspections necessitated by work, which is considered by the Departmental Representative to be incomplete or deficient.**

.4 Any adjustments to the tension, twist or alignment shall be made by Contractor in consultation with the Departmental Representative to ensure effects on signal coverage can be reviewed and monitored.

.5 After any adjustment measures are carried out to the tower, the Contractor shall, as required, under the direction of the Departmental Representative, re-orient any antennas.

.6 As-built tension pulse charts with actual measured guy lengths, radii and anchor elevations along with initial design guy tensions, must be provided prior to the inspection.

1.6 POST ERECTION INSPECTION

.1 Not less than six (6) months and not more than one (1) year after the completion inspection, the Consultant shall re-inspect the tower. The purpose of this post erection

inspection is to re-inspect the tower alignment and guy tensions, review satisfactory completion of any previously noted deficiencies and to conduct a general review of the tower condition. At this time the Contractor shall have a minimum crew of two present and carry out any adjustments necessary to ensure the structure meets the requirements of CSA S37- 18 standard. The post-erection inspection will be at the Departmental Representative's expense. All costs incurred by the Contractor during the Post Erection Inspection shall be at the Contractor's expense.

.2 Departmental Representative to advise Contractor at least **ONE WEEK** in advance of the post erection check in order to facilitate scheduling.

.3 Any adjustments to the tension, twist or alignment shall be made by the Contractor in consultation with the Departmental Representative to ensure affects on signal coverage can be reviewed and monitored.

.4 After any adjustment measures that are carried out on the tower, the Contractor shall, as required, under the direction of the Departmental Representative, re-orient any antennas.

1.7 CONFORMANCE LETTER

.1 Upon completion of the installation stage of the project the Contractor is to provide the Departmental Representative with a Conformance Certification Letter stating that the tower has been designed, fabricated and installed as per the Project Specifications.

1.8 ACCESS TO WORK

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

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

1.9 PROCEDURES

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

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

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

1.10 REJECTED WORK

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

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

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

1.11 REPORTS

.1 Submit electronic files of inspection and test reports to Departmental Representative.

1.12 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as may be requested.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

TEMPORARY BARRIERS AND ENCLOSURES

Section 015600

Part 1 General

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 ACCESS TO SITE

.1 Provide and maintain access roads during the construction period as may be required for access to Work.

.2 The Departmental Representative must approve any temporary roads planned. A plan for remediation must be included.

.3 If authorized to use existing roads for access to the project site, maintain such roads for the duration of the Contract and make good damage resulting from Contractor's use of roads.

.4 Any damages as a result of Contractor's activities to existing roadways, property, and adjacent property shall be returned to original condition at Contractors expense.

1.3 SANITARY FACLITIES

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

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

1.4 POWER

.1 Power supply may not be available during the time of construction. The Contractor must provide and maintain power as required for the construction and temporary obstruction lighting.

.2 Connect to power supply in accordance with Canadian Electrical Code once power is provided by Departmental Representative.

1.5 FIRE ROUTES

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

1.6 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.7 PROTECTION OF BUILDING FINISHES

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

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 7 days prior to installation.

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

COMMON PRODUCT REQUIREMENTS

Section 016100

Part 1 General

1.1 REFERENCE STANDARDS

.1 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.2 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.3 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

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

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

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

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

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative 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 Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

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

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

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

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

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and aluminium siding on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

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

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

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

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.6 MANUFACTURER’S INSTRUCTIONS

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Prior to use of a product or material, notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions. Departmental Representative will designate which document is to be followed.

1.7 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 Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative 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 Departmental Representative, whose decision is final.

1.8 SUBSTUTUTION

.1 Departmental Representative is not obligated to consider any substitutes or changes after contract award. Contractor is responsible for all costs associated with reviewing requested changes.

.2 Proposals for submission after Contract Award must include all documentation and information required as part of this contract and statements of respective cost differences of items originally specified and proposed substitutions.

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

.4 Amounts of credits arising from approval of substitutions will be determined by the Departmental Representative and the Contract Sum will be reduced accordingly. No substitutions will be permitted without prior written approval from Departmental Representative.

1.9 CO-ORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

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

1.10 REMEDIAL WORK

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

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

END OF SECTION

CLEANING

Section 017411

Part 1 General

1.1 PROJECT CLEANLINESS

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

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative.

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

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

.5 Provide and use clearly marked separate bins for recycling.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

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

.4 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.5 Remove dirt and other disfiguration from exterior surfaces.

.6 Under no circumstances will burning of construction refuse be allowed on the Departmental Representative’s site. Remove all waste materials from the site to an approved dumping area as designated by local authority.

.7 If the Contractor fails to clean up the site and restore to an acceptable condition, the Departmental Representative shall initiate completion of the work and deduct for same from monies due to the Contractor.

END OF SECTION

STRUCTURE DEMOLITION

Section 024116

Part 1 General

1.1 SCOPE

.1 The Contractor shall dismantle and dispose as directed by the Departmental Representative the existing tower and associated components. These components shall include, but not necessarily be limited to tower steel, guys, anchor assemblies to 300 mm below grade, conduit, lights, ladders, waveguide, footings etc. The contractor shall also be responsible for the removal of existing site items. This is to include the old generator buildings footing, the new generator footing and old concrete blocks that are still present on the site. All disposals shall be completed in a manner acceptable to the Federal, Provincial and Municipal authorities having jurisdiction.

.2 The Contractor shall provide a detailed tower demolition plan to the Departmental Representative with regard to the proposed method of dismantling the tower. The detailed plan must be approved and stamped by a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador, prior to submission. Details should include measures to protect other property such as the new tower, guys and transmitter building. This method must be reviewed by the Departmental Representative prior to the start of any work. This review shall not relieve the Contractor of his responsibilities and liabilities with the regard to the dismantling process. The Contractor shall provide these details in writing to the Departmental Representative complete with sketches if required.

.3 Contractor shall provide the Departmental Representative with a minimum notice of **ONE WEEK** prior to the proposed tower dismantling start.

1.2 SITE CONDITIONS

.1 Environmental protection:

.1 Ensure Work is done in accordance with Section 01 35 43- Environmental Procedures.

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

.3 Fires and burning of waste or materials is not permitted on site.

.4 Do not bury rubbish waste materials.

.5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout project.

.6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.

.7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction as directed by Departmental Representative.

.8 Protect trees, plants and foliage on site and adjacent properties where indicated.

.9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 DEMOLITION

.1 The tower shall be dismantled in such a manner so as to pose no threat to the new tower, antennas or transmitter buildings. Responsibility for any and all damage to property as a result of the dismantling and disposal of the existing tower shall be the sole responsibility of the Contractor.

.2 Existing tower shall not be demolished until new tower is confirmed to be operational by Owner. Once new tower is confirmed to be operational, existing tower and all attachments shall be safely taken down and removed from site.

.3 Remove tower from its foundation ensuring the tower base plates remain intact.

.4 Demolish all existing concrete foundations to be minimum of 300mm below grade level.

.5 Existing anchor assemblies are to removed to a minimum of 300mm below grade.

.6 Ensure that demolition does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.7 Ensure demolition is undertaken safely. If at any period during demolition the safety of the Contractor's staff cannot be maintained, take preventative measures, stop work and immediately notify Departmental Representative.

.8 At end of each day's work, leave work in safe and stable condition.

3.2 CLEANING

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

.2 Separate from general waste stream each of following materials. Stockpile materials in neat and orderly fashion in location and as directed by Departmental Representative for alternate disposal. Stockpile materials in accordance with applicable fire and safety regulations.

.1 Tower structure

.2 Antennas

.3 Obstruction lighting

.4 Tech cables.

.5 All guys and guy hardware.

.6 Transmission lines

.7 Wave-guide Bridge.

.3 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project construction.

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

.5 Transport material designated for recycling/disposal using approved haulers in accordance with applicable regulations.

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

.1 Written authorization from Departmental Representative is required to deviate from approved disposal facilities.

.7 Contractor shall provide written documentation with regard to where and how material was disposed of. On site disposal is strictly prohibited.

END OF SECTION

CAST-IN-PLACE CONCRETE

Section 033000

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

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

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide testing results for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

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

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

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00- Quality Control.

.2 Provide Departmental Representative, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

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

Part 2 Products

2.1 MATERIALS

.1 Lumber: plywood and wood formwork materials to CSA CAN-A23-94.

.2 Reinforcing steel: Grade 400 MPa, deformed bars to CSA G30.12 unless indicated otherwise.

.3 Cement: to CSA A5-93, normal (type 10), sulphate resistant (type 50).

.4 Water, fine aggregates, normal weight coarse aggregates: CSA A23.

.5 Chemical admixtures: to CSA A266.2-1973.

.6 Non-shrink grout: premixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing agents capable of developing minimum compressive strength of 50 Mpa (7000 psi) at 28 days.

2.2 MIXES

.1 Concrete mix to meet Departmental Representative performance criteria to CSA A23.1/A23.2.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

.2 Identify and report immediately to Departmental Representative when concrete mix design and parameters pose anticipated problems or deficiencies related to construction.

.3 Provide concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: C-1.

.2 Compressive strength at 28 days: 30 MPa minimum.

.3 Intended application: Foundations

.4 Aggregate size 40 mm

.5 Slump: unless otherwise noted, shall be 75mm +/- 25mm

.4 Provide quality management plan to ensure verification of concrete quality to specified performance.

.5 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

.6 If the air temperature is 5°C or less, the temperature of the concrete, at the time of placing shall be between 15°C and 30°C.

Part 3 Execution

3.1 PREPARATION

.1 Obtain Departmental Representative's written approval before placing concrete.

.1 Provide 24 hours minimum notice prior to placing of concrete.

.2 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

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

.4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.5 Protect previous Work from staining.

.6 Clean and remove stains prior to application for concrete finishes.

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

.8 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/APPLICATION

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

.2 Workmanship:

.1 Place all anchors against an undisturbed front face.

.2 Ensure that reinforcement and inserts are not disturbed during concrete placement.

.3 Do not place concrete against any surface which is less than 5°C. Remove all snow and ice before placement.

.3 Formwork:

.1 Withdraw all nails and thoroughly clean and repair all form materials before reusing.

.2 Provide a 20mm chamfer on all exposed corners.

.3 Take all precautions necessary to maintain the safety of the structure before removing forms. Pedestal forms to remain in place a minimum of 48 hours. **All formwork is to be completely removed.**

.4 Reinforcement:

.1 Clean all reinforcement of any loose scale, dirt, or other coatings which would destroy or reduce the bond. Reject bars with kinks or bends not shown on the drawings. Thoroughly clean all forms before installing reinforcement.

.2 Do not field cut, bend or displace any reinforcement to permit placing weldments or anchor bolts either before or after concrete is placed unless approval is given by the Departmental Representative.

.3 All reinforcement shall have a minimum of 75mm concrete cover.

.5 Anchor bolts:

.1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.

.2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.3 Set bolts and fill holes as per design drawings

.6 Grout:

.1 Use In-Pakt pre-blended non-shrink dry pack grout as manufactured by King Construction Products or approved equal. All grout installed according to manufacturers instructions.

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

.3 Edges of grout should be tapered off at 45º to give a neat transition between base plates and concrete pedestals.

.7 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.3 Provide effective means of maintaining temperature of concrete in place at a minimum 10°C and a maximum 30°C for three days after placing. When the mean daily temperature is forecasted to be less than 5°C, provide protection for newly placed concrete by means of suitable enclosures or raised coverings, insulation and heat.

.4 Insulation must be protected to prevent loss of effectiveness due to moisture.

.8 Joints:

.1 Locate and form all joints as detailed on drawings.

.2 Clean the face of joints of dirt and then saturate the water before placing new concrete.

3.3 PLACEMENT OF CONCRETE

.1 Consolidation of concrete should be performed by internal or immersion type vibration. Consolidation of the concrete by rods or shovels will not be permitted.

3.4 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00- Quality Control and submit report to Departmental Representative.

.1 Compressive strength at 7 and 28 days.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Contractor for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.3 Contractor will pay for costs of tests.

.4 Contractor to facilitate execution to allow testing and sampling procedures to be performed in accordance with CSA A23.2-00 by Departmental Representative. Concrete cylinders shall be tested for each anchor and the tower base.

.5 Confirmation of air content and slump shall be obtained for each load of concrete delivered to the project.

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

.7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

.8 If inspection or test results indicate that concrete materials do not meet the requirements of this specification, such materials shall be rejected and removed from the site. The Contractor shall be responsible for costs, including testing and additional inspections associated with concrete removal and replacement.

3.5 CLEANING

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

.2 Discuss with Departmental Representative appropriate area on job site where concrete trucks can be safely washed.

.3 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.4 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

STEEL TOWERS

Section 133613

Part 1 General

1.1 CODES AND STANDARDS

.1 The design, supply and erection of the tower shall be in accordance with the latest version of the following codes and standards:

- CSA-S37-13	Antennas, Towers and Antenna Supporting Structures
- CSA B33.4	Galvanized Steel Tower Bolts and Nuts
- ASTM A325	High Strength Bolts for Structural Steel Joints
- CSA CAN3-A23.3	Design of Concrete Structures
- CSA W59	Welded Steel Construction
- CAN/CSA-G40.20	General Requirements for Rolled or Welded Structural Quality Steel
- CAN/CSA-G40.21	Structural Quality Steels
- CAN/CSA-G164	Hot Dip Galvanizing of Irregularly Shaped Articles
- CAN/CSA-S16.1	Limit States Design of Steel Structures
- CAN/CSA-B72	Installation of Lightning Rods
- CAN/CSA-C22.1	Canadian Electrical Code, Part 1
- CAN/CSA-G4	Steel Wire Rope for General Purpose and Mine Hoisting and Mine Haulage
- CSA-CAN3-G12	Zinc Coated Steel Wire Strand
- CSA W47.1	Certification of Companies for Fusion Welding of Steel Structures
- W47.1S1-M	Supplement No.1-M1989 to W47.1-1983
- W59-	Welded Steel Construction (Metal-Arc Welding)
- Z259.2.-M	Fall Arresting Devices, Personnel Lowering Devices and Life Lines
- Z259.1	Fall Arresting Safety Belts and Lanyards for the Construction and Mining Industries

- Canada Labour Code
- Health and Welfare Canada Limits of Exposure to Radio-Frequency Fields at Frequencies from 10 kHz-300 kHz, Safety Code 6
- Newfoundland and Labrador Occupational Health & Safety Act and Regulations
- National Building Code of Canada – 2005
- Transport Canada Standard TP382 – Standards Obstruction Markings
- Canadian Coast Guard Safety Requirements
- SSPC (The Society of Protective Coatings)
- Transport Canada CAR Standard SOR/96-433

Part 2 Products

2.1 GENERAL REQUIREMENTS

.1 All steel CSA G40.21M – 350W u/n. Preference shall be given to the use of structural steels with improved resistance to brittle fracture. A36 modified steel is not acceptable. All materials to be used in the tower shall be new and in accordance with the requirements of CSA Standard S37-18.

.2 Use of material sections less than 5 mm in thickness will not be permitted on primary or secondary structural members. Sections used for attachment or support of auxiliary facilities may be permitted subject to review by the Departmental Representative.

.3 All guys shall be one continuous length Bridge Strand or Guy Strand (Grade 180) and guy attachment assemblies unless otherwise approved by the Departmental Representative. Cut ends of strand shall be capped with a stainless steel hose clamp or ear clips.

2.2 AUXILLARY FACILITIES

.1 The following facilities shall be considered to be an integral part of the tower contract and shall be supplied and erected as such. In mounting any of these auxiliary facilities, care shall be taken that the structural members of the tower are not weakened by the drilling of holes or any other means.

.2 Ladder – The tower shall be equipped with a climbing ladder (outside climb) complete with a Cougar model CSA approved fall arrest rail centered in the ladder. The ladder shall be a separate assembly bolted to the tower and shall conform to the latest version of CSA S37-18. Provide an unobstructed climbing path and maintain the required climbing radius as per CSA S37-18. Shall be Owner supplied, Contractor installed.

.3 Transmission Line Supports – Hangers shall be provided to support the transmission lines at the elevation of all antennas. Lines are to be supported and restrained at centers suitable to the manufacturer's requirements and TX lines are to be installed on the outside face of the tower. Use of wrap lock/ tie wrap devices to secure TX lines is not acceptable. The maximum spacing between supports is 760 mm. Location of Transmission lines will be submitted to Departmental Representative for approval.

.4 Ice Protection:

.1 All horizontal runs of transmission lines shall be protected from falling ice in a manner approved by the Departmental Representative.

.2 Three U-Bolt clips are to be spaced 300 mm apart, directly above the grounding connection and guy markers on each guy.

.3 All obstruction lights shall be protected by ice shields if applicable

.5 Turnbuckles and Shackles

.1 Turnbuckles and shackles shall be manufactured from AISI 1035 steel, heat treated, and shall be hot dip galvanized in accordance with the requirements of the latest version of CSA S37-18. The minimum turnbuckle length shall be 457 mm. Provide full articulation at anchor ends of each turnbuckle by means of shackles.

.2 Install all turnbuckles so as to provide a minimum of 250 mm of take-up for future adjustment. Provide a locking device for each turnbuckle. The locking device shall consist of vinyl coated cable or an approved equivalent.

.3 All guy hardware including turnbuckles and shackles to be Crosby Brand (Heavy Duty Grade) or approved equivalent.

.6 100% Terminations

Bridge sockets shall be sized to provide a minimum of 1220 mm of adjustment. The sockets shall be installed so as to provide a minimum of 760 mm of take-up for future adjustment. The bridge sockets shall be made of heat treated steel. Contractor is to provide details of other 100% terminations.

.7 Anti-Climb Devices

.1 Contractor to install Owner supplied anti-climb.

.8 Guy Markers

.1 Each guy shall be equipped with yellow vinyl guy markers located at the anchor end of each guy. Install such that markers extend to mark at a point 4 m above the ground.

.2 Guy markers shall be approximately 2 m in length and vandal resistant. Field drill 25 mm holes at 200 mm spacing to render these useless for other purposes.

.3 Contractor shall submit shop drawings for Departmental Representative approval.

.9 Fall Arrest Safety Device.

.1 The Contractor shall supply and install a CSA approved Fall Arrest Rail to meet CSA S37-18 and the latest version of CSA Z259.2.4-15 and CSA Z259.2.5-12. Rail system is to be Cougar type trolley compliant or approved equivalent.

.2 The fall arrest rail shall be free from obstructions for the complete height of the tower.

.3 The fall arrest rail shall be supported at spans not more than 1 m. Any extension beyond the top of the tower must be structurally supported for the entire height.

.4 Proper manufactured stop hardware is to be installed at the top of the fall arrest rail to prevent accidental dislodging of the trolley from the rail.

.5 The fall arrest system shall be supplied complete with two new CSA approved trolleys that will be turned over directly to the Departmental Representative. Trolleys shall be supplied with permanently attached lock safe swivel clips for attachment to front D ring of CSA Approved full body harness.

.6 Cable fall arrest systems are not acceptable.

2.3 WAVEGUIDE BRIDGE

.1 The waveguide bridge shall be supplied and installed as per approved design drawings. Designs must incorporate continuous waveguide bridge ice protection from the tower to the equipment shelter.

.2 This ice protection shall incorporate a peaked roof of solid plate construction located above the standard channel support for the waveguides, cables and conduit. Design must allow easy access to TX lines without removal of bridge hardware.

.3 Transmission lines must be protected by the Waveguide Bridge at all times.

.4 The Waveguide Bridge must be independent of and not directly connected to the tower structure or the building.

.5 The waveguide bridge can be supported on a post located in the center or two sides of the assembly, except the support closest to the building which must consist of two posts located on the outside of the assembly.

.6 The waveguide bridge shall be designed to carry all initial and proposed waveguides, cables and conduits as indicated on the antenna and transmission line schedule.

.7 The waveguide shall be supported on cable hangers connected to a trapeze style support system of stainless steel threaded rod or galvanized bar hangers and two levels of horizontal trapeze angles suitable and elevated to run directly into the waveguide window.

.8 The Contractor shall provide a suitable adjustable plate extension to the bridge to protect the lines between the bridge and the building and the bridge and the tower. This plate must taper to the full width of the waveguide window or waveguide ladder on the tower.

.9 Unistrut or Cantruss sections are not acceptable for use on the waveguide bridge or the tower itself.

Part 3 Execution

3.1 DESIGN

.1 The tower, foundation and guy assembly shall be designed in accordance with CSA S37-18 to support all antennas, attachments, etc as indicated. **Tower Owner supplied**

.2 The tower should have a maximum serviceability response (tilt and/or twist) of less than 2.0 degrees under working loads. Tower to be designed to require no torsion resistors.

.3 Serviceability factor of 1.0 to be used for the design.

.4 Design Ice Load: the tower shall be designed with loading consideration of 50 mm of radial ice on all exposed surfaces, including members, guys and all attachments, and antenna components. 50mm shall be the valued considered as the reference ice thickness, t_i as per CSA S37-18.

.5 Design Wind Load: Use Site Specific Wind Data contained in Appendix D.

.6 The loading imposed on the tower by transmission lines and auxiliary lines – feeder lines, attached to it shall be based on the actual dimensions of the lines as determined from the manufacturer's specifications.

.7 Shielding of the transmission lines by the tower members, other feeders or attachments may be considered. When feeder lines are mounted on the inside of one face of the tower, shielding of the leeward lines may be considered, following the procedures outlined in "User's Guide – NBC 2005 – Structural Commentaries (Part 4 of Division B)" Commentary I, Figure I-28 Poles, rods and wires.

.8 Loading from auxiliary facilities and attachments such as ladders, fall arrest rails, feeder line supports, etc. must be considered in a similar fashion as that of the transmission lines and feeders outlined above.

.9 Design to include a wave guide bridge assembly as required to elevate and protect (from falling Ice etc.) transmission lines from the tower base point to the building transmission line entrance. Wave guide bridge to be Approximately 3m from tower to building. See Appendix.

.10 The foundation designs shall be based on the conditions contained in the Geotechnical Report contained in Appendix E.

.11 The Design Engineer accepting responsibility for the tower foundations shall:

.1 Have approved a minimum of ten (10) towers of similar nature in the previous three (3) years.

.2 Be registered or eligible for registration with the Association of Professional Engineers and Geoscientists of Newfoundland.

.3 Seal all drawings issued that relate to the tower.

3.2 ELECTRICAL ANTENNA, TRANSMISSION LINES AND GROUNDING

.1 The tower structure shall be designed for the antenna systems identified in Appendix B. All antennas are leg mounted to the tower at the azimuths indicated. All specified future antennas, lines and mounts shall be incorporated into the tower design.

.2 Supply and installation of new continuous AVA5-50-E1 Heliax transmission cable, or approved equivalent, from the new antennas to the transmitting equipment in the existing equipment building. All cables to extend into the equipment building by three meters.

.3 All transmission lines shall be new 22mm (7/8″) AVA5-50-E1 Heliax Coaxial Cable or approved equal, with VSWR of 1.13, operating at a frequency of 156 MHz (+/- 5MHz). Written verification of this must be submitted to the Departmental Representative for each line prior to installation. Use of spliced lines is unacceptable.

.4 Transmission line connectors and end terminations (Type N) top and bottom, are to be supplied and installed by the Contractor.

.5 Supply all grounding material to properly ground all TX lines minimally at the top, tower mid-point, bottom of tower and building entrance.

.6 RCMP antennas/lines to be supplied by Departmental Representative and installed by Contractor.

.7 CCG antennas to be supplied and installed by contractor according to the following specifications:

.1 All antenna elevations referenced to bottom of antenna

.2 All antennas to be 1/2 wavelength spacing.

.3 All antennas to have suitably designed ice guard protection designed by Contractor. Supply and installation of ice guard protection not in contract.

.4 Frequency range from 138 MHZ to 174 MHZ

.5 Nominal Gain range from 5.0 dBd to 5.5 dBd (2 dipoles) or 8.0 dBd to 8.5 dBd (4 dipoles).

.6 All antennas to have an offset antenna pattern.

.7 Standard of acceptance: Comprod or approved equal.

.8 Contractor shall provide own testing equipment and perform a full line and antenna system sweep.

.9 Departmental Representative shall provide sweep specifications.

.10 The Contractor shall be responsible for the installation of all systems as per the manufacturers' recommendations. All antenna / tower interface hardware not supplied by the antenna manufacturers shall be the responsibility of the Contractor. It shall be the Contractors responsibility to determine any additional material required to mount the antennas to the tower structure. This shall include all antenna struts, mounts, special attachments, bolts, etc. The Contractor shall liaise with the antenna manufacturers or suppliers to obtain adequate information required to design proper mounting interface components.

.11 The Contractor shall be responsible for the installation of all lines and antenna systems, including line hangers, ground kits, connectors, power dividers, hoisting grips, threaded rod, and other necessary hardware. Installation shall be in accordance with the manufacturers recommendations. Line hangers shall be heavy duty hot dip galvanized or stainless steel and be placed at a maximum distance of 762 mm centre to centre. All transmission lines shall be grounded with approved non-braided, solid copper grounding kits.

.12 The Contractor shall design, supply and install new mounts for all antennas. All antenna mounts, mount hardware and line hangers shall be heavy duty hot dip galvanized or stainless steel. Materials prone to rust or corrosion are not acceptable.

.13 Antenna assembly and installation must be completed in accordance with the manufacturers' instructions and acceptable industry standards. Antennas or antenna components damaged accidentally prior to full acceptance by the Departmental Representative shall be replaced at the Contractors expense. Replacement will be completed so as not to delay project completion. Contractor shall ensure that the antennas do not interfere with the guy wires. Final antenna locations to be approved by Departmental Representative prior to installation.

.14 A hoisting grip shall be installed temporarily and used to facilitate transmission line installation as recommended by the manufacturer of the transmission line. The connection shall be made using a suitable galvanized connector. Connections may be made to secondary members such as transmission line support brackets, redundant horizontals, antenna mount members, or on primary members where special allowance has been made for such a connection.

.15 Ground kits shall be AVA or approved equivalent and constructed of solid copper wire and meet or exceed the requirements of the transmission line manufacturer. Ground assembly is to be installed with provided tapes and methods included in the ground kits. All transmission lines shall be grounded in accordance with manufacturers recommendations but minimally at the antenna attachment elevation, at 60 m intervals (where applicable), at the tower base and at the building TX line entrance. Connect the terminal end of the ground kit conductor to predrilled purpose specific holes in the tower steel or ground bar as is appropriate to the specific installation. The holes shall be located so as not to weaken the structure. The connection surface must be free of paint providing a good metal-to-metal contact.

.16 The connection point on the tower shall be lower than the connection point on the transmission line. The ground line shall run from the lower end of the taped connection. Ground kit lines are to be installed to eliminate any bends or turns in the grounding wire.

3.3 ELECTRICAL BONDING

.1 Special care shall be taken to ensure continuity of required electrical connections and proper bonding of electrical conduits, etc., upon initial assembly and throughout antenna structure life when subjected to salt spray conditions in coastal installation.

3.4 CONNECTIONS

.1 Connections in the shop may be bolted or welded. All site connections shall be bolted.

.2 Make all welded connections in conformance with CSA Standard W59.1. Use only low hydrogen electrodes or processes of equivalent rating. All weld designs shall be clearly indicated on the design drawings.

.3 Make all bolted connections with high strength bolts clearly marked A325 conforming to A.S.T.M. Standard Specification A325. Place a hardened washer in under the bolt element (nut or bolt head) turned in tightening the bolt. Tighten all bolts by the turn of the nut method as specified in CSA Standard S16.

.4 Power wrenches may be used in installing bolts, provided they are of the adjustable type capable of cutting-out at a pre-selected torque value.

.5 After the tower has been complete, check all bolted connections, including those on miscellaneous metal work, and retighten all loose bolts. Exercise care that bolts adequately tightened are not subjected to additional rotation of the turned element. All damaged nuts or bolts to be replaced.

3.5 WORKMANSHIP

.1 General: Workmanship and finish throughout shall be equal to the best modern practice for this class construction. All members shall be in accordance with the drawings and shall be straight and true as per CSA S37-18. All like parts shall be interchangeable. All punched holes must be accurately located so that the structure can be erected with a minimum of “drifting”. The ends of members shall be clipped as required to facilitate assembly. In any bending or reworking of any material, methods employed shall ensure that the physical properties of the material are not impaired.

.2 Marking: Each separate member has already been distinctly identified by a number assigned to that member. Each member has been clearly marked with its member number to facilitate erection and traceability. All like parts have the same number.

.3 Handling of Material: Materials shall be handled and stored on the job site in such a manner that no damage shall be done to the materials of any existing building or structure. Special care shall be taken to ensure that galvanizing, priming, or painting is not damaged during handling and erection of materials. Storage of materials on the site will be the responsibility of the Contractor.

3.6 GALVANIZING

.1 The anchorage system and all axillary steel shall be hot dip galvanized to the requirement of CSA S37-18 and the standards specified therein. Galvanizing applied to structural members is to have a minimum mass of Zinc coating of 610 g/m² (2 oz/ft²) equivalent to a thickness of 87 μm (3.40 mils). Galvanizing applied to bolts, nuts and threaded

fasteners is to have a minimum mass of Zinc coating of 460 g/m² (1.5 oz/ft²) equivalent to a thickness of 65 µm (2.54 mils).

.2 The Contractor shall field paint all steel members of the tower where the galvanized finish has been scrapped or chipped during erection in the field. This shall be done using Zinkrich paint, as supplied by the Zinkrich Company, 42 Broadway, New York, New York, U.S.A. or Galvicon or an approved equal. Steel members that have a slightly damaged finish shall be given three coats of Zinkrich Paint applied according to the manufacturer's printed instructions.

.3 Contractor shall warranty all galvanizing work for a period of not less than three (3) years.

3.7 PAINTING

.1 The Contractor shall be responsible for damage done to the tower's paint during shipping and erection.

3.8 ERECTION

.1 The tower shall be erected in a manner that will not bend, scrape, distort, or injure the component parts of the galvanizing. **Upon award of contract, Contractor is to provide a detailed Erection Plan to include the use of gin poles, winches, cranes and erection equipment.**

.2 The use of iron sledges for hammering or driving any members will not be tolerated. All hammering is to be done with wooden mauls or hammers of plastic, lead or other soft material.

.3 Every failure of the material to join together properly shall be reported to the Departmental Representative.

.4 Upon completion of erection, the tower shall be inspected by the Contractor for member damage. Any damaged or missing items, including nuts, bolts, etc., shall be replaced.

.5 The Contractor shall be responsible to ensure that no members of the tower are over stressed during erection. Any members damaged during erection shall be replaced. The Contractor shall be responsible for any damages done to the work of others, or to adjoining structures and property during erection.

.6 The guy tensions shall be adjusted to within + 15% and –5% of the stipulated design tensions noted in the design drawings and as per the requirements of CSA S37-13. The tension calculations shall consider the ambient temperature at the time of adjustment. Full consideration of anchor location with respect to the tower base must be incorporated into the calculation of correct guy tensions. It shall be the Contractor's responsibility to obtain accurate measurements pertaining to elevation differences between the tower base and guy anchors.

.7 The Contractor shall use a three-transit set up to complete final adjustment of vertical alignment and twist and to ensure it meets the requirements of CSA S37-13 for vertical alignment and twist.

.8 Contractor is responsible for establishing temporary obstruction lighting in accordance with Transport Canada requirements.

3.9 CATHODIC PROTECTION FOR ANCHOR SHAFTS

.1 All anchor shafts are to be protected from deterioration and/or corrosion by a properly installed cathodic protection system designed by the Contractor. Anodes to be zinc or magnesium and to last the performance life of the tower.

END OF SECTION

GROUNDING

Section 260527

Part 1 General

1.1 GENERAL

.1 The Contractor shall be responsible for the design, supply and installation of a complete permanent continuous lightening/tower ground system for the new VHF tower. The design shall consider existing site topography and soil/rock conditions and is subject to approval by the Departmental Representative. Provide sacrificial anodes at each anchor for soil conditions.

.2 Contractor shall locate and connect the tower grounding system to the main existing underground building perimeter grounding grid.

.3 Contractor shall be responsible for installing all new external grounding for tower, wave guide bridging and cable entry.

.4 The main external buried ground grid impedance to true earth shall be less than 5 ohms.

.5 In rock conditions, the Contractor shall propose products and systems which shall attain the desired protection. This must be clearly shown on design drawings. All above ground runs of conductor must be securely attached to the rock with clips at spaces not more than 3 m, and covered with a berm of soil which is in turn covered with stones.

Part 2 Products

2.1 MATERIALS

.1 Rod electrodes: copper clad steel, 19mm diameter by 3m long.

.2 Conductors: bare, stranded copper wire for all below grade applications, tinned copper wire for all above grade applications. Wire size No. 4/0 and 2/0 AWG for ground bus, electrode interconnections, tower structure, waveguide bridge, shelter, ground connections.

.3 Conductors: pvc insulated coloured green, stranded copper wire, size No. 4 AWG for grounding cable sheaths, raceways, conduit.

.4 Ground bus bar: Standard of acceptance UGBKIT-0424 by Commscope or approved equivalent.

.5 Ground kits: All waveguide and coaxial cables connecting to antennas on towers shall be connected using cable manufacturers ground kit and instructions.

.6 Earth enhancing compounds shall be considered for use at sites where the main external buried ground grid impedance to true earth cannot be reduced.

.7 Accessories: non-corroding, necessary for complete grounding system, type, size material as indicated, including:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Thermit welded type conductor connectors.

.4 Bonding jumpers, straps.

.5 Pressure wire connectors.

.8 Wire connectors and terminations: as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install continuous grounding system including, electrodes, conductors, connectors and accessories as indicated and to requirements of local authority having jurisdiction.

.2 All buried ground grid conductors shall be installed at 760 mm below finished grade and shall not be routed in or through cable trough.

.3 All ground rods shall be buried vertically at an angle of not more than 30 degrees from vertical such that the top of the rod is installed at 760 mm below finished grade and be directly connected to the ground grid using exothermic connection.

.4 Install exothermic connections in accordance with manufacturer's instructions.

.5 Protect exposed grounding conductors during and after construction.

.6 Towers:

.1 Each tower leg shall be exothermically bonded to the buried grounding ring around the tower’s base with stranded copper cable, wire size No. 4/0 AWG.

.2 Tower grounding ring shall be placed a minimum 610mm away from tower foundations and connected to the building perimeter ground at two different places.

.7 Tower ground bus bar:

.1 A tinned bus bar shall be fastened to the tower just below the area where transmission lines start their horizontal run across the waveguide bridge.

.2 It shall be fastened securely to the tower providing good electrical connection and shall be bonded exothermically to the tower’s ground ring with an No. 2/0 AWG stranded copper cable.

.8 Waveguide Bridge:

.1 Shall be electrically isolated from the tower and shall be bonded to the perimeter ground using AWG No. 4/0 stranded copper cable that is exothermically connected to each mast.

.2 Each mast shall be bonded using #6 AWG green jacketed bonding jumpers with 2-hole terminal eye connections or exothermic connection.

.9 Lightning rods:

.1 A lightning rod shall be installed such that the rod is at least 2 m higher than the structure and any antenna mounted on top of the structure. The base of the lightning rod shall be connected to the tower.

.10 Main external ground bus bar:

.1 The main external ground bus bar shall be located on the exterior wall directly below the antenna cable entrance to the building.

.11 Connection to Existing Ground Grids:

.1 The buried ground grid shall be connected to each and every other buried ground grid on the same site using a minimum of 4/0 AWG (10.16 mm), 19 strand bare conductors of soft drawn copper.

3.2 CONNECTIONS

.1 Before making a ground system connection, remove all paint, foreign matter or dirt.

3.3 MEASUREMENT OF GROUND RESISTANCE

.1 Perform earth loop test and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction.

.2 The Contractor shall measure the resistance to ground at a point near all anchors, the tower base and the transmission line entrance to the building. A report with readings shall be submitted to the Departmental Representative.

.3 The combined resistance of the conductors and associated connectors shall not exceed 5 ohms.

END OF SECTION

OBSTRUCTION LIGHTING

Section 265536

Part 1 General

1.1 GENERAL

.1 Lighting system shall be supplied by Owner, contractor shall be responsible for installation. Details in Appendix.

.2 All required equipment is to be supplied for installation, as specified, by Contractor.

.3 The complete wiring system and lighting fixtures shall be of a waterproof type using COREFLEX CABLE or an approved equal, rigid fittings, and cast-iron or aluminum, type junction boxes.

Part 2 Products

2.1 LIGHTING SYSTEM

.1 Lighting system supplied by Owner.

2.2 CABLE ATTACHMENT

.1 The Contractor shall adequately secure the cables at distances not exceeding 750mm. Use of wrap-lock/tie wrap device to secure cables is unacceptable.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to obstruction light equipment installation.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 OBSTRUCTION LIGHT SYSTEM INSTALLATION

.1 Install flashing obstruction light system to TCCA Standard 621 and in accordance with manufacturer's written instructions.

3.3 PERMITS AND TEMPORARY LIGHTING

.1 When required by Transport Canada, the tower Contractor shall make arrangements to provide temporary tower lighting until the tower is accepted, and the permanent power supply is available. These arrangements will be subject to the final approval of the Departmental Representative.

3.4 ICE PROTECTION

.1 The Contractor shall install ice protection for all lights and lighting systems as applicable.

3.5 TERMINATION OF WIRE AND HOOK UP

.1 The Contractor shall terminate all wiring inside the building as coordinated with Departmental Representative. The Contractor shall attach conduit to ceilings and walls so as to avoid conflict with existing equipment. All conduit shall be installed in a neat manner

END OF SECTION

EXCAVATION, TRENCHING AND BACKFILLING

Section 312310

Part 1 General

1.1 MEASUREMENT PROCEDURES

.1 Excavated materials will be measured in cubic meters in their original location.

.2 The Contractor shall make his own computations of the amount and nature of all excavations required.

.3 If soil conditions are inconsistent with the reported conditions indicated in the Geotechnical reports or drawings, report this immediately to the Departmental Representative.

1.2 DEFINITIONS

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

.1 Rock: solid material in excess of 1.00 m3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m3bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 The Contractor shall adhere to Municipal, Provincial and Federal Codes where blasting is required. The Contractor to provide a minimum of **ONE-WEEK** notice to Departmental Representative prior to any blasting operation.

.2 The Contractor shall adhere to Municipal, Provincial and Federal requirements relating to the safety of excavations and protection of workmen.

1.4 EXISTING CONDITIONS

.1 Examine Geotechnical report in Appendix E.

.2 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site.

.2 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.4 Prior to beginning excavation Work, notify applicable Departmental Representative and establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.

.5 Maintain and protect from damage electric, telephone and other utilities and structures encountered.

.6 Record location of maintained, re-routed and abandoned underground lines.

.7 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with Departmental Representative, condition survey of existing buildings, fencing, service poles, wires, survey bench marks and monuments which may be affected by Work.

.2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative

Part 2 Products

2.1 MATERIALS

.1 Granular Backfill: Pit run natural or blend sand or gravel consisting of clean hard durable particles free from clay lumps, cementation or organic material, having less than 10% by mass passing a #0.075mm sieve, capable of being compacted to the degree specified herein and meeting the approval of the Departmental Representative.

.2 Common Backfill: selected materials from excavation, suitable to the Departmental Representative for the use intended, free from frozen materials, cinders, ashes, sods, organic materials, refuse and other deleterious substances

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, 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 and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with Section 01 56 00- Temporary Barriers and Enclosures and applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.4 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

.1 Strip topsoil to depths as indicated.

.1 Do not mix topsoil with subsoil.

.2 Stockpile in locations as directed by Departmental Representative.

.1 Stockpile height not to exceed 2 m and should be protected from erosion.

.3 Dispose of unused topsoil as directed by Departmental Representative.

3.5 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 SHORING AND BRACING

.1 Contractor is responsible for ensuring that all excavation work is performed in strict accordance with all Federal, Provincial and Municipal regulations. Provide and set all shoring, bracing, etc. necessary to prevent the caving in of excavating sides. Shoring shall be placed so as to be independent of all foundations and shall remain in place until forms have been and approval given to proceed with backfilling.

3.7 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for approval details of proposed dewatering or heave prevention methods.

.3 Protect open excavations against flooding and damage due to surface run-off.

.4 Dispose of water in accordance with Section 01 35 43- Environmental Procedures and in a manner not detrimental to public and private property, or portion of Work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

3.8 EXCAVATION

.1 Strip top soil from within limits of excavation and stockpile as directed for spreading after backfilling.

.2 Excavate to at least the depth shown on the drawings and to a width sufficient to perform the work properly.

.3 Bottoms of all excavations shall be level, kept free of water and cleaned of all loose material and debris before concrete is poured. All foundations shall rest on undisturbed

earth or rock. **The front face of all anchors, not anchored to rock shall bear against undisturbed soil.**

.4 Should the bearing capacity at levels indicated be found inadequate by the Departmental Representative, the Departmental Representative may order the excavation to be carried down to a proper bearing. Such work shall be classified as additional work and cost thereof shall be determined on the basis of unit price quoted. Bearing levels are to be verified by Departmental Representative prior to proceeding with work.

.5 When excavations are carried down to a greater depth than shown on the drawings without the Departmental Representative's written approval, the foundations shall be carried down to the excavated depth at the Contractor's expense. The method of deepening the foundation must be approved by the Departmental Representative.

3.9 ROCK EXCAVATION

.1 All rock excavations shall conform to alignments, profiles, and cross sections shown on the drawings. Carefully scale down all slopes and remove all rock, boulders and fragments, either on or outside the excavated area, liable to roll or slide down the side slopes of cut sections.

.2 Excavated rock shall be disposed off the site or as directed by the Departmental Representative.

3.10 BLASTING

.1 Blasting operations shall be undertaken only with the explicit written permission of the Departmental Representative. Blasting will only be considered when a machine operated buster cannot be used.

.2 The supply, transportation, storage and use of all explosives and accessory equipment used for blasting shall be in accordance with regulations of the authority having jurisdiction. The Contractor shall be responsible for all necessary precautions and cost to prevent damage to surroundings, including responsibility for arrangements, and all costs involved in temporary removal and replacement of utilities.

3.11 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

- .1 Departmental Representative has inspected and approved installations.
- .2 Inspection, testing, approval, and recording location of underground utilities.
- .3 Removal of concrete formwork.
- .4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.4 Compact each layer to following percentages of corrected maximum dry density in accordance with ASTM D698-78.

- .1 Common Backfill 95%

.2 Granular Backfill 100%

.5 Backfilling around installations:

.1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.2 Place layers simultaneously on both sides of installed Work to equalize loading.

.6 Place backfill so as to prevent the accumulation of water around foundations or anchors.

3.12 RESTORATION

.1 Upon completion of work dispose of any spoils neatly on the site by berming the anchors and the tower base and “feathering-out” excess materials.

.2 Replace top-soil over excavated areas.

.3 Restore areas affected by equipment outside the area of work to the condition which existed prior to commencement of work.

.4 Remove surplus material and debris from the site to an area authorized for such disposition by those authorities having jurisdiction.

END OF SECTION

ROCK ANCHORS

Section 316813

Part 1 General

1.1 DESIGN

.1 The minimum number of rock bolts to be installed at one anchor shall not be less than two. Alternatively single rock bolts in certain applications may be approved by the Departmental Representative provided there is a comprehensive testing program implemented by the Contractor in accordance with the requirements of this section.

Part 2 Products

2.1 ROCK BOLTS (ANCHORS)

.1 Rock bolts shall be Spin-Lock Mechanical Rock Anchor Systems by Williams Form Engineering Corp. or approved equivalent. The shield shall be designed to provide even bearing around the hole and to develop the full ultimate tensile strength of the bolt. The shell type to suit rock conditions indicated in Geotechnical Report. Two nuts shall be supplied and installed to secure the anchor weldment. The second nut shall act as a locking nut and be of adequate quality for that purpose.

2.2 GROUT

.1 Use Grout recommended by Rock Bolt Manufacturer. Grout shall be high early strength expanding type, with expansion of 3% to 4% prior of the gel stage. Grout shall have a minimum compressive strength of 40 MPa.

Part 3 Execution

3.1 HOLES

.1 Drill holes to the diameter and length recommended by the rock bolt manufacturer for the bolt diameter to be used. Take care to ensure diameter is accurate and the hole is straight. Clean the hole before inserting the bolt.

.2 Tap bolt into position taking care not to damage the threaded end. Set expansion shield torqueing bolt to value recommended by the manufacturer.

.3 Testing shall be carried out by the Contractor according to the manufacturer's instructions, and in the presence of the Departmental Representative. Establish a test procedure with the Departmental Representative prior to testing. Note that some bolt installations may, as part of the installation process, require tensioning of the bolt. This may constitute the required load test if approved by the Departmental Representative.

.4 The Contractor shall accurately record torqueing and tension values for each bolt, along with the duration of the test. This information shall be submitted to the Departmental Representative for review.

.5 Any bolt slippage shall be reported to the Departmental Representative immediately and a plan submitted for resolution.

.6 The Contractor shall provide written confirmation of recent calibration of the jacking system from an independent testing firm.

.7 The Contractor shall provide conversion charts issued by the jack manufacturer to convert pressure indicated to pounds of tension force.

3.2 GROUTING

.1 Insert flexible grout tube to the bottom of the drill hole. Pump in grout (mixed in accordance with the manufacturer's instruction), slowly withdrawing the grout tube while maintaining pressure on the grout pump until grout is visible at the surface. Grouting to be conducted in presence of the Departmental Representative. Adequate notice of at least 5 days to be provided for inspection.

3.3 PROTECTION

.1 Thoroughly protect the rock bolts above and below grade (minimum of 600 mm) by hot dip galvanizing to the requirements of CAN/CSA-S37-13 and the standards specified therein. In addition, when the bolt is backfilled and below grade, apply a heavy bituminous, corrosion resistant compound.

.2 Follow manufacturer's instructions with regard to curing and protection prior to any backfilling of the anchor.

END OF SECTION