TECHNICAL SPECIFICATION FOR
Re-location and Installation of a
VHF Tower

Canadian Coast Guard
Maritime and Civil Infrastructure
Prepared by: Jonathan Walsh
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Section 011100

Summary of Work

Part 1 – General

1.1 Description of work

The work covered under this specification consists of a re-location of a 45.72m VHF Tower System located in Pearce Peak to Cuslett, Newfoundland and Labrador. The demolition and removal of an existing 39.6m VHF Tower System at Cuslett is to follow.

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. The specification is for a 30 year performance life existing tower. Work shall include but not be limited to the following:

- Re-location and installation of a 45.72m guyed VHF tower structure from Pearce Peak (Argentia) to Cuslett, Newfoundland and Labrador.
- Tower is already dissembled into 3 sections on ground at site in Pearce Peak.
- Tower to be transported from Pearce Peak and taken to a controlled environment for application of coating system before relocation to Cuslett.
- Removal of existing generator building at Cuslett.
- Removal of old footings to 300mm below grade.
- Supply and installation of guys, guy hardware, Waveguide Bridge, antennas, antenna/tower interface, ground system and ice guards components and all other materials required to meet the terms of this contract as based on Construction Installation Package referenced in Appendix B.
- 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.
- Supply and installation of auxiliary facilities such as ladders, safety rails, and platforms.
- 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.
- Complete installation of Owner supplied beacon lighting system to account for tech cable, connectors; junction boxes to manufactures specifications.
- Contractor will be responsible for arranging all snow clearing requirements.
- The safe dismantling and disposal of the existing tower including antennas and antenna systems, transmission lines, guys and anchor systems and ground system. Salvage items as directed by Departmental Representative.
- Clean up of site following completion of all work.
- Transportation of all materials and equipment to the site.
- All antenna orientation, optimization, testing, and system commissioning. Contractor shall coordinate all work with Departmental Representative and provide report.

1.2 Definitions

"Departmental Representative" means: Fisheries and Oceans Canada, Canadian Coast Guard (CCG)

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

1.3 Existing Site Conditions

1.3.1 The contractor should note that this work is to be performed on an existing site. The site is located next to an existing operational site owned by CCG. Refer to the site survey and location maps appended to this specification for site details and new tower locations.

1.3.2 Before tendering it is recommended that the Contractor familiarize themselves with the remote location, scope of work, site restrictions, short construction season 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.

1.3.3 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 location map.

1.3.4 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.

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

1.3.6 Contractors should note that there are restrictions at this location with regard to:

- the available space
- location of cable trenches
- location of buried power conductors
- location of buildings
- location of overhead power conductors
- access to anchors (guy lanes to be cleared of trees and brush)

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.

1.4 Existing Soil Conditions

1.4.1 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. Contractor is to note borehole data in Appendix E is taken from boreholes at site initially proposed and there is potential for discrepancies based on current location.

1.5 Schedule

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

1.5.2 Design and fabrication to be substantially completed by within 6 weeks of award. Installation to be completed within 6 weeks of award.

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

1.5.4 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.

1.6 Site Operations

1.6.1 Arrange for sufficient space adjacent to project site for conduct of operations storage of material etc. Exercise care so as not to obstruct or damage public or private property in area. Do not interfere with normal day-to-day operations at site. All arrangements made for space and access shall be made by the Contractor. All arrangements for security shall be made by the Contractor.

1.6.2 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.

1.7 Project Meetings

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

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

1.7.3 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.

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

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

1.8 Protection of Materials and Equipment

1.8.1 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.

1.9 Documents Required on Site

1.9.1 Contractor to maintain on site one copy of the following:

- Health and Safety Plan
- First Aid Kit
- Contract drawings and specifications
- Addenda
- Reviewed shop drawings
- Change Orders
- Other modifications to Contract
- Field test reports
- Copy of approved work schedule
- Manufacturers Installation and Applications Instructions
- Contact information for Departmental Representative.
- Other items as requested

1.10 Taxes and Permits

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

END OF SECTION

Section 013300

Submittal Procedures

Part 1 – General

1.1 General

1.1.1 The Contractor shall submit for review design and detail drawings in PDF format to the Departmental Representative. The review period by the Departmental Representative shall be two (2) weeks. 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. 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.

1.1.2 The Contractor, at no additional cost to the Departmental Representative, shall make any changes in the drawings which may be required, consistent with this Specification and shall submit revised copies for review in the manner herein set out. The review does not relieve the Contractor from responsibility for ensuring that his complete work meets all the requirements for the drawings and Specifications contained herein. Items submitted are to be complete, in final form and ready "for construction". Incomplete submissions will be returned. The Contractor shall ensure that the tower design, including guy location, does not interfere with the operation of the antenna systems.

1.1.3 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.

1.1.4 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.

1.2 Mandatory Construction Plan Submittal

1.2.1 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:

a. List of subcontractors proposed for: steel fabrication, galvanizing, painting and tower erection.
b. Project specific safety program
c. Project environment protection plan
d. Detailed demolition plan
e. Tower Erection plan

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

1.3 Mandatory Technical Submission

1.3.1 Copies of all Quality Control and Quality Assurance programs in place relating to, governing and demonstrating the ability to complete the work in question, including but limited to, the tower painting process, steel fabrication process and the tower steel galvanizing process. Details of all material handling procedures are to be included.

1.3.2 Details with regard to the steel supplier and fabrication company and their CWB certification number.

1.3.3 Sealed Drawings which include:

a) 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.

1.3.4 On acceptance of the Tender, the Contractor shall submit for review sealed design calculation report which includes:

- Reference design standard.
- All foundation analysis and calculations.
- Any other information requested by Departmental Representative.

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

1.4 As Built Drawings

1.4.1 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 a full set of drawings (with Tower Engineer's stamp) on CD in AutoCAD format and two (2) copies of the stamped paper versions in binders including **ALL** product data on the lighting system and controller, antennas, Tx lines, etc. Binder to have cover page with the Project Name and Location, Departmental Representatives Name (Canadian Coast Guard), design engineer, Manufacturer, Installer and date of completion. A tower profile photo should also be included.

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

1.4.3 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.

1.4.4 All As-built submissions to be bound in a binder format.

1.5 Inspection Reports

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

1.6 Safety Plan

1.6.1 The Contractor is to submit two (2) copies of their 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.

END OF SECTION

Health and Safety Requirements

Section 013530

Part 1 - General

1.1 Summary

1.1.1 This section describes specific safety requirements to be observed and enforced during the scope of this work.

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

1.1.3 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.

1.2 Construction Safety

1.2.1 Provide all workers, including sub-trades, with adequate and appropriate safety regulations prior to commencement of their duties. Ensure all workers comply with all safety regulations required by Federal and Provincial Regulations, Worker's Compensation Board and municipal statutes. Take all precautions and provide all required protection to ensure the safety of the general public and the workers in accordance with the current edition of the Occupational Health and Safety Act and Regulations applicable for construction projects and all applicable regulations such as but not limited to The Canada Labour Code, The Provincial Workers Compensation Regulations, Health and Welfare Canada Safety Code 6.

1.2.2 In the event of conflict between any provisions of the above authorities the most stringent shall govern.

1.2.3 Provide health and safety protection required by the manufacturer's printed literature and ensure that all workers are trained in the safe use of health and safety equipment and the handling of materials. Ensure that at least one-person remains on site at all times who is properly trained in the first aid aspects required to deal with emergency situations that may arise. The safety person should be trained in the proper use of climbing harnesses and equipment.

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

1.2.5 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.

1.2.6 Post "NO SMOKING" signage where flammable materials are being used. Do not allow use of spark producing equipment during application of flammable

materials. Ensure that at least one site person is trained to deal with emergency situations that may arise due to fire.

1.2.7 Take all required precautions, including those recommended by the manufacturers printed instructions, to protect persons and property, including vehicles from over-spray of materials.

1.2.8 Contractors' Site/Project specific Safety Plan shall incorporate the following;

a) Continuous attachment at all times while on the tower. No unattached climbing will be permitted at any time
b) Use of CSA approved; full body harness, belts, lanyards, trolleys, safety hats, safety boots, safety vest, and other equipment used to complete the job.
c) Only experienced personnel with previous training and demonstrated experience working on similar structures and heights to work on the project.
d) Not allowing personal to use equipment winches for transport of personnel.
e) The ability for any worker to discuss issues that they feel affects workers safety.
f) Tailgate/job assessment forms to be completed daily and made available upon request.
g) **Appropriate fall rescue plans and equipment.**

1.2.9 The Contractor shall prepare a written **Project/site specific Construction 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 subcontractors 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. Regular Site Safety Meetings and daily tailgate/job assessment meetings shall be held and minuted by the Contractor.

1.3 Fire Safety

1.3.1 Comply with the latest requirements of standard for Building Construction Operations FCC, No. 301, (Latest Edition) issued by the Fire Commissioner of Canada.

1.4 Falsework and Scaffolding

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

1.5 Overloading

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

1.6 Signage and Barriers

1.6.1 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.

1.6.2 The Safety Plan must be placed on the Construction Site in a common area visible to all workers and other persons accessing the site. All employees are to be advised of the Safety Plan. The Safety Plan shall also address the means to communicate the intent to all persons.

1.6.3 Submission of a Safety Plan to the Departmental Representative does not relieve the Contractor of any legal obligations for the provision of construction safety as specified by Federal and/or Provincial Safety Acts or Regulations.

1.6.4 Contractor shall ensure compliance with the Safety Plan. The Departmental Representative or authorized representative reserves the right to demand removal of any person(s) not complying. Any person removed shall not be permitted reentry to the site.

1.6.5 Provide Safety Plan immediately upon award of contract. The Safety Plan shall be submitted to the Departmental Representative for review prior to commencement of work. Work shall not be allowed to begin until safety plan has been submitted. Revise Safety Plan as required for changes in work procedures or when directed by Departmental Representative, Safety Officer or authority.

1.7 Hazardous Products

1.7.1 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.

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

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

1.7.4 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.

1.7.5 Where the use of hazardous and toxic products can not be avoided

.1 Advise Departmental Representative before hand 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.

END OF SECTION

Environmental Protection

Section 013543

Part 1 – General

1.1 Summary

1.1.1 This section describes environmental protection requirements to be observed and enforced during the progress of the Work.

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

1.1.3 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.

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

Part 2 – Products

2.1 Avoid the use of hazardous products. Use environmentally friendly products where practical.

Part 3 - Execution

3.1 Fires

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

3.2 Disposal of Waste

3.2.1 Do not bury rubbish or waste materials on site.

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

3.3 Pollution Control

3.3.1 Control emissions from equipment and plant to governing authorities' emission control requirements.

3.3.2 Prevent dust and debris from demolition operations and other extraneous materials from contaminating air beyond application area by providing temporary enclosures.

3.3.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

3.3.4 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.

3.3.5 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 m of a water body.

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

3.3.7 Work should be scheduled 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 during the construction phase.

3.3.8 Construction waste material such as pre-treated wood must be disposed of in an appropriate manner and shall not be incinerated onsite. Construction waste material such as aluminum, steel, iron, etc should be recycled through a metal recycler.

3.3.9 All exposed soil should be minimized by limiting the area that is exposed at any one time and by limiting the time that any one area is exposed. Stockpiled soil must be covered and/or dyked to prevent erosion or silt runoff from leaving the site.

3.3.10 All spills or leaks should be promptly contained, cleaned up and reported to the CCG - Traffic Center at 709-772-2083 and notification given to the Project Officer handling the job.

3.3.11 Any and all stipulations of federal, provincial, or municipal authorities must be strictly followed.

3.3.12 During the constructional and operational phases of the project, limit or prohibit any activities on any of the surrounding wetland/bog (i.e. Heavy Equipment).

3.3.13 During Constructional phase of the project, target areas for excavation should be limited to areas that are not considered a wetland/bog.

3.4 Drainage

3.4.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water at all times.

3.4.2 Do not pump water suspected of containing suspended materials into waterways, sewer or drainage systems.

END OF SECTION

Quality Control

Section 014500

Part 1 - General

1.1 Third Party Inspections

1.1.1 The Contractor is to insure that all new guy lug welds are tested by a third party NDT inspector before erection of the tower. Testing is to be 100% Magnetic Particle, testing reports to be submitted for review and approval prior to erection.

1.1.2 The Contractor shall have the tower painting inspected by a qualified NACE inspector prior to erection of the tower. Testing reports to be submitted for review and approval prior to erection.

1.1.3 The Contractor shall have a minimum of 3 concrete test cylinders taken by a qualified inspector at the tower base and all 3 anchors. Testing reports to be submitted for review and approval prior to erection.

1.2 Foundation Inspection

1.2.1 The foundation placement is subject to inspection during the following project stages:

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

1.2.2 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. The Departmental Representative 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 by the Departmental Representative 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.

1.3 Completion Inspection

1.3.1 A completion inspection is to be carried out by the Departmental Representative. 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 01 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 by the Departmental Representative. The Contractor shall have sufficient crew on site during the inspection to correct deficiencies noted by the Departmental Representative. Contractor to advise Departmental Representative ONE WEEK in advance to completion of the tower to permit scheduling of this inspection.

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

1.3.3 All work must be completed and satisfactory prior to the Departmental Representative'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.**

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

1.3.5 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.

1.3.6 An 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.

1.4 Post Erection Inspection

1.4.1 Not less than six (6) months and not more than one (1) year after the completion inspection, the Departmental Representative 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- 01 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.

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

1.4.3 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.

1.4.4 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.

1.5 Conformance Letter

1.5.1 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.

Part 2 – Products (N/A)

Part 3 – Execution (N/A)

END OF SECTION

Temporary Facilities

Section 015100

Part 1 – General (N/A)

Part 2 – Products (N/A)

Part 3 – Execution

3.1 Access

3.1.1 Access to the tower site is available as described in section 011100. When appropriate, maintain this access during the construction period. Contractor is responsible for providing their own site office and accommodations.

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

3.1.3 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.

3.1.4 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.

3.2 Sanitary Facilities

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

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

3.3 Power

3.3.1 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.

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

3.4 Drainage

3.4.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

3.4.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

3.4.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements and any other applicable Federal or provincial requirements.

END OF SECTION

Common Product Requirements

Section 016100

Part 1 - General

1.1 Summary

1.1.1 This Section describes requirements to be observed during the progress of the Work for materials and equipment.

1.2 Submittals

1.2.1 Within five working days of written request by the Departmental Representative, submit following information for any and all materials and products proposed for use:

(a) name and address of the manufacturer and suppliers.
(b) trade name, model and catalogue number.
(c) performance, descriptive and test data.
(d) manufacturer's installation or application instructions.
(e) evidence of arrangements to procure.
(f) conformance to applicable standards.

1.3 Supply and Use

1.3.1 Use new material and equipment unless otherwise specified.

1.3.2 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.

1.3.3 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

1.4 Manufacturer's Instructions

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

1.4.2 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.

1.5 Conformance

1.5.1 When material or equipment is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report stating that materials or equipment meets or exceeds specified requirements. Trace-ability of all materials is to be performed.

1.6 Substitution

1.6.1 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.

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

1.6.3 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.

1.6.4 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.

Part 2 – Products (N/A)

Part 3 – Execution (N/A)

END OF SECTION

Clean Up

Section 017411

Part 1 - General

1.1 Clean Up

1.1.1 Upon completion of the work, or sooner if ordered by the Departmental Representative, remove all temporary structures and clear away all rubbish, equipment, surplus and waste material remaining on or about the site, and attributable to this Contact, and place the site in a neat and tidy condition.

1.1.2 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.

1.1.3 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

1.1.1 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.

1.1.2 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.

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

Part 2 – Products (N/A)

Part 3 – Execution

3.1 General

3.1.1 Tower may not be felled.

3.1.2 Coast guard shall disconnect cabling as necessary prior to Contractor commencing demolition activities.

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

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

3.2 Demolition

3.2.1 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.

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

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

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

3.2.5 Existing anchors are to be cut off at grade a minimum of 300mm below grade.

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

3.2.7 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 Coast Guard.

3.3 Salvage

3.3.1 Salvage the following:

- All antennas
- All obstruction lighting
- Tower
- Recycling of all items.

3.4 Disposal

3.4.1 Dispose of:

1) Old cables.
2) All guys and guy hardware.
3) Transmission lines
4) Existing Wave-guide Bridge.
5) Foundations.

3.4.2 Dispose of all materials in accordance with applicable provincial regulations. Contractor is responsible for transportation of demolished materials from site to appropriate waste handling facility. See Appendix G

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

END OF SECTION

Concrete Work

Section 033000

Part 1 - General

1.1 Reference Standards

1.1.1 The design and installation of concrete shall be in accordance with the latest version of the referenced standards and codes.

a) Design, install and reinforce foundations and anchors to CAN/CSA 3-A23.1-94 except where specified otherwise.

b) Perform formwork and cast-in-place concrete work to CAN/CSA 3-A23.1-94, except where specified otherwise.

c) Perform reinforcing work to CAN/CSA 3-A23.1-94 and welding of reinforcing to CSA W186-1970, except where specified otherwise.

d) Cure and protect concrete work to CAN/CSA -A23.1-94, except where specified otherwise.

1.2 Test Reports

a) 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.

b) Confirmation of air content and slump shall be obtained for each load of concrete delivered to the project. The Contractor shall be responsible for the proper completion of the concrete. All costs associated with the testing of concrete supplied to the project shall be the responsibility of the Departmental Representative.

c) 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 all costs, including testing and additional Engineering inspections associated with concrete removal and replacement.

d) The Contractor shall notify the Departmental Representative at least **ONE WEEK** prior to placing concrete. Notification shall be in writing with a copy to the Departmental Representative.

e) Contractor to arrange and pay for all testing. Testing reports to be submitted for review and approval prior to erection.

Part 2 – Products

2.1 Materials

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

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

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

d) Water, fine aggregates, normal weight coarse aggregates: CSA A23.

e) Chemical admixtures: to CSA A266.2-1973.

f) 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 Concrete Mixes

a) Except where indicated or specified otherwise use concrete mix designed to produce minimum compressive cylinder strength at 28 days of 30 Mpa for tower foundation and 25 Mpa for anchors.

b) Slump, unless noted otherwise, shall be 75mm +/-25mm.

c) All concrete exposed to exterior temperatures and weather in its final use shall contain an air-entraining agent. Total air content to be as specified in CSA Standard A23, for the particular size of aggregate being used. The air-entraining agent shall be compatible with the water reducing agent.

d) The maximum size of coarse aggregate shall be 40mm.

e) 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 Workmanship

3.1.1 Place all anchors against an undisturbed front face.

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

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

3.2 Formwork

3.2.1 Design all formwork in accordance with CSA Standard A23.

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

3.2.3 Provide a 20mm chamfer on all exposed corners.

3.2.4 Take all precautions necessary to maintain the safety of the structure before and after forms are removed.

3.2.5 Take care that the concrete is not chipped or cracked while removing the forms. Pedestal forms to remain in place a minimum of 48 hours. **All formwork is to be completely removed.**

3.3 Reinforcement

3.3.1 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. Fabricate, detail and install all reinforcing steel as per Reinforcing Institute of Canada "Manual of Standard Practice" latest edition.

3.3.2 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.

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

3.4 Joints

3.4.1 Construct all joints as detailed on the drawings.

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

3.5 Grouting of Base Plates

3.5.1 Use In-Pact pre-blended non-shrink dry pack grout as manufactured by C.C. Chemicals Ltd. or approved equal. All grout should be installed according to the manufacturer's instructions.

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

3.6 Curing and Protection of Concrete

3.6.1 Provide effective means of maintaining the temperature of concrete in place at a minimum of 10° C and a maximum of 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.

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

3.6.3 The use of calcium chloride to accelerate curing is prohibited.

3.7 Placement of Concrete

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

END OF SECTION

Steel Towers

Section 133613

Part 1 - General

1.1 General

1.1.1 Work in this section relates to the design, supply and installation of the new guyed structure.

1.1.2 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 Lightening 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

2.1.1 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 S37-13.

2.1.2 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 Representive.

2.1.3 Hollow sections will not be permitted on primary or secondary structural members which include tower legs, horizontals and diagonals.

2.1.4 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

2.2.1 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.

2.2.2 Ladder – The tower shall be equipped with a climbing ladder (outside climb preferred) complete with a CSA approved fall arrest rail centered in the ladder. Fall arrest rail shall be a Trylon Cougar model to match CCG current standars. The ladder shall be a separate assembly bolted to the tower and shall conform to the latest version of CSA S37-13. Provide an unobstructed climbing path and maintain the required climbing radius as per CSA S37-13.

2.2.3 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.

2.2.4 Ice Protection

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

- Three U-Bolt clips are to be spaced 300 mm apart, directly above the grounding connection and guy markers on each guy.
- All obstruction lights shall be protected by ice shields if applicable.

2.2.5 Turnbuckles and Shackles

- 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 S37-13. The minimum turnbuckle length shall be 457 mm. Provide full articulation at anchor ends of each turnbuckle by means of shackles.
- 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.
- All guy hardware including turnbuckles and shackles to be Crosby Brand (Heavy Duty Grade) or approved equivalent.

2.2.6 100% 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.

2.2.7 Anti-climb Devices

- The tower is to be provided with a locked, Anti-climb device approved by the Departmental Representative. The Anti-climb should incorporate a framed, heavy gauge expanded wire mesh cage bolted flush to the tower face using round headed hardware that cannot be used as a step or hand hold. The panel should be approximately 2.5 m high with the lower edge positioned approximately 3 m above grade. Access should be prevented from both outside and inside the tower. Contractor is to submit drawings of the anti-climb system including specification sheets on the wire mesh and gauge thickness for approval by the Departmental Representative.
- The anti-climb shall be hinged on two faces, the climbing face and the transmission line face. Operable panels shall been framed, hinged on one vertical side, with a combined latching mechanism with a lock on the opposite vertical edge. A locking mechanism requiring removable hardware such as long steel rods to open access panels is not acceptable.
- The trap door in the horizontal anti-climb should easily open up to allow safe access to the tower.
- Barbed wire will not be permitted as part of the anti-climb.

2.2.8 Guy Markers

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

2.2.9 Fall Arrest Safety Device

- The Contractor shall design, supply and install a CSA approved Fall Arrest Rail to meet CSA S37-13 and the latest version of CSA Z259.2.4-15 and CSA Z259.2.5-12. Rail system is to be Trylon type trolley compliant or approved equivalent.
- The fall arrest rail shall be free from obstructions for the complete height of the tower.
- 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.
- 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.
- 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.
- Cable fall arrest systems are not acceptable.

2.3 Waveguide Bridge

2.3.1 The waveguide bridges 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.

2.3.2 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.

2.3.3 Transmission lines must be protected by the waveguide bridge at all times.

2.3.4 The waveguide bridge must be independent of and not directly connected to the tower structure or the building.

2.3.5 The waveguide bridge can be supported on a post located in the centre 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.

2.3.6 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.

2.3.7 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.

2.3.8 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.

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

Part 3 - Execution

3.1 Design – **(Tower Supplied, Foundations Only by Contractor)**

3.1.1 The tower shall be designed in accordance with CSA S37-13 to support all antennas, attachments, etc as indicated.

3.1.2 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.

3.1.3 The towers guy assembly and foundation shall be designed in accordance with CSA S37-13 to support all antennas, attachments, etc as indicated.

3.1.4 Design Ice Load: The tower shall be designed with loading consideration of 70 mm of radial ice on all exposed surfaces, including members, guys and all attachments, and antenna components. The density of the ice shall be taken as 900 kg/m^3.

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

3.1.6 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.

3.1.7 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.

3.1.8 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.

3.1.9 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.

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

3.1.11 The Design Engineer accepting responsibility for the tower foundations shall

a. Have approved a minimum of ten (10) towers of similar nature in the previous three (3) years.
b. Be registered or eligible for registration with the Association of Professional Engineers and Geoscientists of Newfoundland.
c. Seal all drawings issued that relate to the tower.

3.2 Connections

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

3.2.2 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.

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.3 Workmanship

3.3.1 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 S37-13. 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.

3.3.2 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.

3.3.3 Punching: Punching shall be done by methods designed to ensure accuracy. The center of any hole shall, in no case, be displayed more than1.5mm from its position shown on the drawings. Plugging or welding mis-punched holes will not be allowed. Punches and dyes shall be sharp and true and all punch holes shall be round, true to size, and free from ragged edges and burrs. Where applicable, punching performed on bent members, shall be done after bending to avoid distortion of holes.

3.3.4 Welding: All welding shall be performed in accordance with CSA Standard W59 latest revision and shall be undertaken by a fabricator fully approved by the Canadian Welding Bureau to the requirements to CSA Standard W47, latest revision. Provide copy of CWB Certification to Departmental Representative.

3.3.5 Handling of Material: Materials shall be handled and stored in the plant and 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.

3.4 Galvanizing

3.4.1 The anchorage system and all a shall be hot dip galvanized to the requirement of CSA S37-13 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).

3.4.2 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.

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

3.5 Painting

3.5.1 The tower shall be painted by a qualified painting facility subject to audit and approval by the Departmental Representative to match existing colors of the tower. All anchor shaft below assemblies to be coated with a heavy bituminous compound.

3.5.2 All surfaces of the tower are to be painted with exception of an area of the leg splice plates connection mating surfaces, thus to ensure a good electrical connection for grounding purposes.

Care shall be taken to ensure galvanized members are kept clean and free of all oils and contaminates during material handling process.

Surface Preparation – Galvanized steel must be cleaned prior to blasting in accordance with SSPC-SP-1 – "Solvent Cleaning"

Contractor to advise CCG if the coating system will be applied onsite or within shop. Either option will have to meet the coating manufacturing requirements for application.

3.5.3 **Light Sweep blast all surfaces** in accordance with SSPC-SP-7 to remove any chromate treatment, or poorly adhered zinc salts that may be present to increase mechanical bonding through increased roughness. Care should be taken to remove as little zinc as possible while maintaining desired roughness. After sweep blasting, the coating system should be applied ideally the same day and a max of one day.

SPECIFICATION FOR ABRASIVE SWEEP-BLASTING

- Blast pressure - 300kPa maximum.
- Media grade 0.2 to 0.8 mm
- Media type(<5 mhos hardness) – clean silica and slags, alumina, limestone.
- Angle of blasting to surface 30-60°
- Distance from surface 300-600mm
- Nozzle type minimum – 10mm venturi type.
- Grit should not be recycled.

Coating System to be water based Acrylic (no Alkyds are acceptable)

3.5.4 To be applied as per manufacturers specifications:
Primer: Aqualux 523-613 @ 2.5 – 3.5 mils dft (or approved equivalent)

Finish: Aqualux 522-121white & 522-126 Orange @ 2.5 – 3.5 mils dft (or approved equivalent)

3.5.5 All paints must meet ASTM performance requirements for abrasion resistance, hardness, fading, flexibility and salt-spray resistance. Paint products must not contain Lead (pb) in their composition.

3.5.6 All paint shall be applied in shop conditions as per manufacturers instructions, evenly spread and free from all marks, stains, defects and flaws. It is contractors responsibility to transport the tower to the shop from Pearce Peak and then onward to Cuslett. No painting shall be done when the temperature is lower than 10º C and humidity's above 50%. No painting shall be done in damp weather. No painting shall be done when the tower metal is hot enough to cause paint blister and produce a porous coating. No coat of paint shall be applied until the previous coat is thoroughly dry as per manufactures recommendations. Where painting or priming is done in the shop, any areas damaged during transit or erection shall be cleaned and touched up with new Zinc rich primers and/or paint as required.

3.5.7 Contractor shall warrant all painted items for three (3) years for 90 % coverage. Any damage to the paint from normal environmental conditions prevalent at the site shall be repaired by the Contractor at no cost to the Departmental Representative in a manner approved by the Departmental Representative.

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

3.6 Erection

3.6.1 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.**

3.6.2 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.

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

3.6.4 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.

3.6.5 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.

3.6.6 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.

3.6.7 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.

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

3.7 Cathodic Protection of Anchor Shafts

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.

3.8 Electrical Antenna, Transmission Lines and Grounding

3.8.1 Supply and installations of all antennas

3.8.2 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. Terminate into N type female connector both ends. Contractor is responsible for all testing, and reporting for the lines and antennas. 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.

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

3.8.4 Antenna Specifications

- RCMP antennas to be supplied by owner and installed by contractor.
- CCG antennas to be supplied and installed by contractor according to the following specifications below.
    - All antenna elevations referenced to bottom of antenna
    - All antennas to be 1/2 wavelength spacing.
    - All antennas to have suitably designed ice guard protection designed by Contractor.

- Frequency range from 138 MHZ to 174 MHZ
- Nominal Gain range from 5.0 dBd to 5.5 dBd (2 dipoles) or 8.0 dBd to 8.5 dBd (4 dipoles).
- All antennas to have an offset antenna pattern.
- Standard of acceptance: Comprod or approved equal.

3.8.5 Contractor is responsible for a full line and antenna system sweep.

3.8.6 Contractor shall provide own testing equipment for sweep test.

3.8.7 CCG shall provide on site Technician to provide sweep specifications.

3.8.8 The tower structure shall be designed for the antenna systems contained in Appendix G. All antennas are leg mount. All specified future antennas, lines and mounts shall be incorporated into the tower design.

3.8.9 All transmission lines shall be new 22mm (7/8") AVA5-50-E1 Heliax Coaxial Cable or approved equal, with VSWR of 1.13, operating in the frequency of 156 MHz range. All lines shall be supplied complete with connectors, hoisting grips, hangers, ground kits and other necessary hardware.

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

3.8.11 The Contractor shall supply and install all new transmission lines as noted above. All lines will extend into the building three meters.

3.8.12 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 tower 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.

3.8.13 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.

3.8.14 The antenna elevations are referenced from ground level to the bottom of

the antenna. Deviations from these centers of radiation greater than 0.5 m must be reported to the Departmental Representative.

3.8.15 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.

3.8.16 A hoisting grip shall be installed 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.

3.8.17 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.

3.8.18 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.

3.9 Electrical Bonding

3.9.1 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.

END OF SECTION

Grounding

Section 260527

Part 1 - General

1.1 General

1.1.1 The Contractor shall be responsible for the design, supply and installation of a complete permanent continuous grounding system for the new VHF tower system. The design shall consider existing site topography and soil/rock conditions and is subject to approval by the Departmental Representative. All rods shall be "Copperclad" or approved equal, 19 mm diameter x 3000 mm long driven vertically. Provide sacrificial anodes at each anchor for soil conditions.

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

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

1.1.4 Main External Buried Ground Grid

` The main external buried ground grid impedance to true earth shall be less than 10 ohms.

1.1.5 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 Equipment Specifications

The following sub-sections specify the equipment to be installed to meet the requirements of this standard.

2.1.1 Ground and Connecting Conductors:

- Use bare copper wire for all below grade applications tinned copper for all above grade applications.
- The main external buried ground grid shall consist of a minimum of 2/0 AWG, 19 strand bare conductors of soft drawn copper.
- Connections from the base of the towers to the main external buried ground grid shall be a minimum of 2/0 AWG, 19 strand bare conductors of soft drawn copper.
- Connections from buildings, equipment enclosures, shelters and storage tanks to the main buried ground grid shall be a minimum of 1/0 AWG (8.25 mm), multi-stranded bare conductors of soft drawn copper.

- The connection from the waveguide ground bus bar to the main external buried ground grid shall be a minimum of 2/0 AWG multi-stranded conductors of soft drawn copper.
- The connection from the main interior ground bus bar to the main external buried ground grid shall be a minimum of 2/0 AWG multi-stranded conductors of soft drawn copper.
- Connections from the main interior ground bus bar to secondary bus bars and equipment cabinets shall be a minimum of 2/0 AWG multi-stranded conductors of soft drawn copper.
- The combined resistance of the conductors and associated connectors shall not exceed 0.5 ohms.

2.1.1 Ground Rods: Ground rods shall be copper-coated steel rods measuring 19 mm in diameter and 3 m in length.

2.1.2 Ground Bus Bars:

- Ground bus bars shall be a minimum of 6.4 mm (1/4 in) thick, consisting of soft copper with sets of two non-threaded holes per connection. These holes shall have a diameter of 9.53 mm (3/8 in) and shall be spaced 25.4 mm (1 in) apart. The bus bar length, bus bar width and total number of connections shall be determined by the quantity of ground connections required for the specific site.
- Bus bars shall be installed with one ground conductor attached directly to the bus bar with a thermit weld commonly referred to as a pigtail.
- All ground bus bars shall be mounted on fiberglass insulators rated at 2700 volts (indoor continuous rating) which shall be mounted on steel stand-off mounting brackets.

2.1.3 Thermit Connectors: All thermit connectors shall be of the exothermic type requiring a mold unless otherwise noted on the drawings.

2.1.4 Compression Connectors:

- Tower ground bus bar
- All compression connectors specified in this standard shall be of the type requiring a linesman’s type Y35 hand operated hydraulic compression tool.
- Low-force compression connectors as may be acceptable for the interconnections within an equipment cabinet shall not be covered by this standard.
- A compression connection shall be installed as per the manufacturer’s instructions and shall not be used to connect to more than one conductor per compression operation unless specified by the manufacturer.
- External ground bus bar.

2.1.5 Bolted Connectors

- The use of bolted connectors shall not normally be acceptable for the connections covered by this standard.

- A notable exception shall be where a bolted connector forms an integral part of a compression connector. For example, compression connectors used to connect equipment cabinet ground conductors to flat bus bars incorporate an integral bolted connector.

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

2.1.7 Additions to the Standard Buried Grid

- The addition of counterpoises or earth enhancing compounds shall be considered for those sites where the ground impedance cannot be achieved by other means. All such additions shall be approved by the design engineer prior to construction.

- Counterpoises shall consist of buried conductors installed radially outward from the site to a maximum length of 30 m and a minimum burial depth of 1.5 m.

2.1.8 Buried Ground Grid Conductor: All buried ground grid conductors shall be installed at 400 mm below finished grade and shall not be routed in or through cable trough. If this depth is not practical, consideration should be given to encasing the ground grid conductors in concrete.

2.1.9 Buried Ground Connectors

- All buried ground connectors shall be of the thermit type and shall be installed at 400 mm below finished grade.

- Buried ground connectors shall not be incased in concrete unless required as part of a building foundation or if the depth requirement cannot be achieved.

2.1.10 Connecting to Non-C.C.G. Ground Grids: The main external C.C.G. 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.

2.1.11 Lightning Rods

- 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.

- A ground conductor shall be connected to the lightning rod using a thermit connector and to the tower at a minimum spacing of 3 m using bolted connectors. This conductor shall be connected directly to the main external buried ground grid using a thermit connector.

2.1.12 Grounding of Towers

- Towers shall be connected to the buried ground grid at each corner of the tower from the lowest point on the tower above any mechanical tower hinge.

2.1.13 Ground Conductor Installation Details

- All ground conductors shall be installed to avoid sharp bends, excess loops, and shall be routed to minimize the distance to ground.

- Since lightning surges are composed of a wide spectrum of frequencies, copper braid should be considered for applications requiring short connections to irregular surfaces and because of its superior high frequency characteristics. Copper braid should also be considered for use to connect ground across mechanical hinges and movable joints.

2.1.14 Waveguide Grounding

- All waveguide and coaxial cables connecting to antennas on towers shall be connected to the tower and any external horizontal support, such as a waveguide bridge, using the waveguide or cable manufacturer's ground kit and instructions. These connections shall be installed at the top of the tower, the bottom of the tower and at every 90o bend, with a minimum spacing of 60 m or the manufacturer's specification, whichever is less.

- Hanger kits shall not be used as a substitute for grounding kits.

- All waveguide and coaxial cables entering a C.C.G. facility shall also be connected to an external ground immediately before entering the building.

2.1.15 Triax Cable Grounding: The outer and inner shields of triax cables, used for power line carrier (PLC), entering a C.C.G. facility shall not be connected to an external ground immediately before entering the building. The outer and inner shields shall both be grounded at either the entrance to a screen room if used, or the PLC cabinet if a screen room is not used. If a screen room is used, the triax cable shall be terminated at the screen room wall and coaxial cable shall be used internal

to the screen room. In either case, the outer shield for triax cables shall only be grounded at one place as detailed above. This assumes that lightning protection is provided in both the CVT and LMU box and that the triax is routed entirely underground.

2.1.16 Main External Ground Bus Bar

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

- It is expected that lightning surges shall be more likely to enter a building through a cable from a tower than from a power distribution line. The objective of the above is to provide the shortest route to ground for any such surge using a combination of shielding and surge arrestors at the building point of entry.

2.1.17 Waveguide Ground Bus Bar

- A waveguide ground bus bar shall be located just below the waveguide bridge on the outside of the building. A dedicated ground shall connect this bus bar to the main external buried ground grid. All connections to this bus bar shall be routed external to the building. There shall be no direct connection between this bus bar and the main ground bus bar.

- This bus bar is required to accommodate standard waveguide grounding kits which do not allow a direct thermit connection to the main external buried ground grid. If waveguide grounding kits that allow direct thermit connections become available, these should be considered for use rather than using a bus bar.

Part 3 - Execution

3.1 Standards of Acceptance

3.1.1 Ground Rods and Lightning Rods:
- C.L.M. DN6CC10
- L.C.A. 7510
- Slater 9450

3.1.2 Thermit Connectors:
- Cadwell connectors manufactured by ERICO Products Inc.
- Compression Connectors:Burndy Hyground Compression System

3.2 Ground Rods

3.2.1 All ground rods shall be buried vertically at an angle of not more than 30o from vertical such that the top of the rod is installed at 400 mm below finished grade.

3.2.2 All ground rods shall be directly connected to the basic ground grid using thermit connectors.

3.2.3 Ground rods shall not be incased in concrete unless required as part of a building foundation or if the depth requirement cannot be achieved.

3.2.4 The minimum number and spacing of ground rods shall be site specific such as to reduce the ground grid impedance to that specified in section 5.2.

3.2.5 Ground rods which cannot be driven vertically shall be placed in a 76 mm diameter drilled hole, filled with a Bentonite and water mixture. The procedure for placing the ground rod in Bentonite is as follows:

1. Drill 76 mm diameter hole in rock, 3 m deep.
2. Pour water 1/3 height of the hole.
3. Insert ground rod.
4. Add Bentonite powder in hole, alternating with water.

3.3 Guy Grounding

3.3.1 The tower contractor will connect tower guys to the grounding systems as follows:

(a) to the tower-using Burndy Versatail or exothermic welding (Cadweld)

(b) to the guy wires – using Burndy KVSU or approved equal connectors, such that adverse reactions of different materials will not occur.

(c) to the ground ring – by means of exothermic welding (Cadweld).

(d) wire to wire connections underground – using exothermic welding (Cadweld).

(e) All connections shall be made according to manufacturer's directions. Provide Burndy Pentrox E compound on all connections.

3.4 Connections

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

3.5 Measurement of Ground Resistance

3.5.1 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.

END OF SECTION

Obstruction Lighting

Section 265536

Part 1 - General

1.1 General

Lighting system shall be supplied by owner, contactor shall be responsible for installation only. Details in Appendix

1.2

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

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 Products

2.1.1 Lighting system supplied by owner.

2.2 Cable Attachment

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

2.3 Shop Drawings

2.3.1 N/A.

Part 3 – Execution

3.1 Permits and Temporary Lighting

3.1.1 The Contractor shall obtain an electrical installation permit from the appropriate agency and submit to the Departmental Representative evidence that the lighting installation has been inspected and approved by the said agency.

3.1.2 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.

3.2 Ice Protection

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

3.3 Termination of Wire and Hook Up

3.3.1 The Contractor shall terminate all wiring inside the building, in the existing electrical panel. 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 and Backfill

Section 312310

Part 1 - General

1.1 Definitions

1.1.1 Excavation Classes: Only two classes will be recognized, rock excavation and common excavation.

1.1.2 Rock excavation is defined as excavation of materials from solid masses of igneous, sedimentary or metamorphic rock, which, prior to its removal, was integral with its partner mass, and boulders or rock fragments having individual volume in excess of 1 cubic metre.

1.1.3 Common excavation is defined as excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy equipment.

1.2 Requirements of Regulatory Agencies

1.2.1 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.

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

1.3 Measurement

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

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

1.4 Existing Conditions

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

Part 2 - Products

2.1 Materials

2.1.1 Backfill Material:

(a) 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.

(b) 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 Shoring and Bracing

3.1.1 Contractor is responsible for ensuring that all excavation work is performed in strict accordance with all Federal, Provincial and Municpal 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.

3.2 Pumping and Drainage

3.2.1 Provide all pumping and drainage required to control ground and surface water during excavation and construction of sub grade work.

3.3 Excavation

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

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

3.3.3 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.**

3.3.4 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.

3.3.5 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.

3.4 Rock Excavation

3.4.1 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.

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

3.5 Blasting

3.5.1 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.

3.5.2 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.

3.6 Backfilling

3.6.1 Do not proceed with backfilling operations until the Departmental Representative has inspected and approved work in place. Provide **48 hours** notice to the Departmental Representative.

3.6.2 Backfill spaces excavated and not occupied by parts of substructure or other permanent works with specified material placed up to the surface or surrounding ground.

3.6.3 Place backfill materials in uniform layers not exceeding 200mm loose thickness and simultaneously on sides of structure so that loading is equalized.

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

a. Common Backfill 95%
b. Granular Backfill 100%

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

3.7 Restoration

3.7.1 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.

3.7.2 Replace top-soil over excavated areas.

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

3.7.4 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 Description

1.1.1 This section covers the design and installation of anchors to rock for transfer of shear and tension foundation loads.

1.2 Design

1.1.2 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)

2.1.1 Rock bolts shall be Williams Rock Bolts with expanding shield 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

2.2.1 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

3.1.1 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.

3.2 Bolt Placement

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

3.3 Testing

3.3.1 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.

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

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

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

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

3.4 Grouting

3.4.1 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.

3.5 Protection

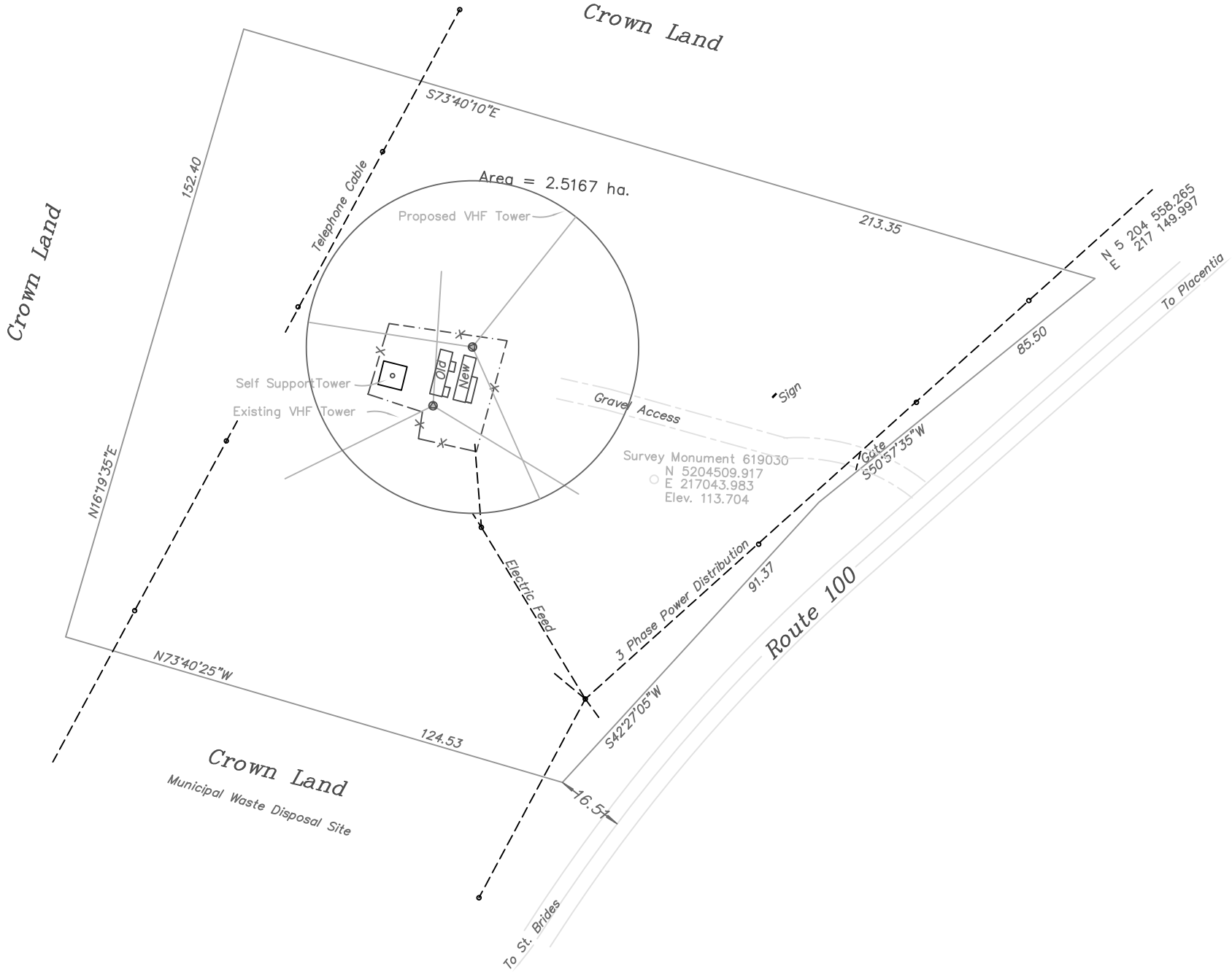
3.5.1 Thoroughly protect the rock bolts above and below grade (minimum of 600 mm) by hot dip galvanizing to the requirements of CAN/CSA-S37-13 and the standards specified therein. In addition, when the bolt is backfilled and below grade, apply a heavy bituminous, corrosion resistant compound.

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

END OF SECTION

Appendix A

Proposed Tower Layout


Crown Land
Crown Land
Crown Land
Municipal Waste Disposal Site
S73°40'10"E
213.35
152.40
N16°19'35"E
N73°40'25"W
124.53
16.5±
S42°27'05"W
91.37
85.50
S50°37'35"W
Area = 2.5167 ha.
Proposed VHF Tower
Telephone Cable
Self Support Tower
Existing VHF Tower
Old
New
Gravel Access
Sign
Gate
Survey Monument 619030
N 5204509.917
E 217043.983
Elev. 113.704
N 5 204 558.265
E 217 149.997
Electric Feed
3 Phase Power Distribution
Route 100
To Placentia
To St. Brides

Appendix B

Construction Installation Package

CONSTRUCTION INSTALLATION PACKAGE

DRAWINGS			
DRAWING NO.	DRAWING TITLE	REV.	REMARKS
T3404 - 00	LIST OF DRAWINGS	0	
T3404 - 01	SCOPE OF WORK: 45.72m MTG362KD TOWER INSTALLATION PACKAGE	0	
T3404 - 02	TOWER PROFILE, Tx ARRANGEMENT AND WAVEGUIDE PORT INFORMATION	0	
T3404 - 03	ANTENNA LIST	0	
T3404 - 04A	ANTENNA LAYOUT (PAGE 1 OF 3)	0	
T3404 - 04B	ANTENNA LAYOUT (PAGE 2 OF 3)	0	
T3404 - 04C	ANTENNA LAYOUT (PAGE 3 OF 3)	0	
T3404 - 05	COMPOUND LAYOUT	0	
T3404 - 06A	SUPPORT FOR ANTENNAS AT ELEVATION 45.70m (ELEVATION VIEW) (PAGE 1 OF 6)	0	
T3404 - 06B	SUPPORT FOR ANTENNAS AT ELEVATION 35.03m TO 37.47m (ELEVATION VIEW) (PAGE 2 OF 6)	0	
T3404 - 06C	SUPPORT FOR ANTENNAS AT ELEVATION 27.41m (ELEVATION VIEW) (PAGE 3 OF 6)	0	
T3404 - 06D	SUPPORT FOR ANTENNAS AT ELEVATION 17.35m TO 20.56m (ELEVATION VIEW) (PAGE 4 OF 6)	0	
T3404 - 06E	SUPPORT FOR ANTENNAS AT ELEVATION 15.57m (ELEVATION VIEW) (PAGE 5 OF 6)	0	
T3404 - 06F	SUPPORT FOR ANTENNAS AT ELEVATION 10.45m (ELEVATION VIEW) (PAGE 6 OF 6)	0	
T3404 - 07	CANADIAN COAST GUARD RF SPECIFICATION	0	
T3404 - 08A	GUY LEVEL 1 CONNECTION AT ELEVATION: 23.24m±	0	
T3404 - 08B	GUY LEVEL 2 CONNECTION AT ELEVATION: 41.53m±	0	
T3404 - 08C	GUY LUG CONNECTION DETAIL	0	
T3404 - 09	EXISTING SITE GROUNDING DETAILS	0	

NOTE: CONTRACTOR TO REFERENCE THE TECHNICAL SPECIFICATION FOR RE-LOCATION AND INSTALLATION OF A VHF TOWER.

SITE COORDINATES	
SITE NAME:	CUSLETT VHF, NL
LATITUDE:	N 46° 58' 27.9"
LONGITUDE:	W 54° 09' 14.8"
ELEVATION (ASL):	134.5m (441ft)

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

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 2018

REGISTERED PROFESSIONAL ENGINEER
PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
JONATHAN E. WALSH
SIGNATURE
July 30/18
DATE
NEWFOUNDLAND & LABRADOR

Department of Fisheries and Oceans
Canadian Coast Guard
Marine and Civil Infrastructure

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com

A founding member of STAC CSPA.
Structure, Tower & Antenna Council.
Conseil des structures, pylônes et antennes.

SITE : CUSLETT VHF, NL

CODE : T3404

DRAWING TITLE :

LIST OF DRAWINGS

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-00

LAST UPDATE: 27-Jul-18

SCOPE OF WORK AND INSTALLATION PACKAGE

THE CONTRACTOR SHALL FABRICATE (IF APPLICABLE), FURNISH AND INSTALL THE FOLLOWING ITEMS:

-TOWER PAINT (AS PER CLIENT SPECIFICATION)
-REPLACE EXISTING MILLER FALL ARREST SAFETY RAIL WITH NEW TRYLON SAFETY RAIL
-TOWER, WAVEGUIDE BRIDGE AND GUY ANCHOR FOUNDATIONS.
-ALL REQUIRED GROUNDING MATERIALS. (INCLUDING LIGHTNING ROD AND GUY ANCHOR GROUNDING)
-ALL NEW LUG CONNECTIONS FOR GUY WIRE CONNECTIONS TO TOWER.
-ALL REQUIRED MATERIALS AND TOOLS REQUIRED TO RESTACK/REINSTALL THE DESTACKED TOWER FROM PEARCE PEAK.
-ALL GUYWIRE MATERIAL AND GUY HARDWARE ASSEMBLY.
-ANTI-CLIMB ASSEMBLY C/W ALL MOUNTING HARDWARE.
-WAVEGUIDE BRIDGE AND ALL ASSOCIATED MATERIALS.
-TOWER LIGHTING SYSTEM C/W ALL MATERIALS, CABLING, BEACON MOUNT AND MOUNTING HARDWARE.
-ALL ANTENNAS AND ALL REQUIRED ANTENNA MOUNTING HARDWARE.
-ALL Tx-LINES, CABLING AND REQUIRED MOUNTING HARDWARE AND GROUNDING MATERIALS.
-ALL REQUIRED MOUNTING HARDWARE.
-ALL REQUIRED CABLING AND GROUNDING MATERIALS.
-ALL MATERIALS REQUIRED TO DEMOLISH/DESTACK EXISTING 39.6m GUYED TOWER AT CUSLETT INCLUDING REMOVING EXISTING ANTENNAS, MOUNTS, CABLING, TOWER AND GUY ANCHOR FOUNDATIONS AND RESTORATION OF SITE.

CANADIAN COAST GUARD SUPPLIED EQUIPMENT:

-LIGHTING SYSTEM (BEACON ONLY – CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL REMAINING HARDWARE, BEACON MOUNT AND CABLING)
-EXISTING TOWER (DESTACKED FROM PEARCE PEAK)

THE CONTRACTOR SHALL CARRY OUT THE FOLLOWING ITEMS:

-TRANSPORTATION TO SITE OF ALL REQUIRED MATERIALS AND EQUIPMENT.
-CONTRACTOR TO STORE OR DISPOSE OF ALL MATERIALS OTHER THAN THOSE TO BE RE USED UNDER THE DIRECTION OF THE OWNER.
-CONTRACTOR TO SUPPLY AND INSTALL NEW PAINT (AS PER CLIENT RECOMMENDATION) TO REPAINT EXISTING DESTACKED TOWER FROM PEARCE PEAK. CONTRACTOR TO REPAINT ON SITE IN CUSLETT PRIOR TO RESTACKING/INSTALLATION OF TOWER AT CUSLETT OR IN A CONTROLLED ENVIRONMENT TO MINIMIZE HANDLING. SEE PAINTING SPECIFICATION.
-CONTRACTOR TO SUPPLY AND INSTALL TRYLON FALL ARREST SAFETY RAIL TO REPLACE EXISTING MILLER FALL ARREST SAFETY RAIL. INSTALL AS PER TRYLON INSTALLATION DRAWINGS.
-CONTRACTOR TO DESIGN, FABRICATE, SUPPLY AND INSTALL TOWER, WAVEGUIDE BRIDGE AND GUY ANCHOR FOUNDATIONS. ALL FOUNDATIONS TO BE DESIGNED BY CONTRACTOR AND ANY DESIGN DRAWINGS ARE TO BE STAMPED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE PROVINCE OF NEWFOUNDLAND AND LABRADOR.
-CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL GROUNDING DETAILS AROUND TOWER, WAVEGUIDE BRIDGE AND GUY ANCHORS AS SHOWN ON DWG T3404-09 (OR ENGINEERED APPROVED EQUIVALENT).
-CONTRACTOR TO INSTALL/RESTACK THE DESTACKED TOWER FROM PEARCE PEAK.
-CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL ALL GUYWIRE MATERIAL AND GUY HARDWARE ASSEMBLY.
-CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL LIGHTING ROD AT TOWER TOP C/W ASSOCIATED MOUNTS, MOUNTING HARDWARE, CABLING AND GROUNDING MATERIALS.
-CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL ANTI-CLIMB ASSEMBLY C/W ALL MOUNTING HARDWARE.
-CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL WAVEGUIDE BRIDGE (APPROX. WAVEGUIDE BRIDGE LENGTH = 6.0m±).
-CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL TOWER LIGHTING SYSTEM C/W ALL MATERIALS, CABLING, BEACON MOUNT AND MOUNTING HARDWARE. CANADIAN COAST GUARD TO SUPPLY TOWER BEACON ONLY.
-CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL ALL ANTENNAS AND ALL REQUIRED ANTENNA MOUNTING HARDWARE.
-CONTRACTOR TO SUPPLY AND INSTALL ALL Tx-LINES, CABLING AND REQUIRED MOUNTING HARDWARE AND GROUNDING MATERIALS FOR ANTENNA INSTALLATIONS.
-CONTRACTOR TO COMPLETE A Tx-LINE SWEEP AND REPORTING FOR EACH INSTALLED ANTENNA.
-CONTRACTOR TO SUPPLY ALL MATERIALS REQUIRED TO DEMOLISH/DESTACK EXISTING 39.6m GUYED TOWER AT CUSLETT INCLUDING REMOVING EXISTING ANTENNAS, MOUNTS, CABLING, TOWER AND GUY ANCHOR FOUNDATIONS AND RESTORATION OF SITE. CONTRACTOR TO STORE OR DISPOSE OF ALL MATERIALS OTHER THAN THOSE TO BE RE USED UNDER THE DIRECTION OF THE OWNER.

CONTRACTOR TO TAKE NOTE OF THE FOLLOWING ITEMS:

-IT IS RECOMMENDED A SITE VISIT SHALL BE CARRIED OUT BY THE BIDDER BEFORE PREPARING THEIR BID IN ORDER TO CONSIDER AND ACCOUNT FOR EXISTING SITE CONDITIONS.
-NEW TRANSMISSION LINES MUST BE INSTALLED AS SHOWN ON DRAWING T3404-02.
-THE CONTRACTOR SHALL DESIGN, FURNISH AND INSTALL STEEL ELEMENTS IN ORDER TO PROTECT THE NON VERTICAL PORTION OF THE TRANSMISSION LINES BETWEEN THE ANTENNA AND THE WAVEGUIDE SUPPORT ON THE TOWER AGAINST ANY FALLING ICE.
-CONTRACTOR TO MAINTAIN PROPER HOUSEKEEPING AND TO ENSURE THE SITE IS CLEAN UPON COMPLETION OF ALL WORK.
-CONTRACTOR SHALL BE RESPONSIBLE TO CHECK ALL MATERIALS AGAINST THE MATERIAL LIST AND PROTECT THE MATERIALS UNTIL INSTALLED AND ACCEPTED BY THE OWNER.
-GROUNDING SYSTEM MUST BE INSTALLED AS PER CANADIAN COAST GUARD NATIONAL GROUNDING STANDARDS.

GENERAL TOWER NOTES:

- ALL STEEL FABRICATION AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE CSA STANDARDS CSA S16.1 AND CSA S37.
- ALL WELDING SHALL BE DONE IN ACCORDANCE WITH STANDARD CSA W59 AND USING E49R.N. (Fu=450 MPa) ELECTRODES. ALL WELDING TO BE PREFORMED IN A CWB REGISTERED SHOP. FIELD-WELDING IS NOT PERMITTED UNLESS NOTED OTHERWISE.
- ALL NEW STEEL SHALL CONFORM TO CSA G40.20/G40.21 300W (PLATE AND ANGLES EQUAL TO OR SMALLER THAN 51X51) AND 350W (HSS SECTIONS AND ANGLES LARGER THAN 51X51).
- ALL NEW BOLTS, WASHERS AND NUTS SHALL CONFORM TO ASTM 325 UNLESS NOTED OTHERWISE. ALL CONNECTIONS TO BE BEARING WITH THE BOLT THREADS OUTSIDE POSSIBLE SHEAR PLANES. ALL BOLTS SHALL BE TIGHTENED USING THE TURN-OF-THE-NUT METHOD AS DESCRIBED IN THE SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS. DO NOT RE-USE EXISTING BOLTS ONCE REMOVED. THREADED CONNECTIONS OTHER THAN HIGH STRENGTH BOLTS SHALL HAVE A MEANS TO PREVENT LOOSENING. ACCEPTABLE METHODS ARE LOCK WASHER OR LOCK NUTS.
- ALL U-BOLTS HAVE TO BE MINIMUM SAE J429 GRADE 2 OR EQUIVALENT WITH ROLLED THREADS. CUT THREADS ARE NOT ACCEPTABLE. EACH THREADED PART OF THE U-BOLT SHALL HAVE A ROUND FLAT WASHER ASTM F436, A SPRING LOCK WASHER EXTRA DUTY TYPE CONFORMING TO ANSI B27.1 AND A SAE GRADE 2 HEX NUT.
- THE FINISHED DIAMETER OF BOLT HOLES SHALL NOT BE MORE THAN 2mm LARGER THAN THE NOMINAL BOLT DIAMETER UNLESS NOTED OTHERWISE.
- CUT EDGES SHALL BE TRUE, SMOOTH AND FREE FROM EXCESSIVE BURRS AND RAGGED BREAKS. SHEAR EDGES OF THICK PLATES SHALL BE PLANNED TO A DEPTH OF 6mm. RE-ENTRANT CUTS SHALL BE AVOIDED; IF USED, THEY SHALL BE FILLETED BY DRILLING PRIOR TO CUTTING.
- TOLERANCES AS INDICATED IN CSA S16.1 SHALL BE CAREFULLY FOLLOWED DURING FABRICATION.
- PRIOR TO GALVANIZING, ALL FABRICATED STEEL SHALL BE THOROUGHLY SHOP INSPECTED.
- EXCEPT WHERE NOTED OTHERWISE, ALL NEW STEEL MEMBERS, BOLTS AND HARDWARE SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH STANDARD CSA G164. DOUBLE=DIPPING IN GALVANIZING BATHS IS NOT PERMITTED.
- ANY DAMAGES TO GALVANIZED SURFACES AND AROUND FIELD-DRILLED HOLES SHALL BE CLEANED AND TOUCHED-UP WITH TWO COATS OF ZINC-RICH PAINT IN ACCORDANCE WITH STANDARD CSA G189.
- ALL STEEL FABRICATION AND INSTALLATION SHALL USE THE GAUGE LINES AND END DISTANCES FROM THE TABLES BELOW UNLESS NOTED OTHERWISE ON DETAIL DRAWINGS.
- CONTRACTOR IS RESPONSIBLE FOR CONFIRMING ALL PART DIMENSIONS, SIZES AND LOCATIONS THROUGH EITHER MOCKUP OR TRIAL FIT, PRIOR TO FABRICATION.
- THE PROVISION ON THE PART OF THE CONSULTANT TO PROVIDE PART DRAWINGS DOES NOT ABSOLVE THE CONTRACTOR THE RESPONSIBILITY FOR CONFIRMING ALL DIMENSIONS. CONTRACTOR TO PRODUCE THEIR OWN SHOP DRAWINGS.
- ALL WORK TO BE DONE BY A QUALIFIED AERIAL CONTRACTOR TRAINED TO PERFORM TOWER TELECOM WORK. ALL WORK TO BE DONE IN ACCORDANCE WITH CSA S37-13 "ANTENNAS, TOWERS, AND ANTENNA-SUPPORTING STRUCTURES", ALL MUNICIPAL, FEDERAL AND PROVINCIAL SAFETY REGULATIONS.
- CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY BRACING.

T:\TELECOMS SITE OWNERS-GENERAL INFO & STANDARDS\CCG\2018-44-TC-CCG-ENGINEERING SERVICES-CUSLETT NL TOWER INSTALLATION\DRAWINGS\IFT\T3404-CUSLETTVHF-2018-44-CCG-IFT-R0

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

PERMIT HOLDER
This Permit Allows

TILLER ENGINEERING INC.

MIRC #02255

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In Newfoundland and Labrador.
Permit No. as Issued by PEG P0227
which is valid for the year 2018

REGISTERED PROFESSIONAL ENGINEER
PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
JONATHAN E. WALSH
SIGNATURE
July 24/18
DATE
NEWFOUNDLAND & LABRADOR

Department of Fisheries and Oceans
Canadian Coast Guard
Marine and Civil Infrastructure

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
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SITE : CUSLETT VHF, NL

CODE : T3404

DRAWING TITLE :

SCOPE OF WORK: 45.72m MTG362KD
TOWER INSTALLATION PACKAGE

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-01

LOADING	
DESIGN SPECIFICATION:	CSA S37-13/REF #3
WIND/SOURCE:	Q_h=866 Pa/REF #3
ICE/SOURCE:	35mm/REF #3
ANTENNA LIST DATED:	2018-JUL-30
LAST SITE VISIT BY:	UNKNOWN

STRUCTURAL STEEL	
LEG MEMBERS	GRADE 40.21-300W/REF #2
DIAG. AND HORIZ.	GRADE 40.21-300W/REF #2
BOLTS	ASTM A325/REF #2

GUY TERMINATION		
GUY	TOWER	ANCHOR
G-1	PREFORM	PREFORM
G-2	PREFORM	PREFORM
G-3	PREFORM	PREFORM

GUY ANCHOR INFORMATION		
AZIMUTH (°)	RADIUS (m)	ELEVATION (m)
1A-3°	42.694±	+ 2.802±
2A-123°	41.056±	+ 1.119±
3A-243°	43.266±	+ 3.405±

NOTES:

1: NUMBER OF PLATES AND BOLTS GIVEN FOR LEG SPLICE IS THE TOTAL NUMBER OF ELEMENTS FORMING THE SPLICE (2 LEGS INCLUDED TOP AND BOTTOM).

2: TOWER ORIGINALLY DESIGNED BY: MAXTOWER
YEAR OF ORIGINAL CONSTRUCTION: 2002
YEAR OF RELOCATION FROM PEARCE PEAK: 2018
DRAWING NO: M2007
MODEL: 45.72m MTG362KD TOWER

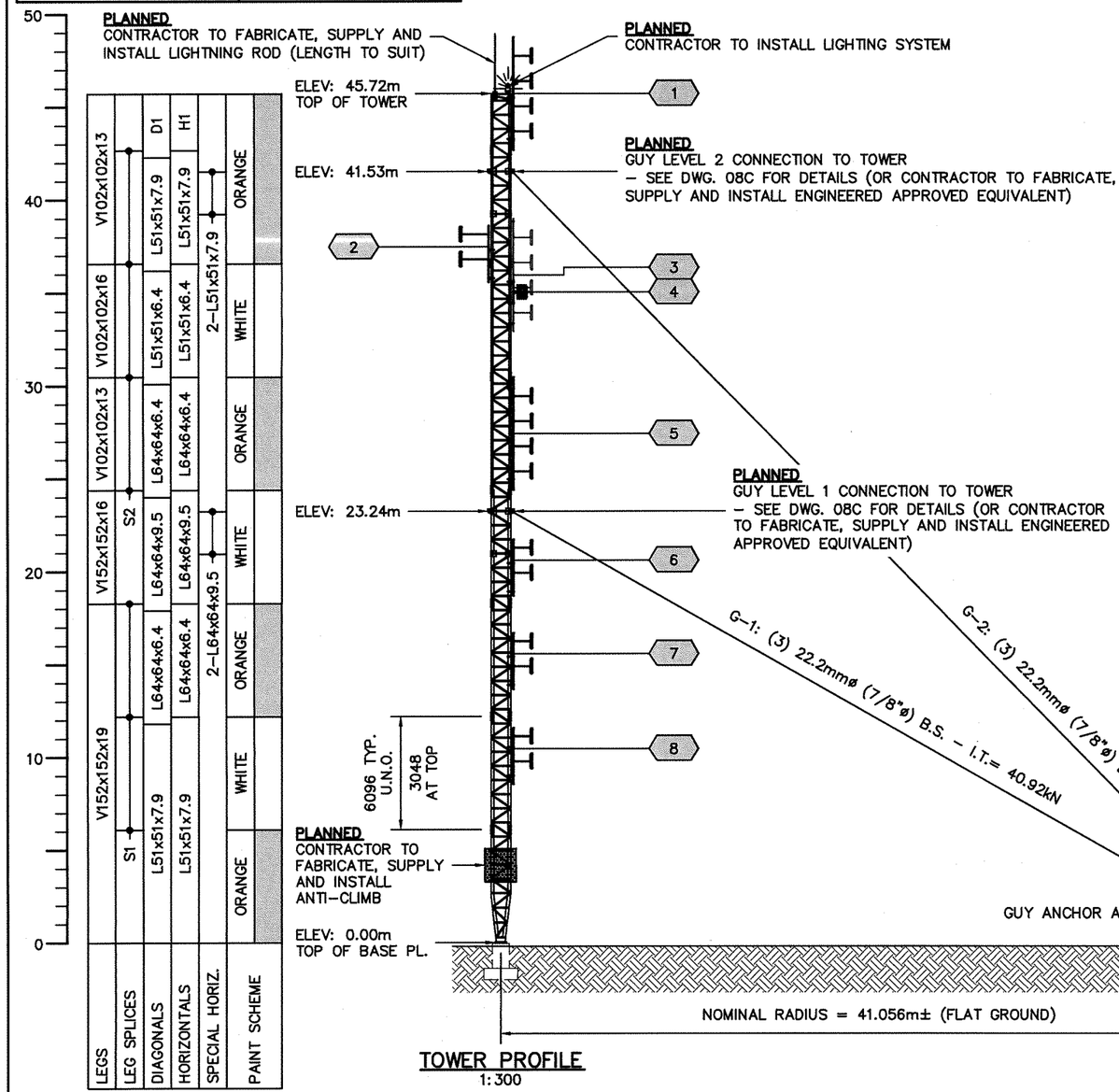
3: TEI STRUCTURAL ANALYSIS DATED: 2018-JUL-30.

LEGEND:

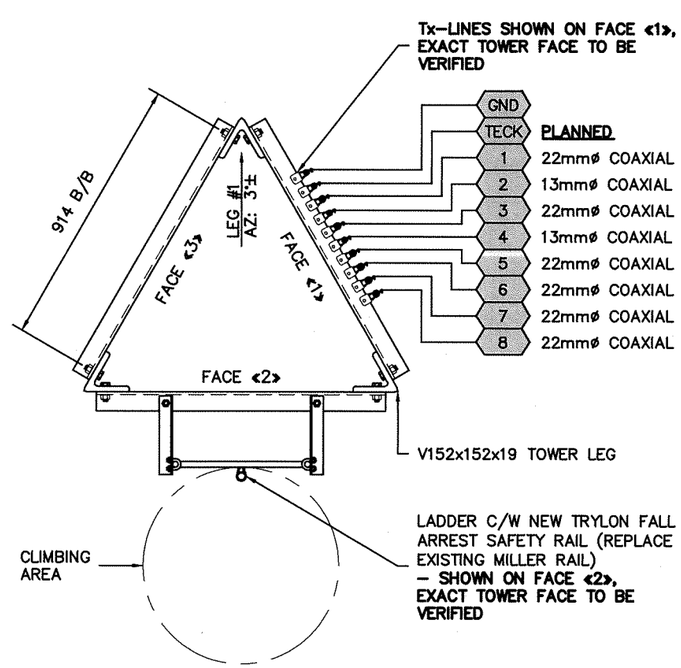
S1: (28) 16mmø x 70mm± A325 BOLTS C/W SPLICE PLATES
S2: (16) 16mmø x 64mm± A325 BOLTS C/W SPLICE PLATES
D1: L44x44x4.8
H1: L51x51x4.8

(#) EXISTING ANTENNA
(#) THIS PROJECT ANTENNA

NORTH



TOWER PROFILE
1:300



Tx-ARRANGEMENT
(CROSS SECTION ABOVE WAVEGUIDE BRIDGE)
1:20

T.B.D.
CONTRACTOR TO MAP/LABEL ON SITE

WAVEGUIDE PORT INFORMATION
(VIEW FROM INSIDE OF THE SHELTER)
N.T.S.

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PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
PERMIT HOLDER
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PEG Newfoundland and Labrador
JONATHAN E. WALSH
SIGNATURE
July 30/18
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SITE : CUSLETT VHF, NL

CODE : T3404

DRAWING TITLE :

TOWER PROFILE, Tx ARRANGEMENT AND WAVEGUIDE PORT INFORMATION

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-02

LAST UPDATE: 27-Jul-18

T:\TELECOMS SITE OWNERS-GENERAL INFO & STANDARDS\CCG\2018-44-TC-CCG-ENGINEERING SERVICES-CUSLETT NL TOWER INSTALLATION\DRAWINGS\IFT\T3404-CUSLETTVHF-2018-44-CCG-IFT-R0

ANTENNA LIST

ANTENNA NO.	ANTENNA TYPE	ELEVATION (m)	AZIMUTH (°)	MAIN TX–LINE	EQUIPMENT AT ANTENNA ELEVATION LEVEL	ANTENNA OWNER	ANTENNA IDENTIFIER	STATUS
1	«SINCLAIR» SRL–210C–4	45.70	275	PLANNED (1) 22mmø COAXIAL	–	CCG	–	PLANNED
2	«SINCLAIR» SRL–210C–2	37.47	150	PLANNED (1) 13mmø COAXIAL	–	CCG	–	PLANNED
3	«SINCLAIR» SRL–210C–4	35.95	275	PLANNED (1) 22mmø COAXIAL	–	RCMP	–	PLANNED
4	«SINCLAIR» SRL–227	35.03	36	PLANNED (1) 13mmø COAXIAL	–	CCG	–	PLANNED
5	«SINCLAIR» SRL–210C–4	27.41	275	PLANNED (1) 22mmø COAXIAL	–	CCG	–	PLANNED
6	«SINCLAIR» SRL–210C–2	20.56	275	PLANNED (1) 22mmø COAXIAL	–	CCG	–	PLANNED
7	«SINCLAIR» SRL–210C–2	15.57	275	PLANNED (1) 22mmø COAXIAL	–	RCMP	–	PLANNED
8	«SINCLAIR» SRL–210C–2	10.45	275	PLANNED (1) 22mmø COAXIAL	–	RCMP	–	PLANNED

NOTES:

1–THE ELEVATIONS OF THE ANTENNAS ARE GIVEN TO THE CENTER OF THE ANTENNA (ANTENNA MIDPOINT) WITH RESPECT TO ELEVATION 0.0m ON THE TOWER (TOP OF THE BASE PLATE).

LEGEND:

CCG = CANADIAN COAST GUARD

RCMP = ROYAL CANADIAN MOUNTED POLICE

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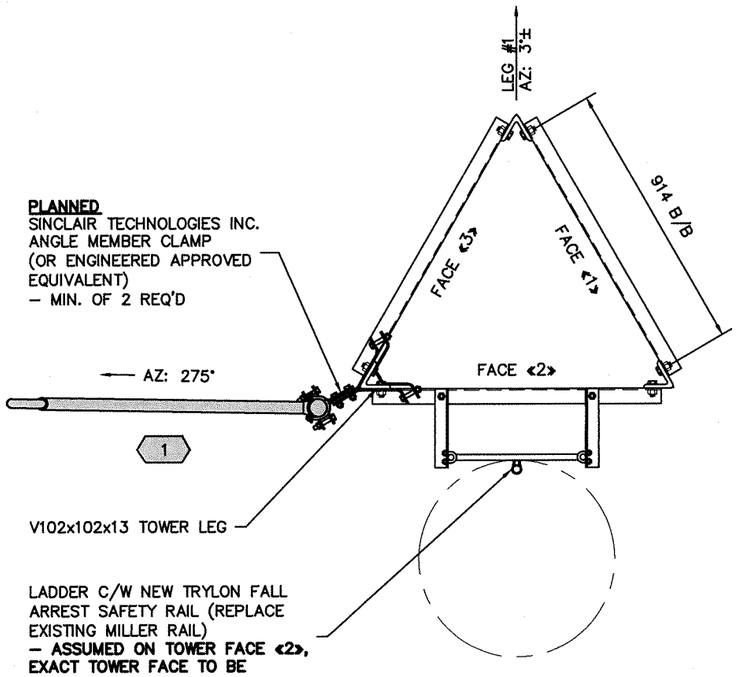
DRAWING TITLE :

ANTENNA LIST

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-03

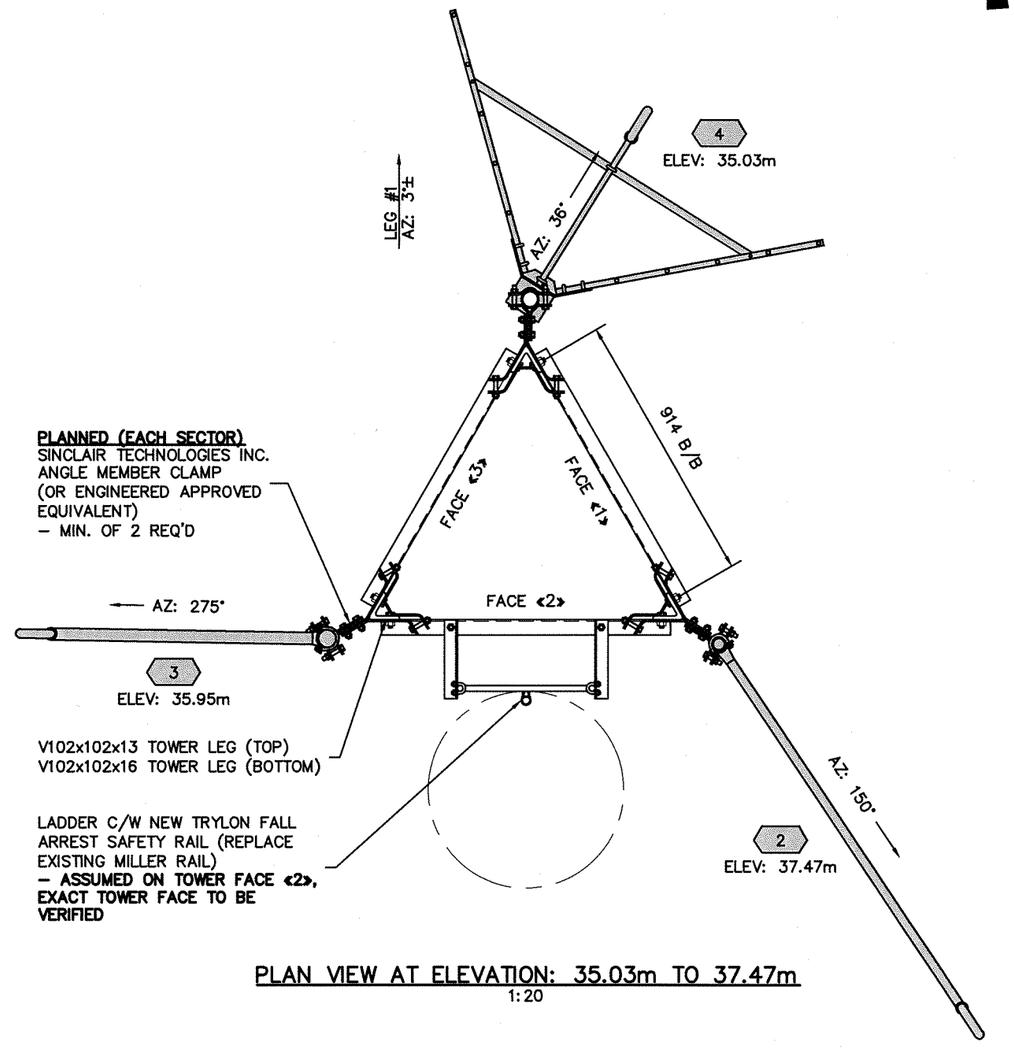


PLANNED
SINCLAIR TECHNOLOGIES INC.
ANGLE MEMBER CLAMP
(OR ENGINEERED APPROVED EQUIVALENT)
– MIN. OF 2 REQ'D

V102x102x13 TOWER LEG

LADDER C/W NEW TRYLON FALL ARREST SAFETY RAIL (REPLACE EXISTING MILLER RAIL)
– ASSUMED ON TOWER FACE «2», EXACT TOWER FACE TO BE VERIFIED

PLAN VIEW AT ELEVATION: 45.70m
1:20



PLANNED (EACH SECTOR)
SINCLAIR TECHNOLOGIES INC.
ANGLE MEMBER CLAMP
(OR ENGINEERED APPROVED EQUIVALENT)
– MIN. OF 2 REQ'D

V102x102x13 TOWER LEG (TOP)
V102x102x16 TOWER LEG (BOTTOM)

LADDER C/W NEW TRYLON FALL ARREST SAFETY RAIL (REPLACE EXISTING MILLER RAIL)
– ASSUMED ON TOWER FACE «2», EXACT TOWER FACE TO BE VERIFIED

PLAN VIEW AT ELEVATION: 35.03m TO 37.47m
1:20

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SITE : CUSLETT VHF, NL

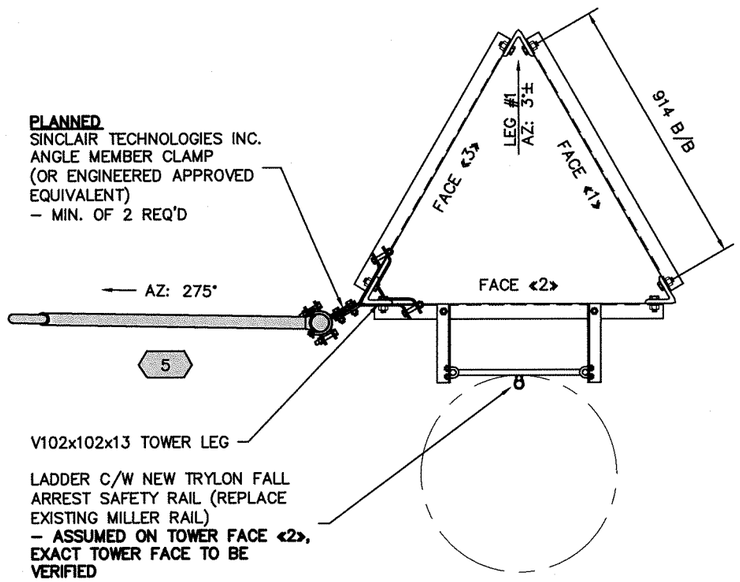
CODE : T3404

DRAWING TITLE :

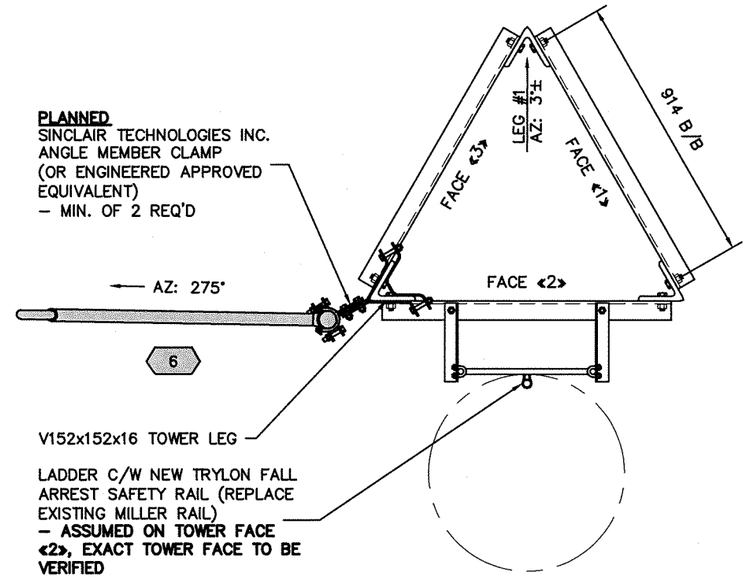
ANTENNA LAYOUT
(PAGE 1 OF 3)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-04A



PLAN VIEW AT ELEVATION: 27.41m
1:20



PLAN VIEW AT ELEVATION: 20.56m
1:20

NORTH

PROVINCE OF NEWFOUNDLAND AND LABRADOR

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SITE : CUSLETT VHF, NL

CODE : T3404

DRAWING TITLE :

ANTENNA LAYOUT
(PAGE 2 OF 3)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-04B

LAST UPDATE: 27-Jul-18

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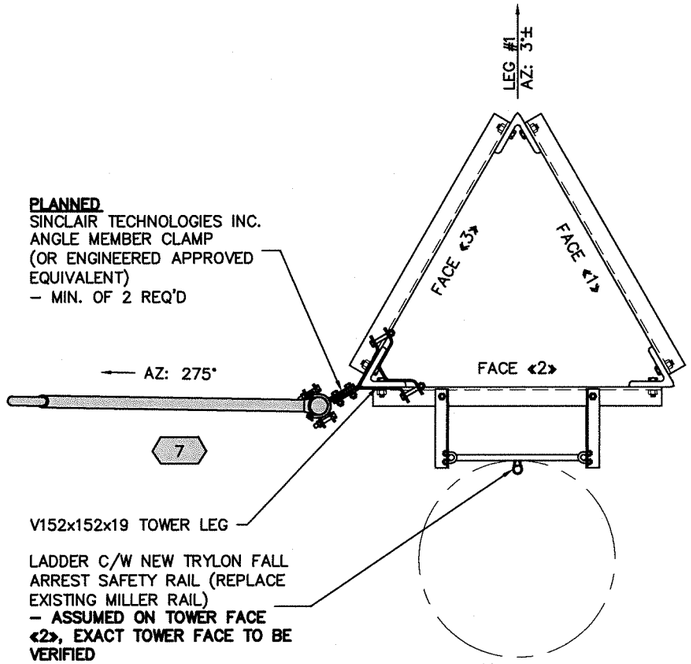
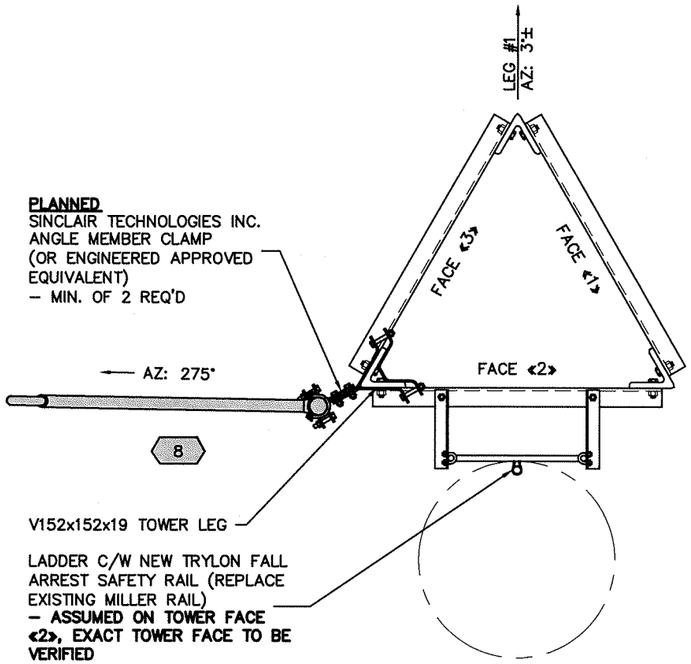


PLANNED
SINCLAIR TECHNOLOGIES INC.
ANGLE MEMBER CLAMP
(OR ENGINEERED APPROVED EQUIVALENT)
– MIN. OF 2 REQ'D

V152x152x19 TOWER LEG

LADDER C/W NEW TRYLON FALL ARREST SAFETY RAIL (REPLACE EXISTING MILLER RAIL)
– ASSUMED ON TOWER FACE «2», EXACT TOWER FACE TO BE VERIFIED

PLAN VIEW AT ELEVATION: 15.57m
1:20



PLANNED
SINCLAIR TECHNOLOGIES INC.
ANGLE MEMBER CLAMP
(OR ENGINEERED APPROVED EQUIVALENT)
– MIN. OF 2 REQ'D

V152x152x19 TOWER LEG

LADDER C/W NEW TRYLON FALL ARREST SAFETY RAIL (REPLACE EXISTING MILLER RAIL)
– ASSUMED ON TOWER FACE «2», EXACT TOWER FACE TO BE VERIFIED

PLAN VIEW AT ELEVATION: 10.45m
1:20

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
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 2018

REGISTERED PROFESSIONAL ENGINEER
PEG Newfoundland and Labrador
JONATHAN E. WALSH
SIGNATURE
Jul 30/18
DATE
NEWFOUNDLAND & LABRADOR

Department of Fisheries and Oceans
Canadian Coast Guard
Marine and Civil Infrastructure

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Tel. (709) 579-6700
Fax. (709) 579-6701
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SITE : CUSLETT VHF, NL

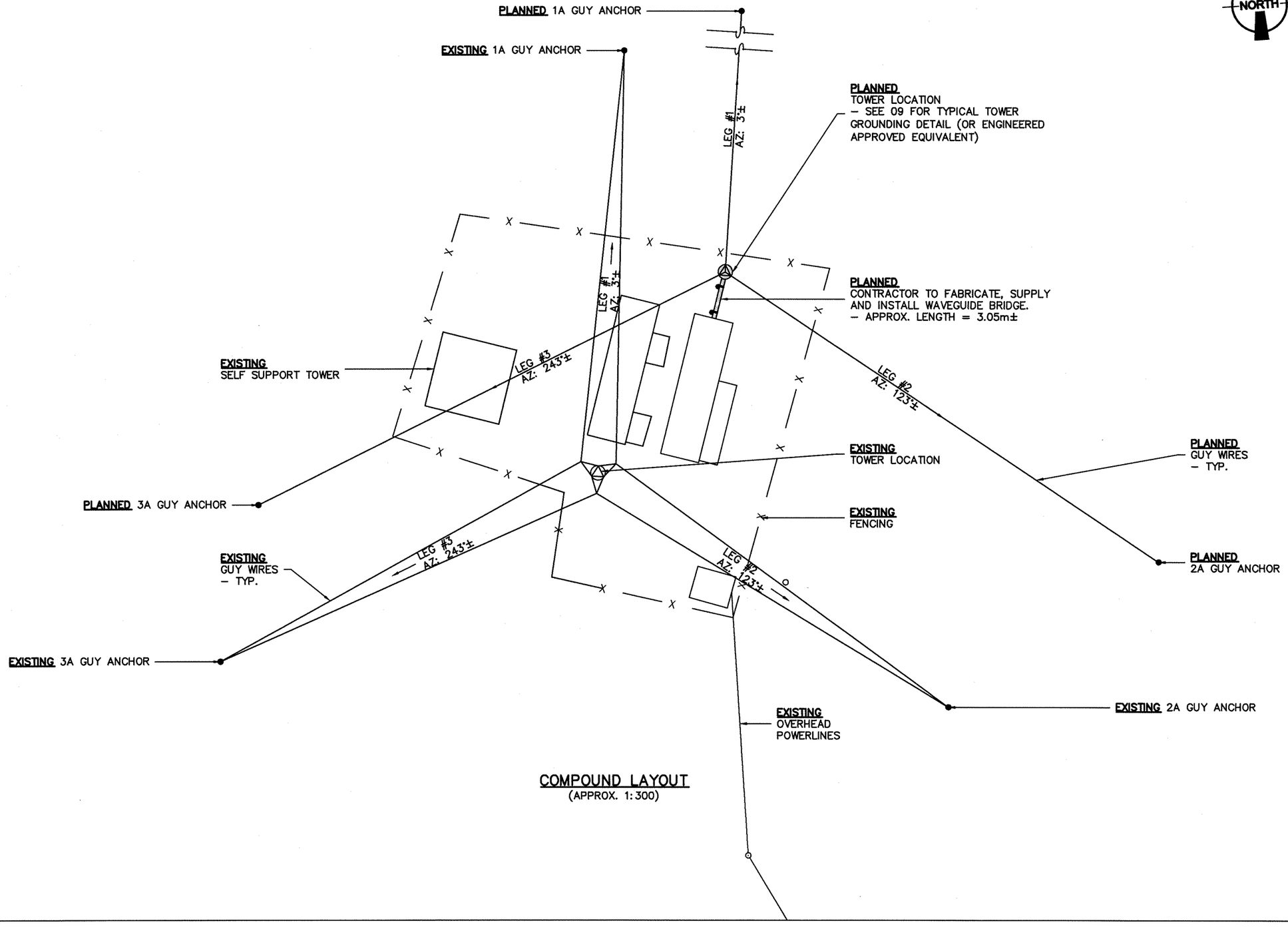
CODE : T3404

DRAWING TITLE :

ANTENNA LAYOUT
(PAGE 3 OF 3)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-04C



COMPOUND LAYOUT
(APPROX. 1:300)

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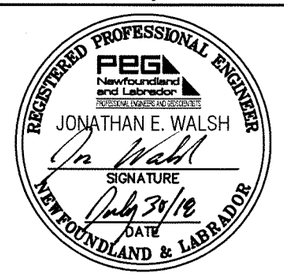

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SITE : CUSLETT VHF, NL

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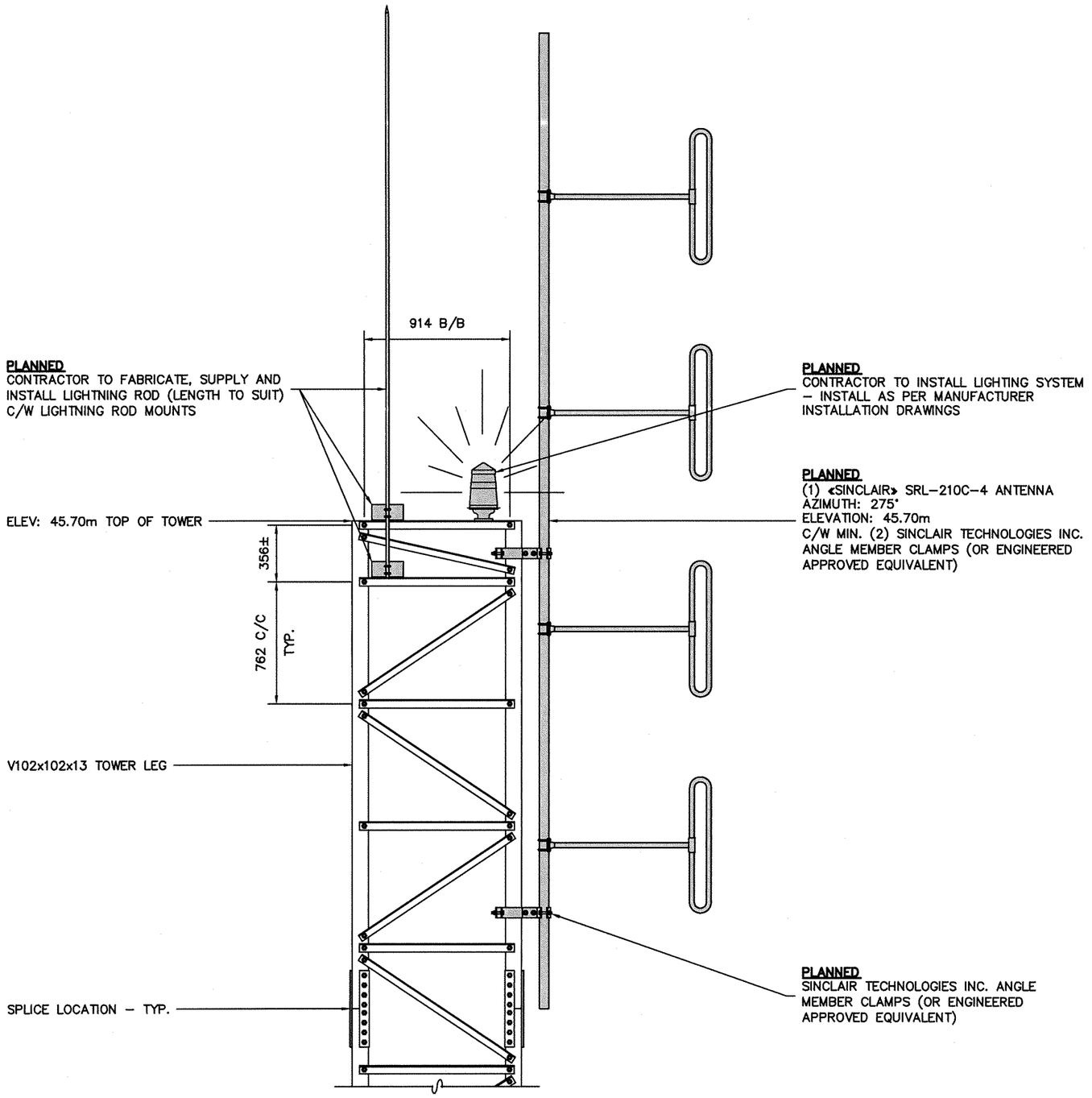
DRAWING TITLE :

COMPOUND LAYOUT

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-05



ELEVATION VIEW AT ELEVATION: 45.70m

1:30

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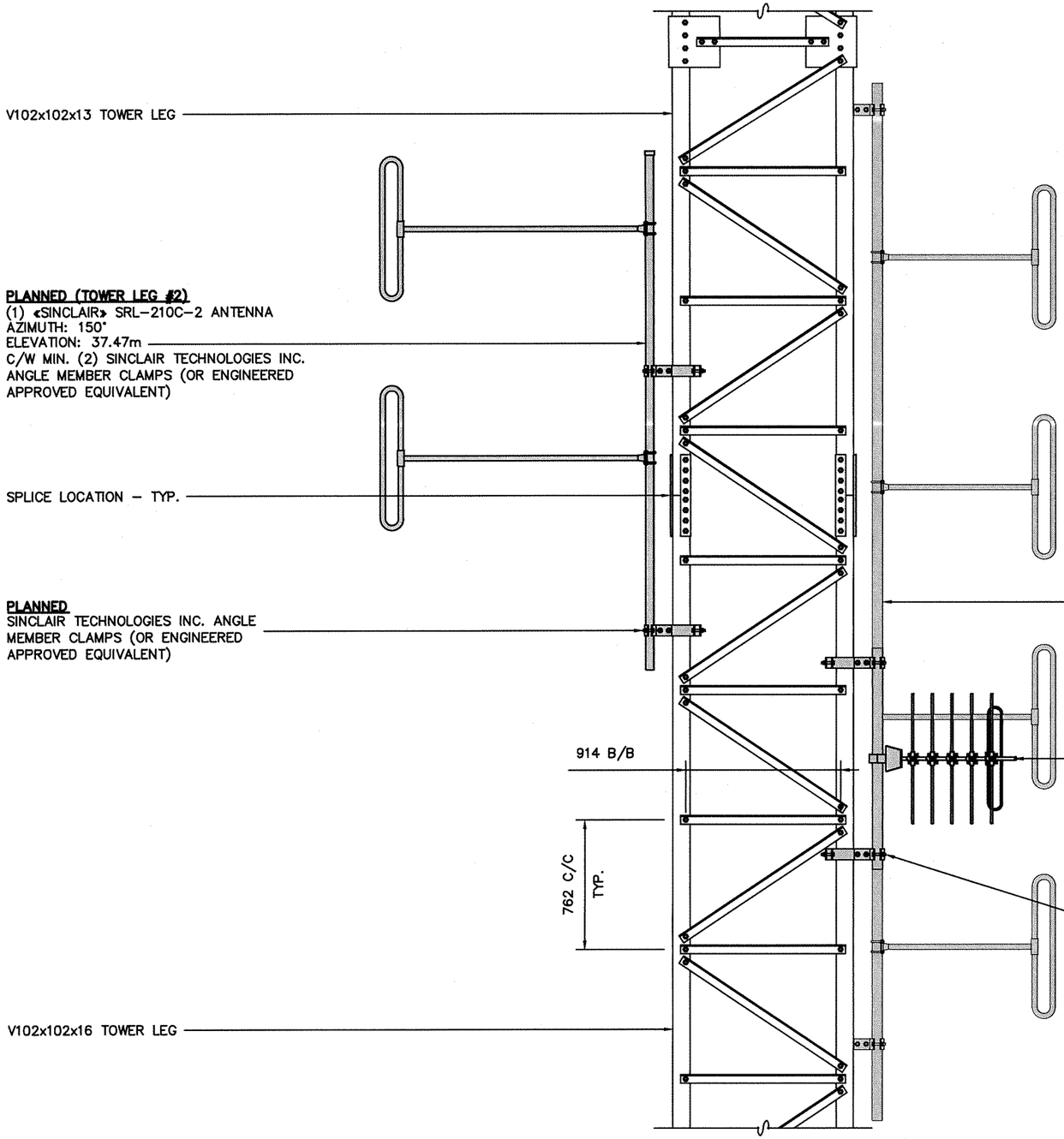
DRAWING TITLE :
SUPPORT FOR ANTENNAS AT ELEVATION 45.70m
(ELEVATION VIEW)
(PAGE 1 OF 6)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-06A



ELEVATION VIEW AT ELEVATION: 35.03m TO 37.47m
1:30

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DRAWING TITLE :
SUPPORT FOR ANTENNAS AT
ELEVATION 35.03m TO 37.47m
(ELEVATION VIEW)
(PAGE 2 OF 6)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

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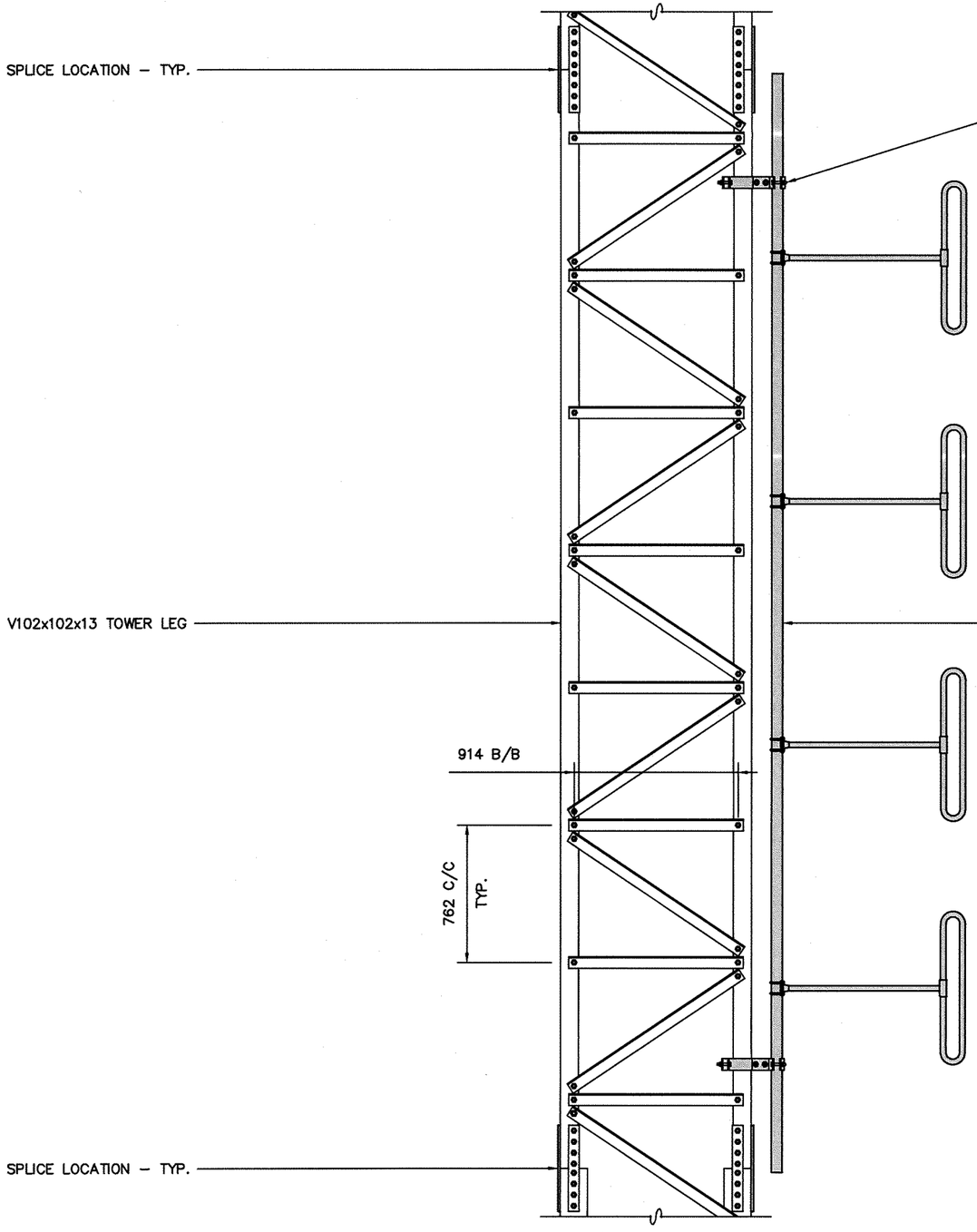
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-06B



PLANNED
SINCLAIR TECHNOLOGIES INC. ANGLE MEMBER CLAMPS (OR ENGINEERED APPROVED EQUIVALENT)

PLANNED
(1) «SINCLAIR» SRL-210C-4 ANTENNA
AZIMUTH: 275°
ELEVATION: 27.41m
C/W MIN. (2) SINCLAIR TECHNOLOGIES INC. ANGLE MEMBER CLAMPS (OR ENGINEERED APPROVED EQUIVALENT)

ELEVATION VIEW AT ELEVATION: 27.41m
1:30

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CODE : T3404

DRAWING TITLE :
SUPPORT FOR ANTENNAS AT ELEVATION 27.41m
(ELEVATION VIEW)
(PAGE 3 OF 6)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

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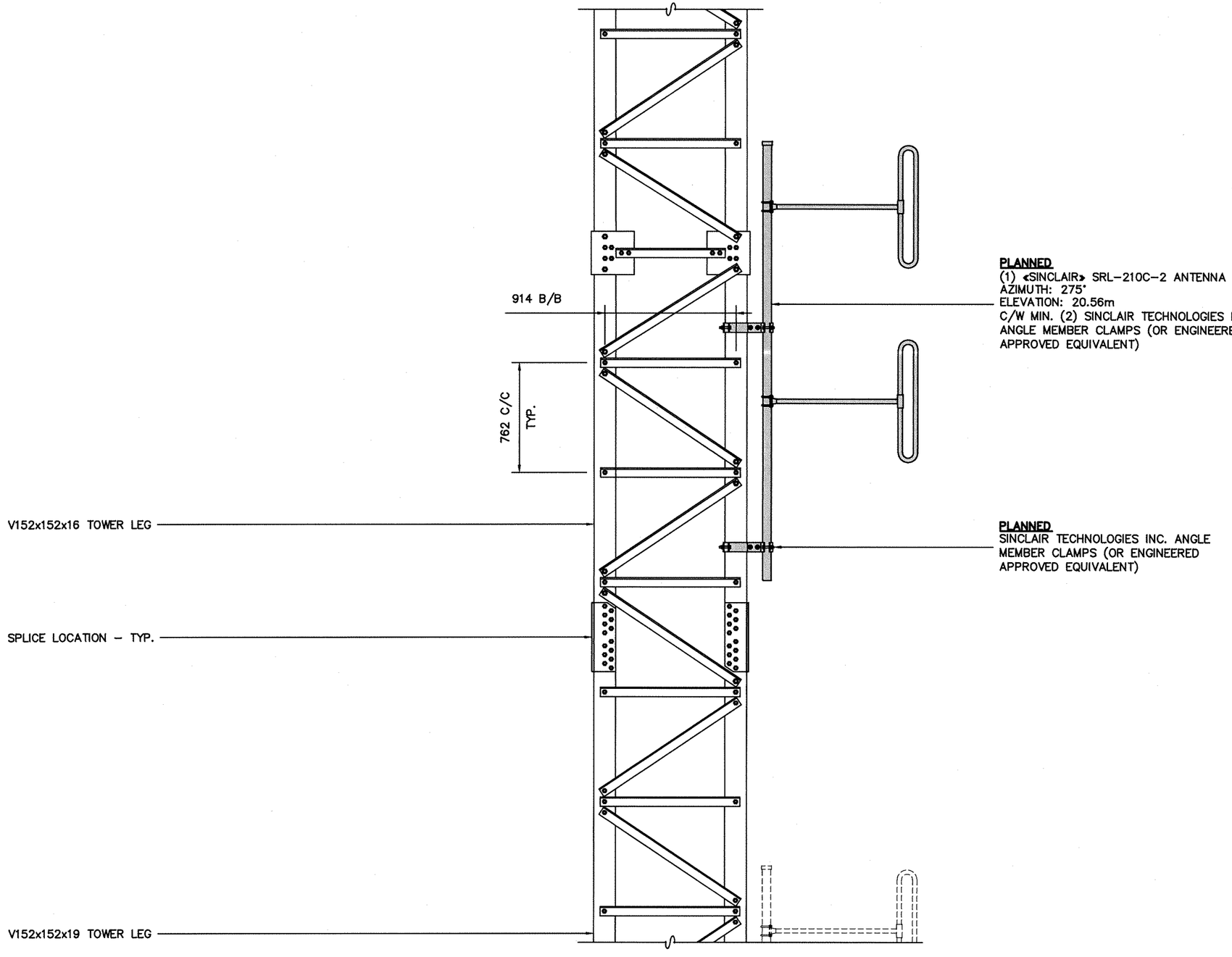
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-06C



ELEVATION VIEW AT ELEVATION: 17.35m TO 20.56m
1:30

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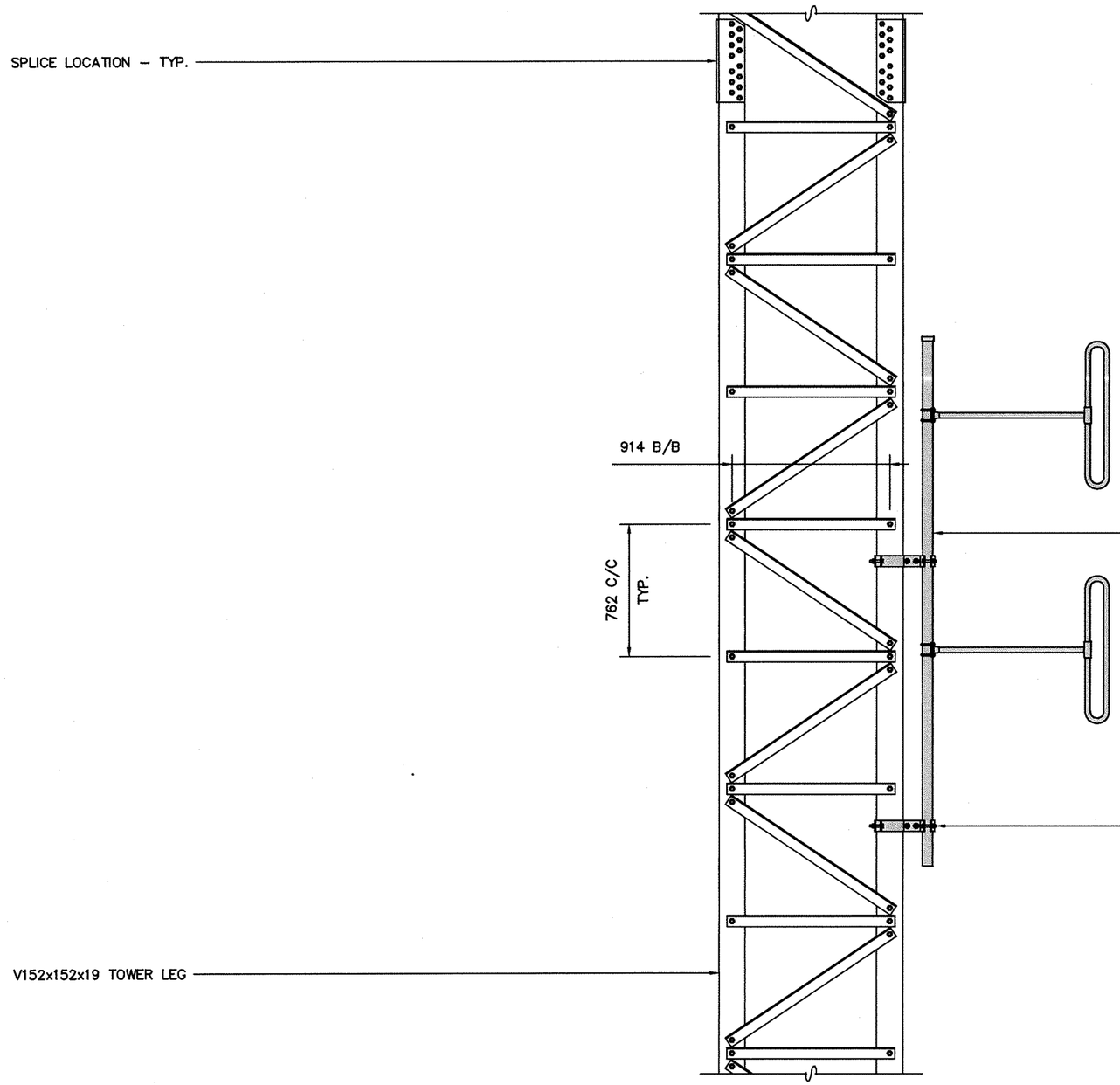
DRAWING TITLE :
SUPPORT FOR ANTENNAS AT
ELEVATION 17.35m TO 20.56m
(ELEVATION VIEW)
(PAGE 4 OF 6)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-06D



PLANNED
(1) «SINCLAIR» SRL-210C-2 ANTENNA
AZIMUTH: 275°
ELEVATION: 15.57m
C/W MIN. (2) SINCLAIR TECHNOLOGIES INC. ANGLE MEMBER CLAMPS (OR ENGINEERED APPROVED EQUIVALENT)
– RCMP SUPPLIED (ANTENNA/CABLING) TO BE CONTRACTOR INSTALL ONLY WITH CABLES TERMINATED WITHIN SHELTER.
– OWNER TO PROVIDE ANTENNA/CABLING UPON CONTRACT AWARD

PLANNED
SINCLAIR TECHNOLOGIES INC. ANGLE MEMBER CLAMPS (OR ENGINEERED APPROVED EQUIVALENT)

ELEVATION VIEW AT ELEVATION: 15.57m
1:30

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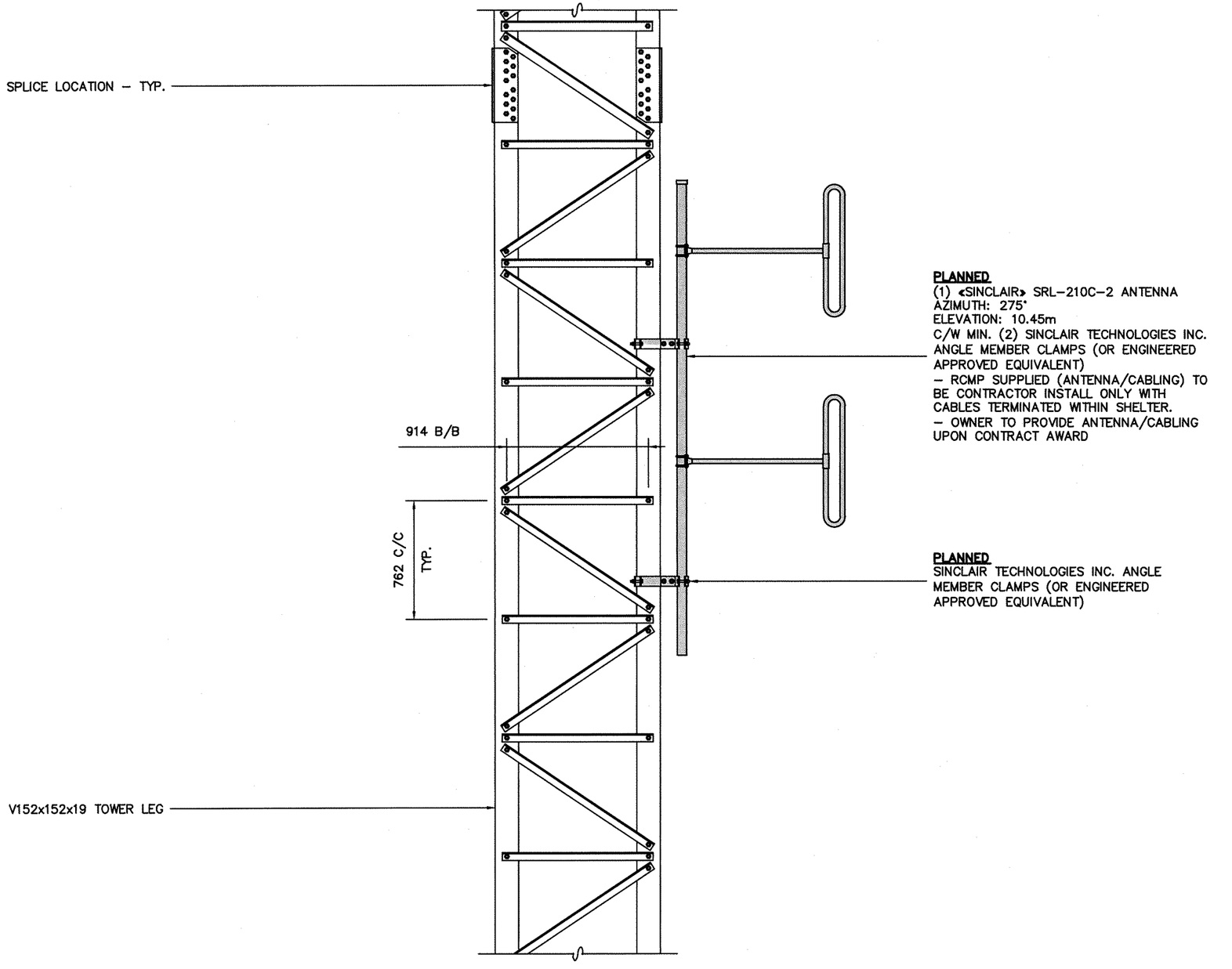
DRAWING TITLE :
SUPPORT FOR ANTENNAS AT ELEVATION 15.57m
(ELEVATION VIEW)
(PAGE 5 OF 6)

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-06E



ELEVATION VIEW AT ELEVATION: 10.45m
1:30

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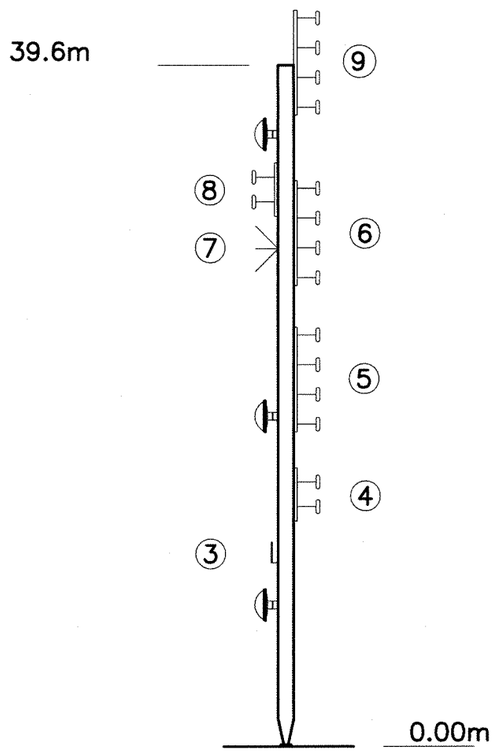
DRAWING TITLE :
SUPPORT FOR ANTENNAS AT ELEVATION 10.45m
(ELEVATION VIEW)
(PAGE 6 OF 6)

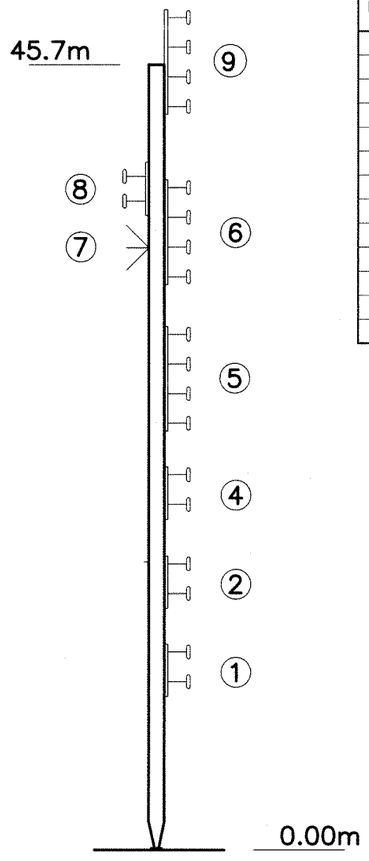
REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-06F

EXISTING



PROPOSED



ANTENNA SYSTEMS					
ITEM	TYPE	ELEV. (ANTENNA MID POINT)	AZ.	LOCATION	TX LINE
1	SRL-210C-2	10.45M	275°	LEG 3	22mm COAXIAL
2	SRL-210C-2	15.57M	275°	LEG 3	22mm COAXIAL
3	BLUEWAVE (V) (BWY 146Y-4)	17.35M	44°	LEG 1	13mm COAXIAL
4	SRL-210C-2	20.56M	275°	LEG 3	22mm COAXIAL
5	SRL-210C-4	27.41M	275°	LEG 3	22mm COAXIAL
6	SRL-210C-4	35.95M	275°	LEG 3	22mm COAXIAL
7	SRL-227	35.03	36°	LEG 1	13mm COAXIAL
8	SRL-210C-2	37.47	150°	LEG 2	13mm COAXIAL
9	SRL-210C-4	45.70M	275°	LEG 3	22mm COAXIAL

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DRAWING TITLE :

CANADIAN COAST GUARD
RF SPECIFICATION

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
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SCALE :	AS SHOWN
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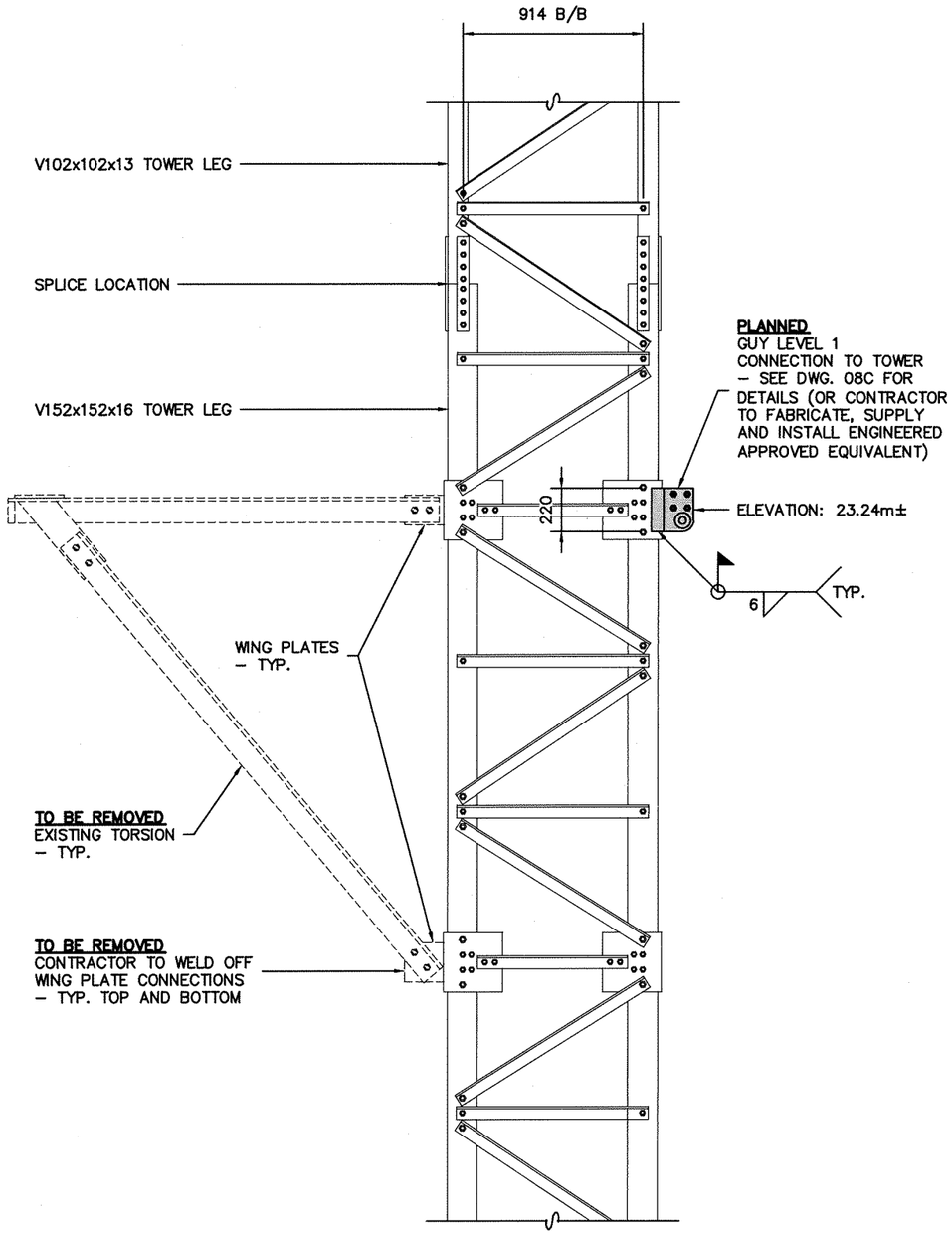
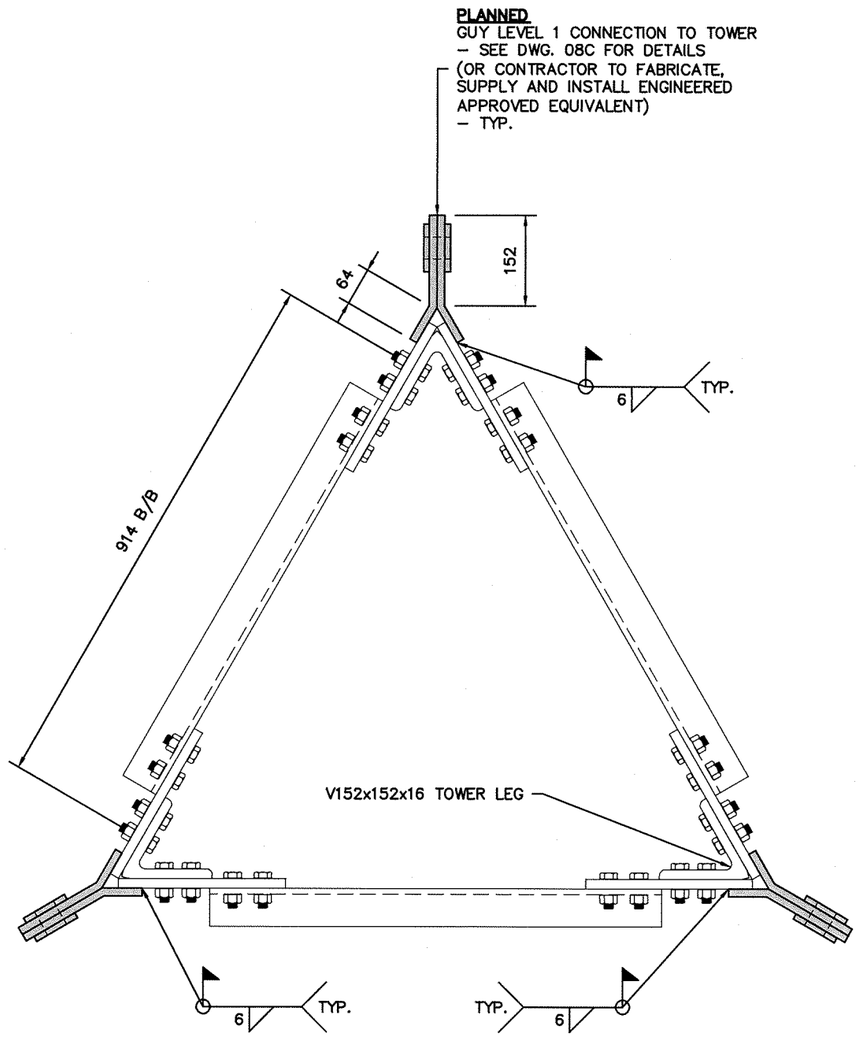
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-07



ELEVATION VIEW AT ELEVATION 23.24m±
1:30



PLAN VIEW AT ELEVATION 23.24m±
1:10
NOTE: EXTERIOR LADDER NOT SHOWN FOR CLARITY

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DRAWING TITLE :

GUY LEVEL 1 CONNECTION
AT ELEVATION: 23.24m±

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
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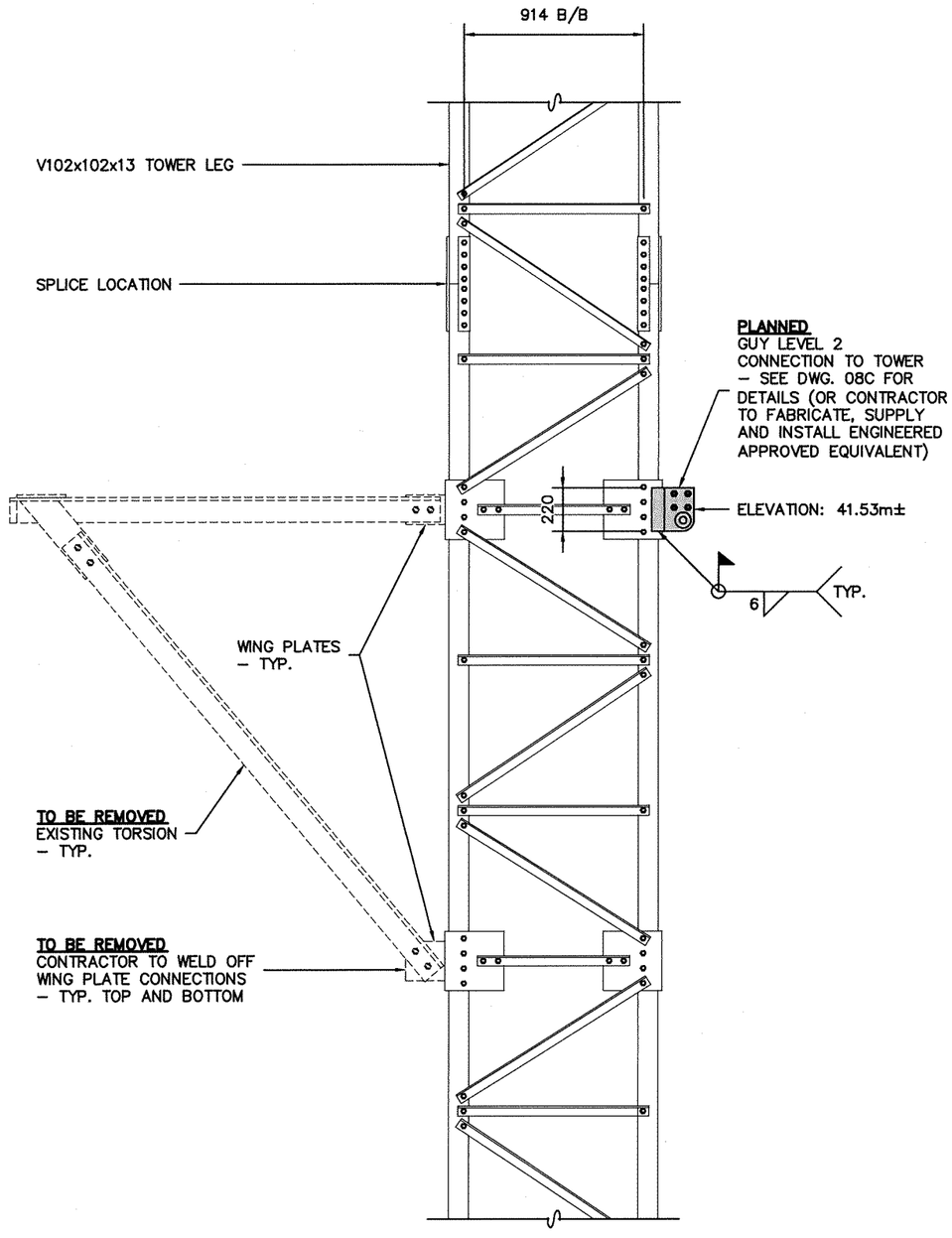
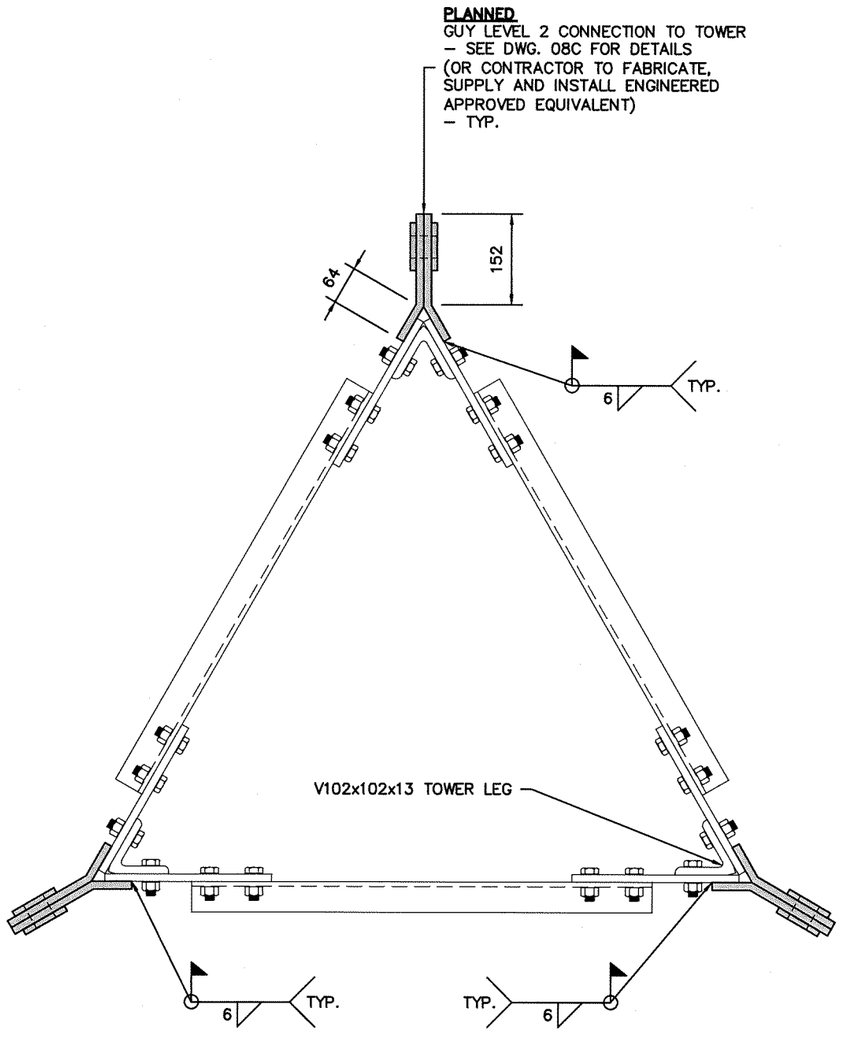
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-08A



ELEVATION VIEW AT ELEVATION 41.53m±
1:30



PLAN VIEW AT ELEVATION 41.53m±
1:10
NOTE: EXTERIOR LADDER NOT SHOWN FOR CLARITY

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DRAWING TITLE :

GUY LEVEL 2 CONNECTION
AT ELEVATION: 41.53m±

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R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

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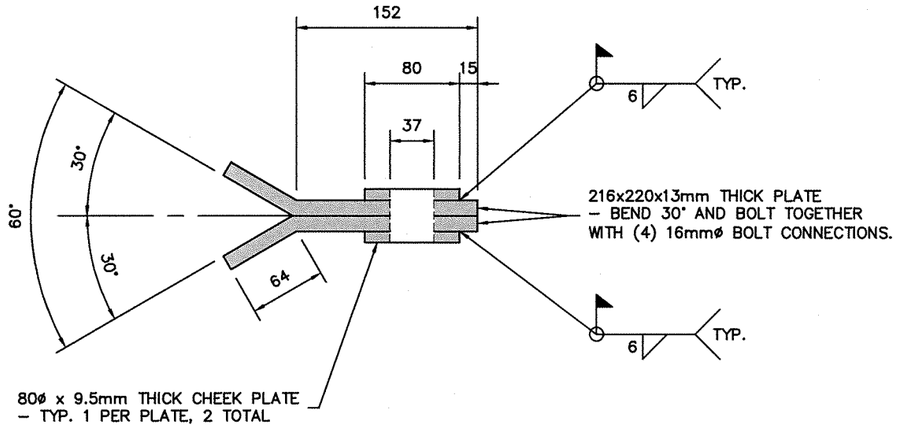
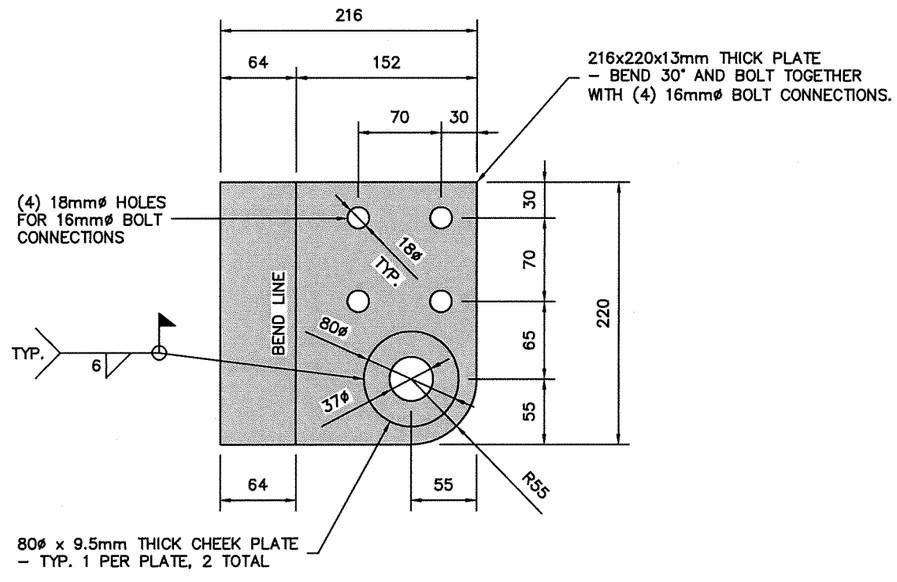


PLAN VIEW



ELEVATION VIEW

GUY LUG CONNECTION DETAIL

1:5

NOTE: CONTRACTOR TO FABRICATE, SUPPLY AND INSTALL GUY LUG CONNECTION AS SHOWN ABOVE OR ENGINEERED APPROVED EQUIVALENT)

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To practice Professional Engineering
In Newfoundland and Labrador.
Permit No. as Issued by PEG P0227
which is valid for the year 2018

REGISTERED PROFESSIONAL ENGINEER
PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
JONATHAN E. WALSH
SIGNATURE
July 30/19
DATE
NEWFOUNDLAND & LABRADOR

Department of Fisheries and Oceans
Canadian Coast Guard
Marine and Civil Infrastructure

TEI™
119 Springdale Street
St. John's, NL
Tel. (709) 579-6700
Fax. (709) 579-6701
www.tillerengineering.com

A founding member of STAC CSPA.
Structure, Tower & Antenna Council.
Conseil des structures, pylônes et antennes.

SITE : CUSLETT VHF, NL

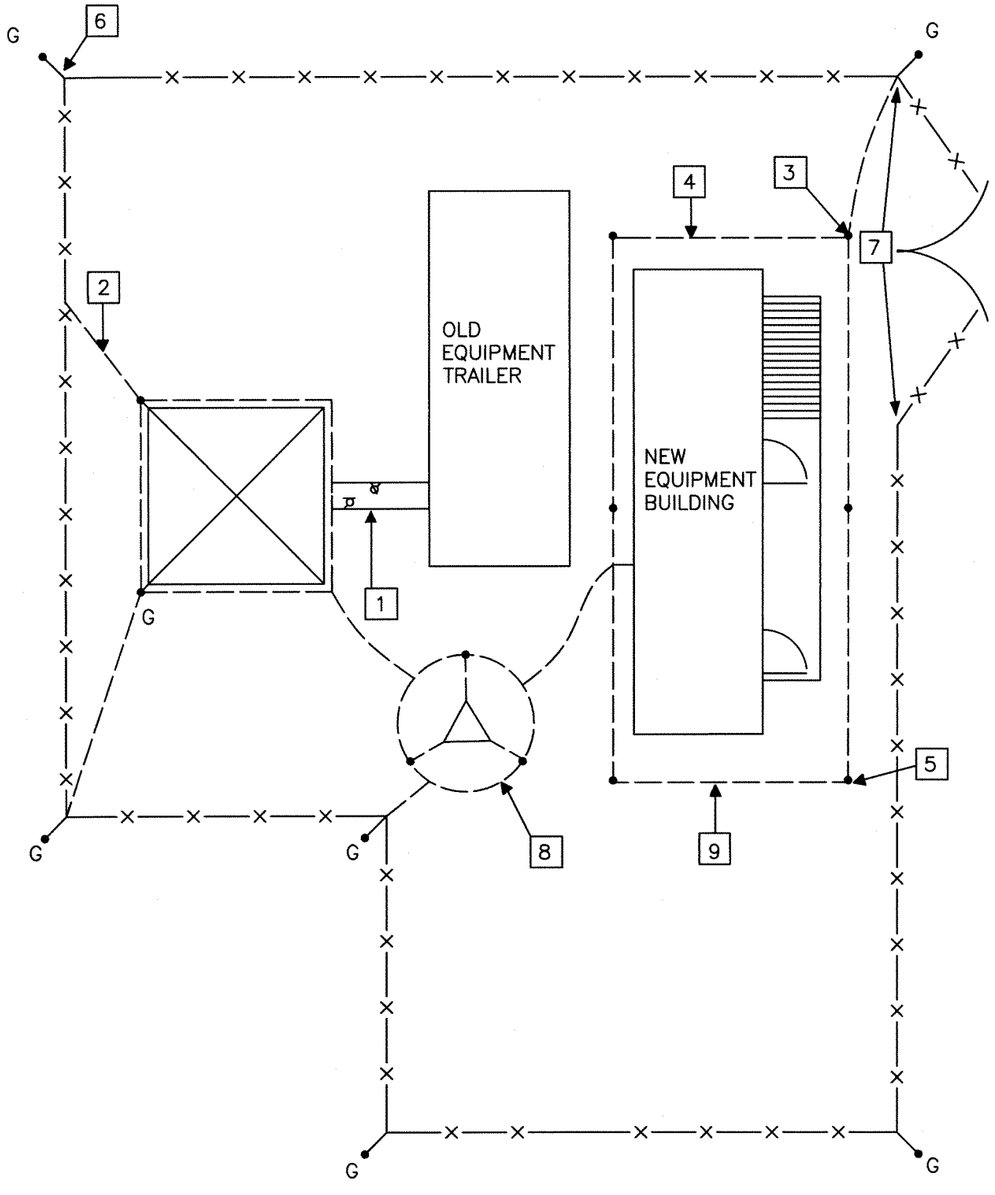
CODE : T3404

DRAWING TITLE :

GUY LUG CONNECTION DETAIL

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-08C



DRAWING NOTES:

1. WAVE GUIDE BRIDGE SUPPORTS TO BE EXOTHERMICALLY CONNECTED TO GROUND LOOP UPON REMOVAL OF OLD EQUIPMENT TRAILER
2. CONFIRMED FENCE GROUNDING TO BE TIED INTO EXTERNAL GROUND LOOP USING 2/0 BARE COPPER WIRE AND EXOTHERMIC CONNECTIONS
3. CONFIRMED EXOTHERMIC WELDED CONNECTION TYP
4. CONFIRMED 2/0 BARE COPPER WIRE
5. CONFIRMED 3/4" COPPER GROUND ROD TYP 4 CORNER POSTS
6. BONDED CORNERS OF FENCE AND GATE POSTS TO PERIMETER OR RADIAL GROUND USING AWG #2/0 TINNED STRANDED COPPER.
7. FENCE GATE WAS GROUNDED TO GATE POST USING 2/0 COPPER WIRE
8. CONFIRM INSTALLATION OF TOP AND BOTTOM GROUNDING FOR THE 7/8"Ø COAXIAL TX LINE TO THE SRL 227 ANTENNA
9. INSTALLED EXTERNAL GROUND LOOP AROUND NEW EQUIPMENT BUILDING USING 2/0 BARE COPPER WIRE.. .

PROVINCE OF NEWFOUNDLAND AND LABRADOR

PEG Newfoundland and Labrador PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

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 2018

REGISTERED PROFESSIONAL ENGINEER
PEG Newfoundland and Labrador
JONATHAN E. WALSH
SIGNATURE
July 30/18
DATE
NEWFOUNDLAND & LABRADOR

Department of Fisheries and Oceans
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SITE : CUSLETT VHF, NL

CODE : T3404

DRAWING TITLE :

EXISTING SITE GROUNDING DETAILS

REV.	DESCRIPTION	DATE	DWN BY	CHK BY	APP BY
R0	ISSUED FOR TENDER	2018-JUL-30	J.D.	J.W.	J.W.

SCALE :	AS SHOWN
DATE :	2018-JUL-30
DRAWN BY :	J. DOYLE
APPROVED BY :	J. WALSH
FILE No :	2018-44
DRAWING No :	T3404-09

Appendix C

Environment Canada Site Specific Wind Data

Cuslett, NL 45.7m Tower

Site-Specific 10-yr. Wind Pressure Report (V2.1 2016-01-04 Format)

Site Information:

Name: Cuslett, NL
Latitude: 46° 58' 27.9" N
Longitude: 54° 9' 14.8" W
Tower Height (m): 45.7
Elevation MSL (m): 134.5

Results:

Note: Following direction from the S37 Committee, Qe can no longer be provided.

Q_{nbc} (Pa):	600	$Q_{nbc} = 600(Z/10)^{0.2}$	V_{nbc} = 68.15 mph
Icing:	As per CAN/CSA S37-13		
Q_{Min} (Pa)	250	$Q_{Min} = 250(Z/10)^{0.2}$	V_{Min} = 43.99 mph

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[0.1625\, e^{(-0.0025\, z)} + 1.2124\, \ln(z/0.2000) / \ln(z/0.0500)]\, 68.27\}^2\, (z/10)^{0.200}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\, e^{(-a2\, z)} + a_3\, \ln(z/z_h) / \ln(z/z_{01})]\, v_{01}\}^2\, (z/10)^{0.200}$$

Site Values of Coefficients:

$$a_1 = 0.1625,\ a_2 = 0.0025,\ a_3 = 1.2124,\ z_h = 0.2000,\ z_{01} = 0.0500,\ v_{01} = 68.27 \text{ mph}$$

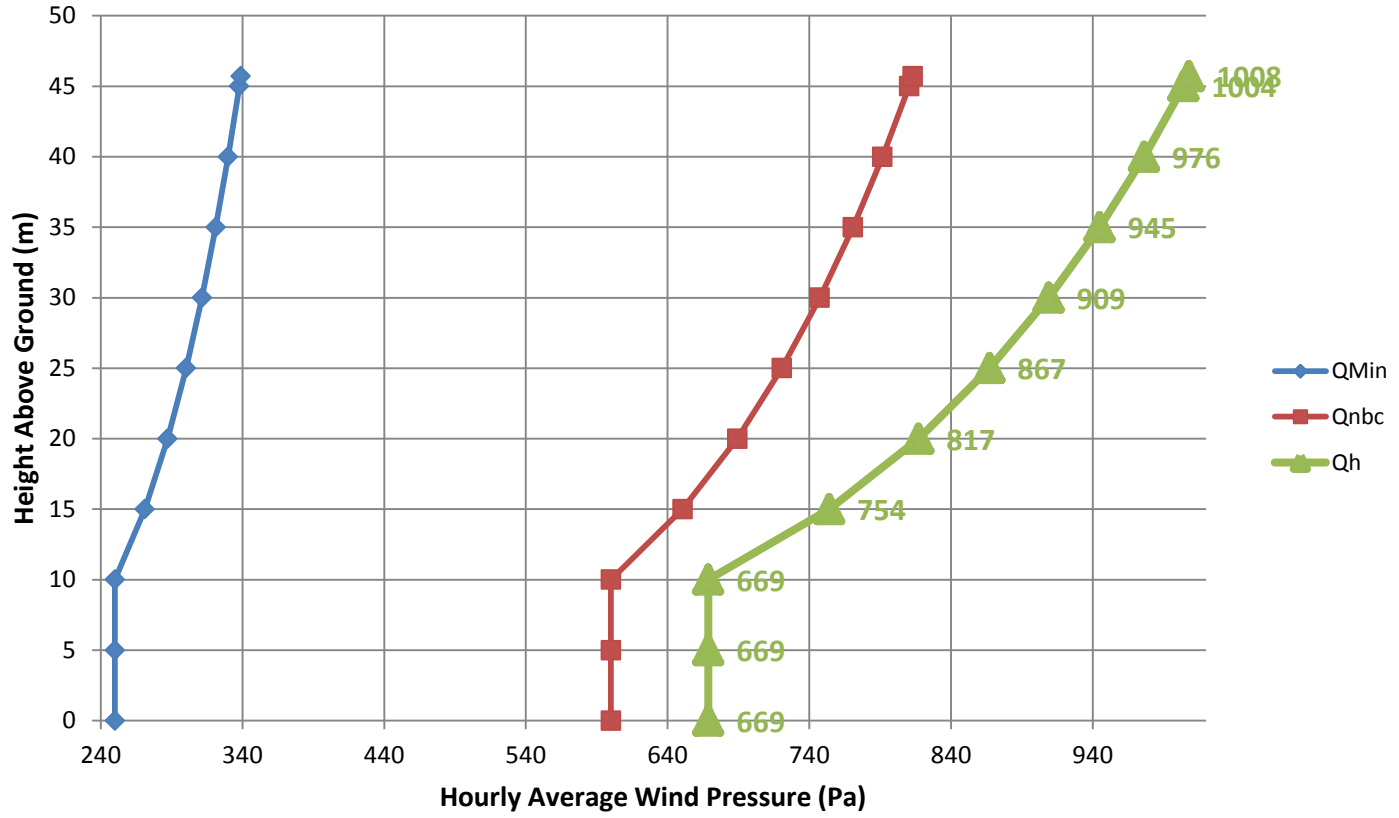
Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.
Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q_{nbc} value is profiled with the $^2/_{10}$ power law.
Q_{Min}: Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law as per Section 5.4.1 of S37-13.

Wind Pressure Formula: Formula for the design wind pressure as a function of height. (Ref.: S37-13, 5.3.1)
Height (Z): the vertical distance (m) above ground level at the base of the tower.

Note: No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].



Q_{nbc} Profile: Regionally representative reference wind profiled with the $^{2}/_{10}$ power law.
Q_{Min} Profile: Minimum site-specific wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^{2}/_{10}$ power law.
Q_h Profile: The site-specific wind pressure profile directly from the Taylor and Lee (1984) simple guidelines.

Explanatory notes regarding the new report format and changes to calculation methods.

1. The most significant change from the previous versions of the reports is that the exponent used in the Q_h equation is no longer fixed at 0.2. The exponent now varies continuously from 0.2 for open terrain to 0.32 for closed terrain.
2. A new Q_{min} profile has been added to the graphs and it represents the minimum acceptable reference wind pressure profile. It starts with the minimum 10-metre reference wind pressure of 320 Pa for a 50-year return period as per section 5.4.1 of S37-13 and then uses the same $^{2}/_{10}$ power law formulation as the Q_{NBC} profile to generate the curve. The corresponding 10-metre reference wind pressures for the 10-year and 30-year return periods are 250 Pa and 300 Pa respectively.
3. Q_h will always be plotted even when they are less than Q_{Min}. This will allow designers to see how Q_h varies over the height of the tower. Also, in rough terrain and for taller towers, the Q_h profile might cross the Q_{Min} profile.
4. The coefficients for the Q_h equation will now always be given regardless of the Q_{NBC} or Q_{Min} values.
5. The wind speeds will be given for each of the 4 equations (Q_h, Q_{NBC}, or Q_{Min}) too.

Cuslett, NL 45.7m Tower

Site-Specific 30-yr. Wind Pressure Report (V2.1 2016-01-04 Format)

Site Information:

Name: Cuslett, NL
Latitude: 46° 58' 27.9" N
Longitude: 54° 9' 14.8" W
Tower Height (m): 45.7
Elevation MSL (m): 134.5

Results:

Note: Following direction from the S37 Committee, Qe can no longer be provided.

Q_{nbc} (Pa):	720	$Q_{nbc} = 720(Z/10)^{0.2}$	V_{nbc} = 74.65 mph
Icing:	As per CAN/CSA S37-13		
Q_{Min} (Pa)	300	$Q_{Min} = 300(Z/10)^{0.2}$	V_{Min} = 48.19 mph

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[0.1625\, e^{(-0.0025\, z)} + 1.2124\, \ln(z/0.2000) / \ln(z/0.0500)]\, 74.72\}^2\, (z/10)^{0.200}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\, e^{(-a2\, z)} + a_3\, \ln(z/z_h) / \ln(z/z_{01})]\, v_{01}\}^2\, (z/10)^{0.200}$$

Site Values of Coefficients:

$$a_1 = 0.1625,\ a_2 = 0.0025,\ a_3 = 1.2124,\ z_h = 0.2000,\ z_{01} = 0.0500,\ v_{01} = 74.72 \text{ mph}$$

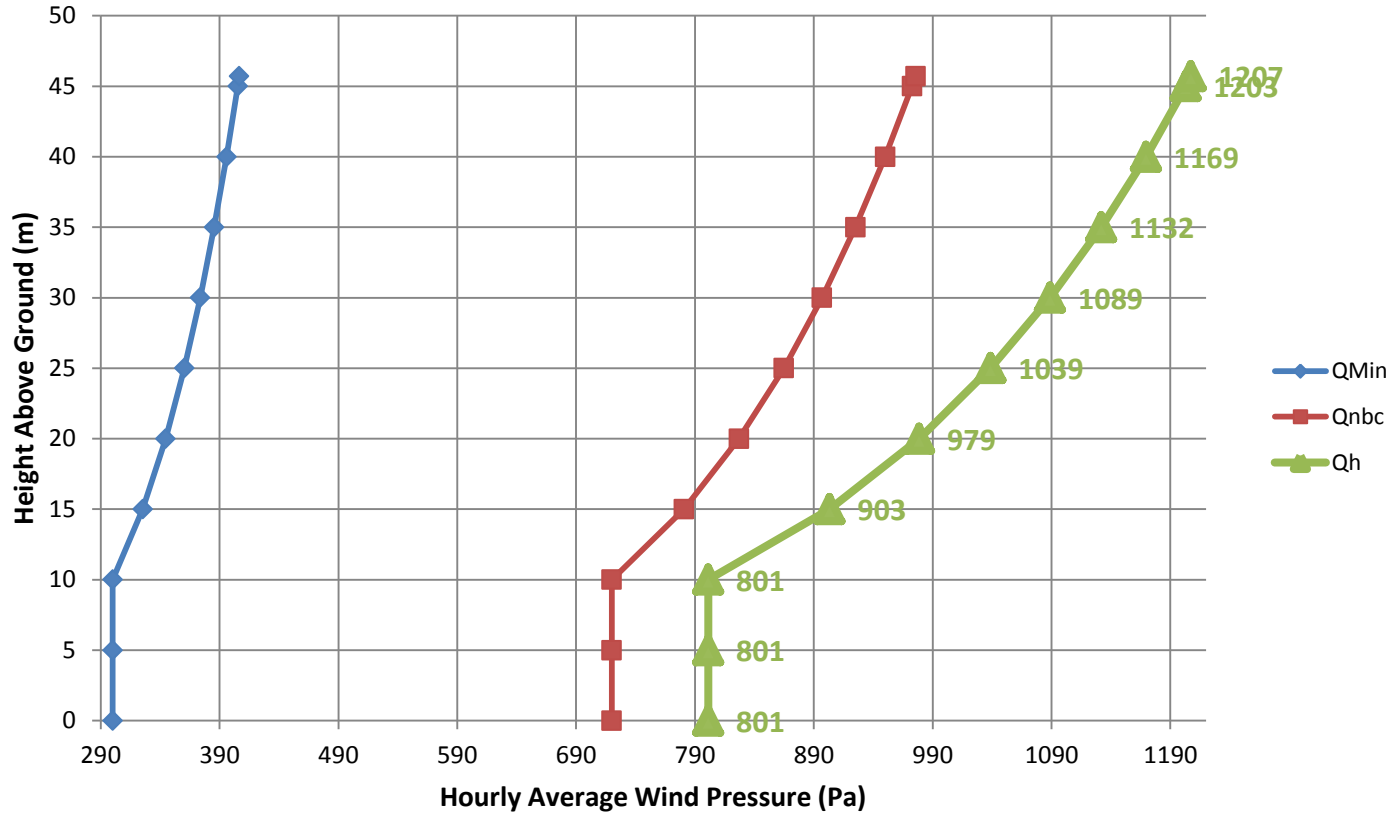
Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.
Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q_{nbc} value is profiled with the $^2/_{10}$ power law.
Q_{Min}: Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law as per Section 5.4.1 of S37-13.

Wind Pressure Formula: Formula for the design wind pressure as a function of height. (Ref.: S37-13, 5.3.1)
Height (Z): the vertical distance (m) above ground level at the base of the tower.

Note: No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].



Q_{nbc} Profile: Regionally representative reference wind profiled with the $^{2}/_{10}$ power law.
Q_{Min} Profile: Minimum site-specific wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^{2}/_{10}$ power law.
Q_h Profile: The site-specific wind pressure profile directly from the Taylor and Lee (1984) simple guidelines.

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3. Q_h will always be plotted even when they are less than Q_{Min}. This will allow designers to see how Q_h varies over the height of the tower. Also, in rough terrain and for taller towers, the Q_h profile might cross the Q_{Min} profile.
4. The coefficients for the Q_h equation will now always be given regardless of the Q_{NBC} or Q_{Min} values.
5. The wind speeds will be given for each of the 4 equations (Q_h, Q_{NBC}, or Q_{Min}) too.

Cuslett, NL 45.7m Tower

Site-Specific 50-yr. Wind Pressure Report (V2.1 2016-01-04 Format)

Site Information:

Name:	Cuslett, NL
Latitude:	46° 58' 27.9" N
Longitude:	54° 9' 14.8" W
Tower Height (m):	45.7
Elevation MSL (m):	134.5

Results:

Note: Following direction from the S37 Committee, Qe can no longer be provided.

Q_{nbc} (Pa):	780	$Q_{nbc} = 780(Z/10)^{0.2}$	V_{nbc} = 77.7 mph
Icing:	As per CAN/CSA S37-13		
Q_{Min} (Pa)	320	$Q_{Min} = 320(Z/10)^{0.2}$	V_{Min} = 49.77 mph

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[0.1625\, e^{(-0.0025\, z)} + 1.2124\, \ln(z/0.2000) / \ln(z/0.0500)]\, 77.67\}^2\, (z/10)^{0.200}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\, e^{(-a2\, z)} + a_3\, \ln(z/z_h) / \ln(z/z_{01})]\, v_{01}\}^2\, (z/10)^{0.200}$$

Site Values of Coefficients:

$$a_1 = 0.1625,\ a_2 = 0.0025,\ a_3 = 1.2124,\ z_h = 0.2000,\ z_{01} = 0.0500,\ v_{01} = 77.67 \text{ mph}$$

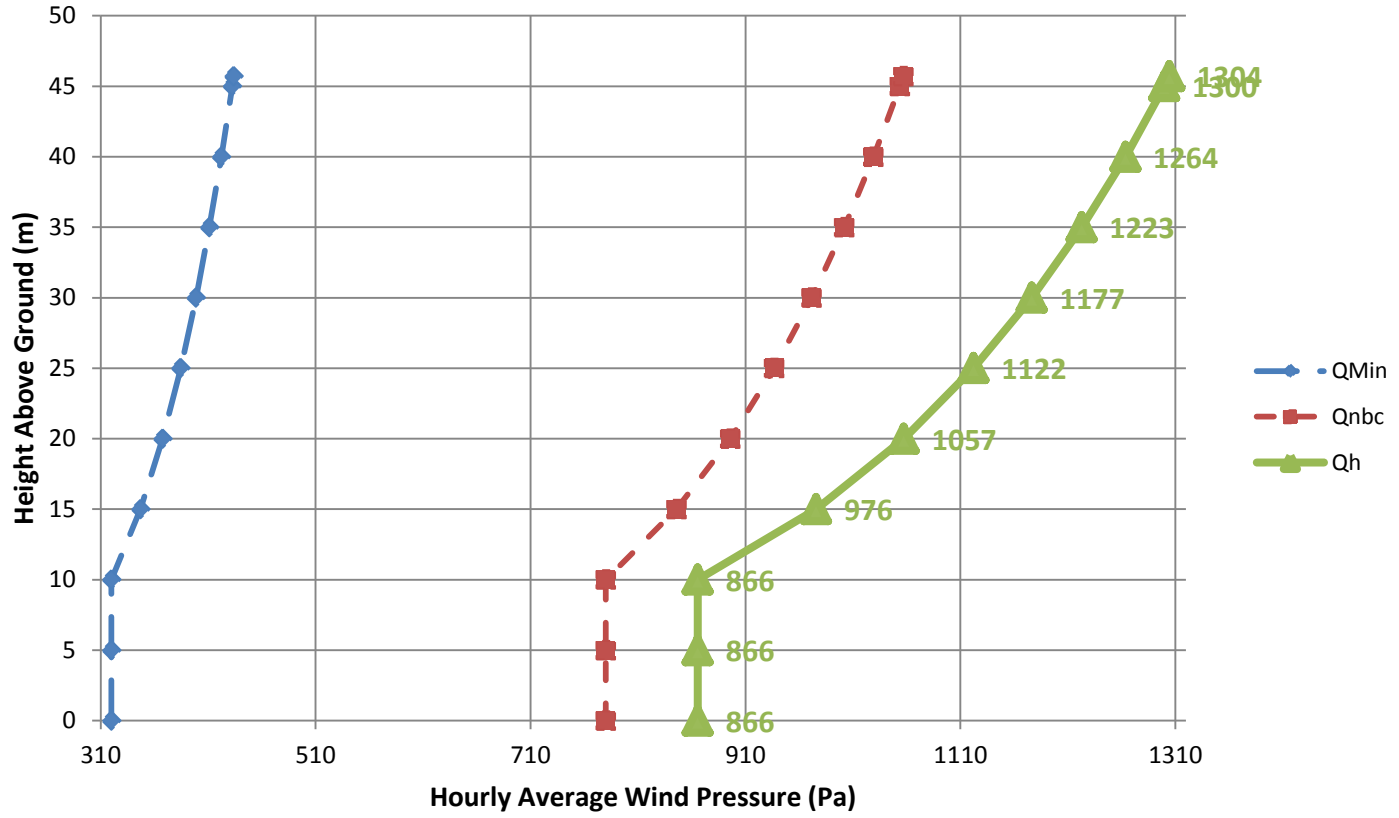
Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.
Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada and the Q_{nbc} value is profiled with the $^2/_{10}$ power law.
Q_{Min}: Minimum reference wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law as per Section 5.4.1 of S37-13.

Wind Pressure Formula: Formula for the design wind pressure as a function of height. (Ref.: S37-13, 5.3.1)
Height (Z): the vertical distance (m) above ground level at the base of the tower.

Note: No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].



Q_{nbc} Profile: Regionally representative reference wind profiled with the $^{2}/_{10}$ power law.
Q_{Min} Profile: Minimum site-specific wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^{2}/_{10}$ power law.
Q_h Profile: The site-specific wind pressure profile directly from the Taylor and Lee (1984) simple guidelines.

Explanatory notes regarding the new report format and changes to calculation methods.

1. The most significant change from the previous versions of the reports is that the exponent used in the Q_h equation is no longer fixed at 0.2. The exponent now varies continuously from 0.2 for open terrain to 0.32 for closed terrain.
2. A new Q_{min} profile has been added to the graphs and it represents the minimum acceptable reference wind pressure profile. It starts with the minimum 10-metre reference wind pressure of 320 Pa for a 50-year return period as per section 5.4.1 of S37-13 and then uses the same $^{2}/_{10}$ power law formulation as the Q_{NBC} profile to generate the curve. The corresponding 10-metre reference wind pressures for the 10-year and 30-year return periods are 250 Pa and 300 Pa respectively.
3. Q_h will always be plotted even when they are less than Q_{Min}. This will allow designers to see how Q_h varies over the height of the tower. Also, in rough terrain and for taller towers, the Q_h profile might cross the Q_{Min} profile.
4. The coefficients for the Q_h equation will now always be given regardless of the Q_{NBC} or Q_{Min} values.
5. The wind speeds will be given for each of the 4 equations (Q_h, Q_{NBC}, or Q_{Min}) too.

Appendix D

Structural Analysis Report

CCG
STRUCTURAL ANALYSIS

45.72m GUYED KNOCK DOWN TOWER
OWNED BY CCG

Cuslett, NL

Prepared by:

TEI
119 Springdale St.
St. John's, NL,
Canada

Prepared for:

Aaron Slaney
CCG

Issue Date:	Status:	Project #:	Issued By:	Reviewed By:	Approved By:
April 27, 2018	R0 – Issued to Client	2018-44	JCW	JW	JW

TABLE OF CONTENTS

1.0 Introduction

As per instructions, we have analyzed the CCG owned 45.72m triangular cross section, guyed all-weld tower. This tower was originally installed at Pearce Peak and is being re-located to the CCG Custlett tower site. The existing tower will be modified by removing all the current torsion resistors at each guy level for re-installation at Cuslett.

The structural analysis was performed to assess whether the tower meets the strength requirements of CSA S37-13 with the addition of proposed antennas as shown on the attached tower profile. This analysis only includes the tower structure. The foundations will be designed at a later date based on loads provided in this report.

Structure Detail

Height:	45.72m
Type:	Guyed Knock Down
Name:	Cuslett, NL
Latitude (N):	46º 58' 27.9"
Longitude (W):	54º 9' 14.8"

Analysis Parameters

Standard:	CSA S37-13
Ice Loading:	35 mm glazed radial
Wind Loading:	866 Pa (Site Specific 1/50yr Wind Data)
Reliability Class:	I
Serviceability Factor:	669 Pa (Site Specific 1/10yr Wind Data)
Loading Combinations:	24 Load Cases (12 bare, 12 iced)

Sources of Information

Tower Drawings:	None
Structural Mapping:	None
Reports:	None
Environmental Data:	Environment Canada Site Specific Wind Data dated April 4, 2018
Correspondence:	Email from Aaron Slaney dated April 10, 2018
RF Design:	Proposed Antenna Arrangement dated March 20, 2018
Geotechnical Report:	None

2.0 Assumptions

Several assumptions were made in order to facilitate our analysis. General assumptions are included in Section 5.0. If you have any knowledge which would indicate they do not accurately represent the existing tower, proposed and existing antenna and transmission line arrangements, or site specific information, we must be notified so that we can make the appropriate changes to our analysis, conclusions and any recommendations.

Project specific assumptions utilized in completing our structural analysis include:

1. The yield strength for the tower legs and diagonals was taken as 350W. Horizontals and all other structural members were taken as 300W.

2. The tower members, connections, and other relevant components are in good condition and are capable of carrying their full design capacity based on a recent visual tower maintenance inspection.

3. Antennas and line loading for inclusion into the modeling programs were retrieved from the proposed antenna arrangement.

4. Bluewave (V) BMY 146Y-4 (Antenna #7) has since been eliminated from the proposed antenna arrangement by the RCMP but is still considered for this analysis.

3.0 Analysis Results

Based on the above information and assumptions, our analysis results indicate that the tower **DOES NOT experience overloads** under the proposed loading in accordance with the strength requirements of CSA S37-13.

Graphical tower loading and capacity results are provided in Appendix C.

Foundations were not evaluated as part of this analysis. Foundations to be designed at a later date based on the following:

- Foundation Base:
  - Axial = 492.2 kN
  - Shear N-S = -26.22 kN
  - Shear E-W = 24.33 kN
  - Moment N-S = 0 kN-m
  - Moment E-W = -0.01 kN-m
  - Torsion = 1.14 kN-m
- Guy Anchors:
  - Level 1 @ 23.2: Tension at Anchor = 117.70 kN
  - Level 2 @ 41.5: Tension at Anchor = 116.10 kN

For your information, we have attached the tower profile and loading chart, as well as graphical analysis results.

4.0 Conclusions

Based on the above information, particulars and assumptions, our analysis results indicate that the tower structure **DOES NOT experience overloads** when assessed in accordance with the strength requirements of CSA S37-13 under Class I Reliability. As a result the tower **is capable of supporting the proposed loading.**

We trust the forgoing is satisfactory. If you have any questions or comments, please contact the undersigned.

Jon Wong, P. Eng.
Structural Engineer
Tiller Engineering Inc.
119 Springdale Street
P.O. Box 403, 50 Hamlyn Road Plaza
St. John's, NL, Canada
A1E 5X7

Phone: (709) 579-6700
Fax: (709) 579-6701
Email: jwong@tei-inc.ca
Web: www.tillerengineering.com
Toll Free: 1-877-907-6700

5.0 General Notes & Assumptions

1. All Results plus Conclusions derived from this analysis report are as accurate as the information provided to Tiller Engineering Inc.

2. All Results plus Conclusions and recommendations are based on analysis results for Reliability Class I. This is the most conservative case whereby the target failure probability is 0.01% over a 50 year period, since any failure would result in unacceptable risk of injury and/or interrupted service.

3. Should the Client wish to accept some measure of risk, Tiller Engineering Inc. can re-evaluate the results, conclusions and recommendations based on either Reliability Class II or III at the Client's request.

4. This analysis is completed in accordance with the strength/safety (Ultimate Limit States-ULS) and antenna service (Serviceability Limit States-SLS) requirements of CSA S37-13.

5. In our analysis, twenty-four (24) load cases are evaluated: twelve (12) wind directions under (a) full design wind pressure without ice and (b) half design wind plus full ice thickness.

6. Our assessment is based on the maximum CSA S37-13 recommended ice thickness. These figures are general in nature and based on Environment Canada data. Site specific ice loading could change considerably. If you have any site specific information which would indicate that greater uniform accumulations of ice are likely to occur, please contact us immediately since this analysis would not be valid.

7. ULS evaluation compares the minimum factored resistance governed by either members or connections with factored loads resulting from wind and/or ice (maximum governing) applied to the structure.

8. SLS evaluation reports deflection of microwave antenna beams as a result of applied service loads, if applicable. Unless specified by the owner, total deflection is compared against antenna manufacturer data for ½ antenna beam width. The owner may also specify operational availability for the analysis, used in calculating service loads (default for our analyses is a serviceability factor of 1).

9. The analysis does not constitute an approval/disapproval of the physical condition of the structure. Unless noted otherwise, Tiller Engineering Inc. assumes the physical condition of the structure does not impair its performance under ULS or SLS. A thorough inspection of the actual tower conditions is recommended by CSA S37-13 prior to any analysis or modifications to the structure. This should be completed by qualified engineering personnel if it has not been done immediately prior to the analysis. Tiller Engineering Inc. cannot comment on any capacity effects due to condition of subsurface foundations unless a thorough on-site evaluation is performed.

10. Azimuths are generally referenced to True North unless otherwise indicated.

11. This report is only valid if antennas and lines are installed as listed above. Any changes should be forwarded to Tiller Engineering Inc.'s attention for further assessment.

12. This tower analysis report is intended to verify the adequacy of the **main** tower structural components. Legs, diagonals and guys were checked and are an indication of the adequacy of the complete tower system.

13. The loading considered in our analysis includes all existing antennas, transmission lines and other appurtenances as shown in Appendix A.

14. The tower and its foundation system have been properly constructed as per the original design drawings and specifications and able to resist the original design loads.

15. The tower members, connections, foundations and other relevant components are in good condition and are capable of carrying their full design capacity.

16. Transmission lines and other linear attachments are assumed to act integral with the tower mast where warranted as per CSA S37-13.

17. New antennas and line loading for inclusion into the modeling programs were provided by CCG.

18. Initial guy tensions assumed to be 10% of breaking strength unless noted.

APPENDIX A

Environment Canada Site Specific Wind Data

Cuslett, NL 45.7m Tower

Site-Specific 50-yr. Wind Pressure Report (V2.1 2016-01-04 Format)

Site Information:

Name: Cuslett, NL
Latitude: 46° 58' 27.9" N
Longitude: 54° 9' 14.8" W
Tower Height (m): 45.7
Elevation MSL (m): 134.5

Results:

Note: Following direction from the S37 Committee, Qe can no longer be provided.

Q_{nbc} (Pa):	780	$Q_{nbc} = 780(Z/10)^{0.2}$	V_{nbc} = 77.7 mph
Icing:	As per CAN/CSA S37-13		
Q_{Min} (Pa)	320	$Q_{Min} = 320(Z/10)^{0.2}$	V_{Min} = 49.77 mph

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[0.1625\, e^{(-0.0025\, z)} + 1.2124\, \ln(z/0.2000) / \ln(z/0.0500)]\, 77.67\}^2\, (z/10)^{0.200}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\, e^{(-a2\, z)} + a_3\, \ln(z/z_h) / \ln(z/z_{01})]\, v_{01}\}^2\, (z/10)^{0.200}$$

Site Values of Coefficients:

$$a_1 = 0.1625,\ a_2 = 0.0025,\ a_3 = 1.2124,\ z_h = 0.2000,\ z_{01} = 0.0500,\ v_{01} = 77.67 \text{ mph}$$

Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.
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Wind Pressure Formula: Formula for the design wind pressure as a function of height. (Ref.: S37-13, 5.3.1)
Height (Z): the vertical distance (m) above ground level at the base of the tower.

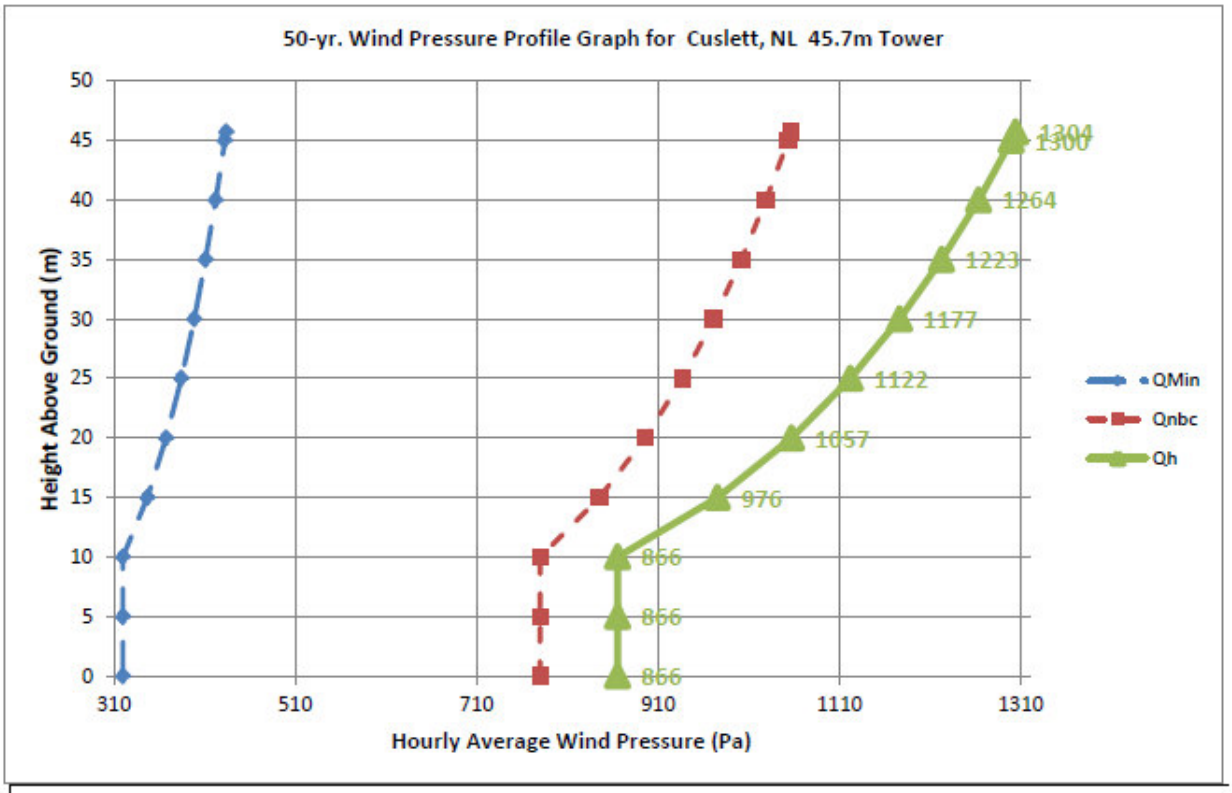
Note: No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].

April 04, 2018

Environment Canada Site Specific Wind Data

Cuslett, NL 45.7m Tower



Q_{NBC} Profile: Regionally representative reference wind profiled with the $^2/_{10}$ power law.
Q_{Min} Profile: Minimum site-specific wind pressure (320 Pa, 300 Pa, and 250 Pa for the 50-year, 30-year, and 10-year return periods respectively) profiled with the $^2/_{10}$ power law.
Q_h Profile: The site-specific wind pressure profile directly from the Taylor and Lee (1984) simple guidelines.

Explanatory notes regarding the new report format and changes to calculation methods.

1. The most significant change from the previous versions of the reports is that the exponent used in the Q_h equation is no longer fixed at 0.2. The exponent now varies continuously from 0.2 for open terrain to 0.32 for closed terrain.
2. A new Q_{min} profile has been added to the graphs and it represents the minimum acceptable reference wind pressure profile. It starts with the minimum 10-metre reference wind pressure of 320 Pa for a 50-year return period as per section 5.4.1 of S37-13 and then uses the same $^2/_{10}$ power law formulation as the Q_{NBC} profile to generate the curve. The corresponding 10-metre reference wind pressures for the 10-year and 30-year return periods are 250 Pa and 300 Pa respectively.
3. Q_h will always be plotted even when they are less than Q_{Min}. This will allow designers to see how Q_h varies over the height of the tower. Also, in rough terrain and for taller towers, the Q_h profile might cross the Q_{Min} profile.
4. The coefficients for the Q_h equation will now always be given regardless of the Q_{NBC} or Q_{Min} values.
5. The wind speeds will be given for each of the 4 equations (Q_h, Q_{NBC}, or Q_{Min}) too.

April 04, 2018

Environment Canada Site Specific Wind Data

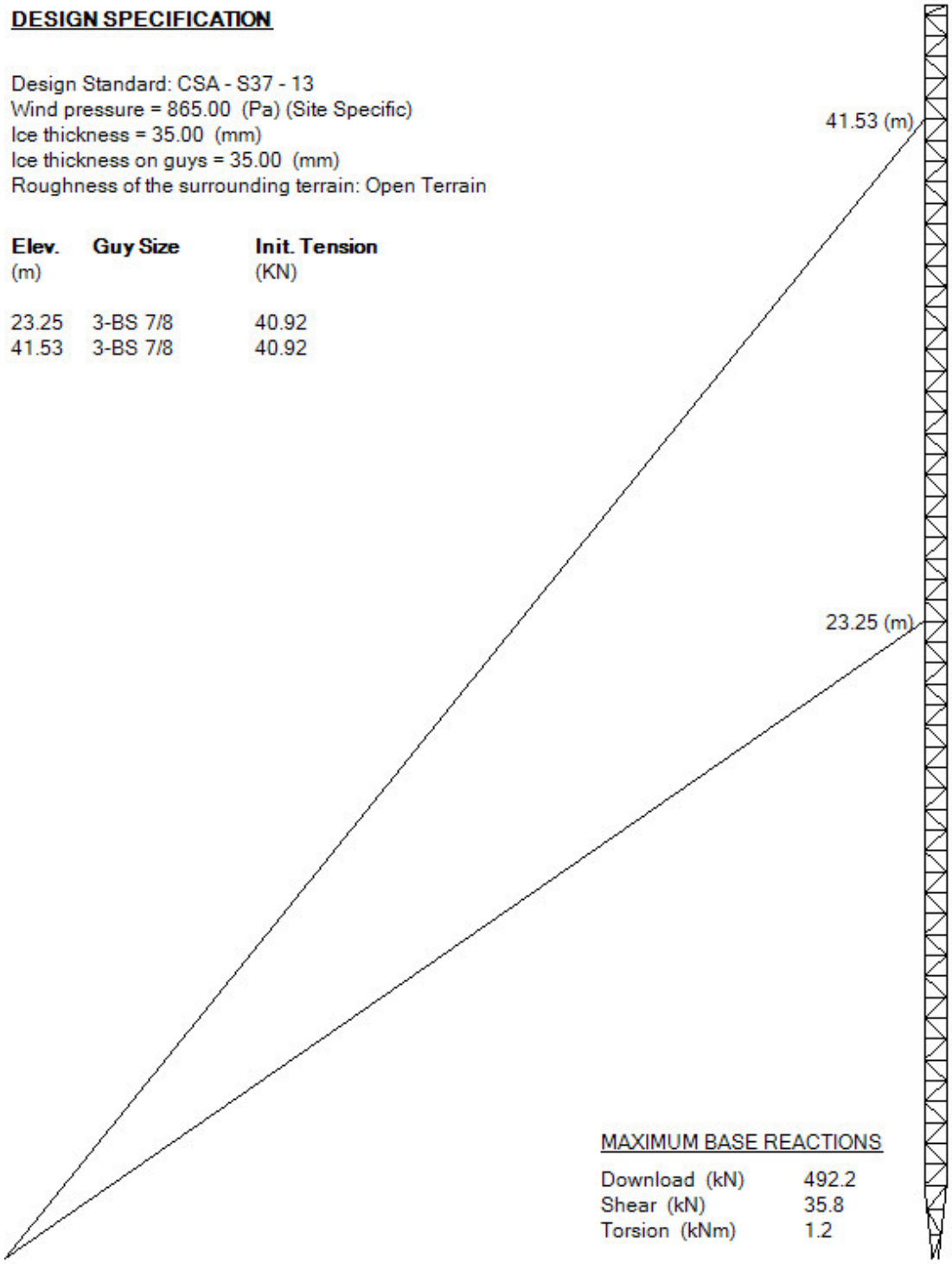
Appendix B

Tower Profile and Antenna Loading

DESIGN SPECIFICATION

Design Standard: CSA - S37 - 13
Wind pressure = 865.00 (Pa) (Site Specific)
Ice thickness = 35.00 (mm)
Ice thickness on guys = 35.00 (mm)
Roughness of the surrounding terrain: Open Terrain

Elev. (m)	Guy Size	Init. Tension (KN)
23.25	3-BS 7/8	40.92
41.53	3-BS 7/8	40.92



Tower Profile

ANTENNA AND TX LINE LOAD:

Ant#	Owner	Antenna Type	Elevation (m)	Azimuth	TX Line / RRUs	Status
1	CCG	SRL-210C-4	45.70	275°	22mm COAXIAL	PLANNED
2	CCG	SRL-210C-2	37.47	150°	13mm COAXIAL	PLANNED
3	CCG	SRL-210C-4	35.95	275°	22mm COAXIAL	PLANNED
4	CCG	SRL-227	35.03	36°	13mm COAXIAL	PLANNED
5	CCG	SRL-210C-4	27.41	275°	22mm COAXIAL	PLANNED
6	CCG	SRL-210C-2	20.56	275°	22mm COAXIAL	PLANNED
7	CCG	BLUEWAVE (V) (BMY 146Y-4)	17.35	44°	13mm COAXIAL	PLANNED
8	CCG	SRL-210C-2	15.57	275°	22mm COAXIAL	PLANNED
9	CCG	SRL-210C-2	10.45	275°	22mm COAXIAL	PLANNED

Note: The related information contained in the above table is the main contributor to the existing structural loading only. It is not intended to be a complete and exact inventory of all tower appurtenances. **BLACK** antennas are existing, **BLUE** are proposed antennas and TX lines, **RED** are to be removed and **GREEN** are future.

Legend: DC (V1) = Old Solution (4) Pair Power (Version 1)
DC (V2) = New Solution (4) Pair Power (Version 2)
FO (V1) = Old Solution (24) Pair Fiber (Version 1)
FO (V2) = New Solution (4) Pair Fiber (Version 2)
FO (V3) = New Solution (6) Pair Fiber (Version 3)

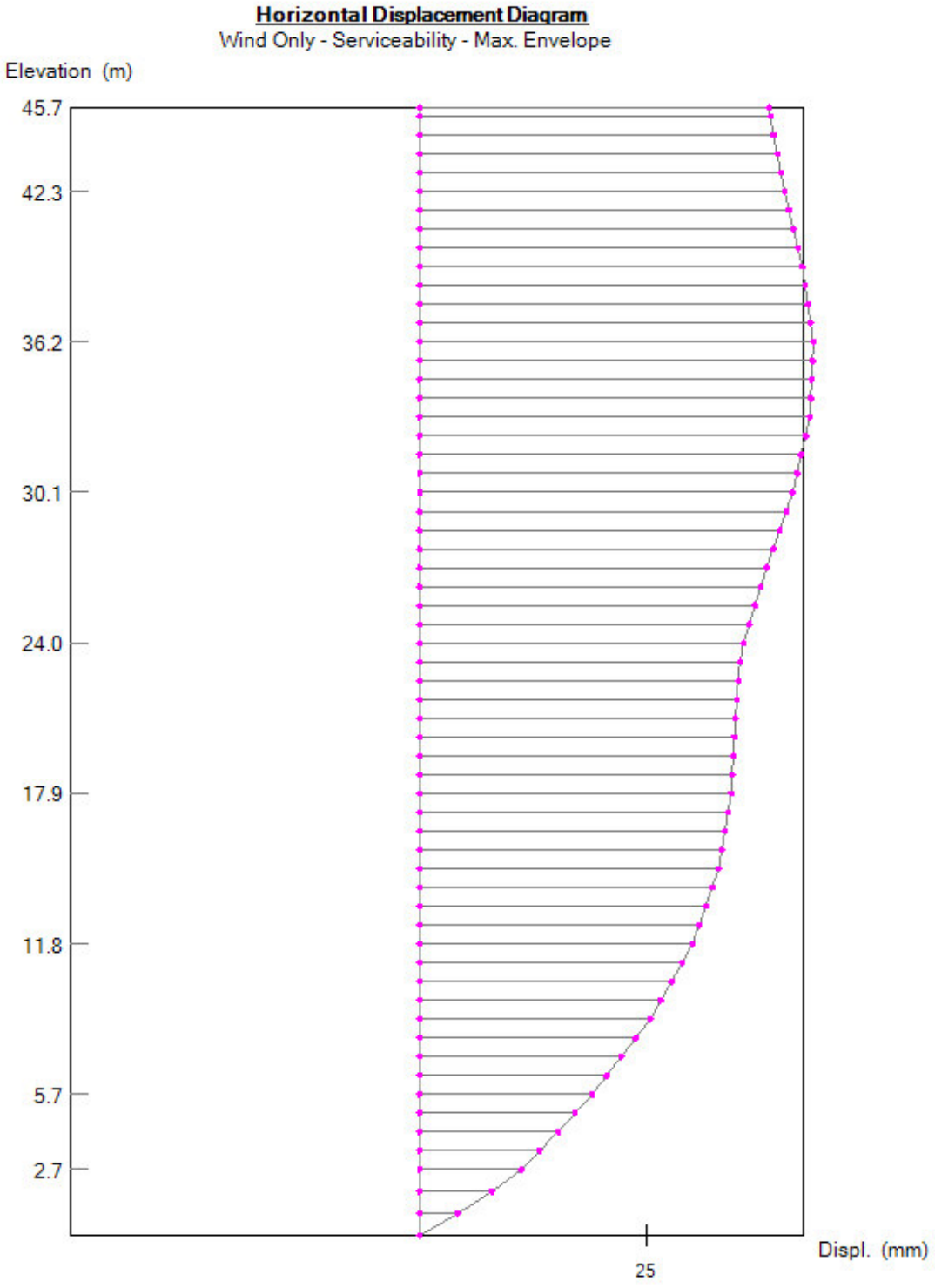
Appendix C

Graphical Analysis Results

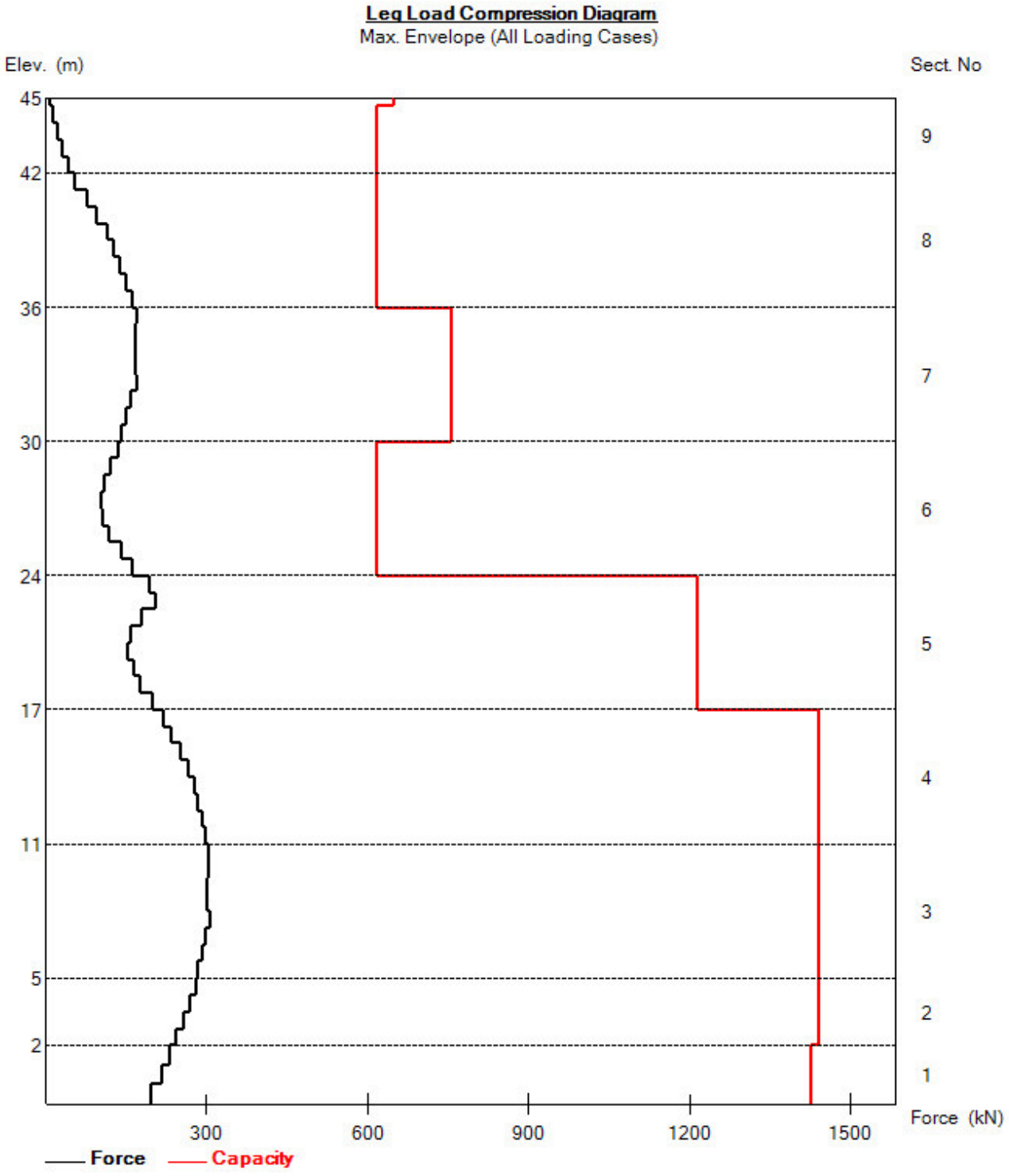
Section A: PROJECT DATA

```
Project Title:      SA+CIP
Customer Name:      CCG
Site:               Cuslett
Contract No.:       2018-44
Revision:           1
Engineer:           J.Wong
Date:               Apr 17 2018
Time:               11:19:27 AM

Design Standard:    CSA-S37-13

GENERAL DESIGN CONDITIONS

Start wind direction:                       0.00 (Deg)
End wind direction:                         330.00 (Deg)
Increment wind direction:                   30.00 (Deg)
Elevation above ground:                     0.00 (m)
Roughness of the surrounding terrain:       Open Terrain
Importance Factor:                          1.00
Serviceability Factor:                      1.00
Gust Factor Cg:                             2.0
Material Density:                           7850.0(kg/m^3)
Young's Modulus:                            199947.6 (MPa)
Poisson Ratio:                              0.30
Weight Multiplier:                          1.00

WIND ONLY CONDITIONS:
Wind pressure:                              865.00 (Pa)
Wind Load Factor:                           1.40
Dead Load Factor:                           1.25
Dead Load Factor for Uplift:                0.85
Dead Load Factor for Guys:                  1.00

WIND AND ICE CONDITIONS:
Wind pressure:                              865.00 (Pa)
Ice thickness:                              35.00 (mm)
Ice density:                                900.00(kg/m^3)
Ice thickness on guys:                      35.00 (mm)
Ice density on guys:                        900.00(kg/m^3)
Wind Load Factor:                           1.40
Dead Load Factor:                           1.25
Ice Load Factor:                            1.45
Dead Load Factor for Guys:                  1.00
Temperature Reduction with Ice: 10.0 (Deg. Celsius)

WIND ONLY SERVICEABILITY CONDITIONS:
Wind pressure:                              668.00 (Pa)
Wind Load Factor:                           1.00
Dead Load Factor:                           1.00
Dead Load Factor for Guys:                  1.00

Site Specific Wind:           Yes

Site specific Wind Pressure Profile Formula Coefficients:
a1:           0.1625
a2:           0.00250
a3:           1.212
Zh:           0.200
Z01:          0.050
V01:          77.670
V01 (10 year):68.270

Additional axial forces in horizontal members at Guy and Torsion Resistor levels due to local effect
of Guys and/or TRs are considered.

Analysis performed using: TowerSoft Finite Element Analysis Program
```

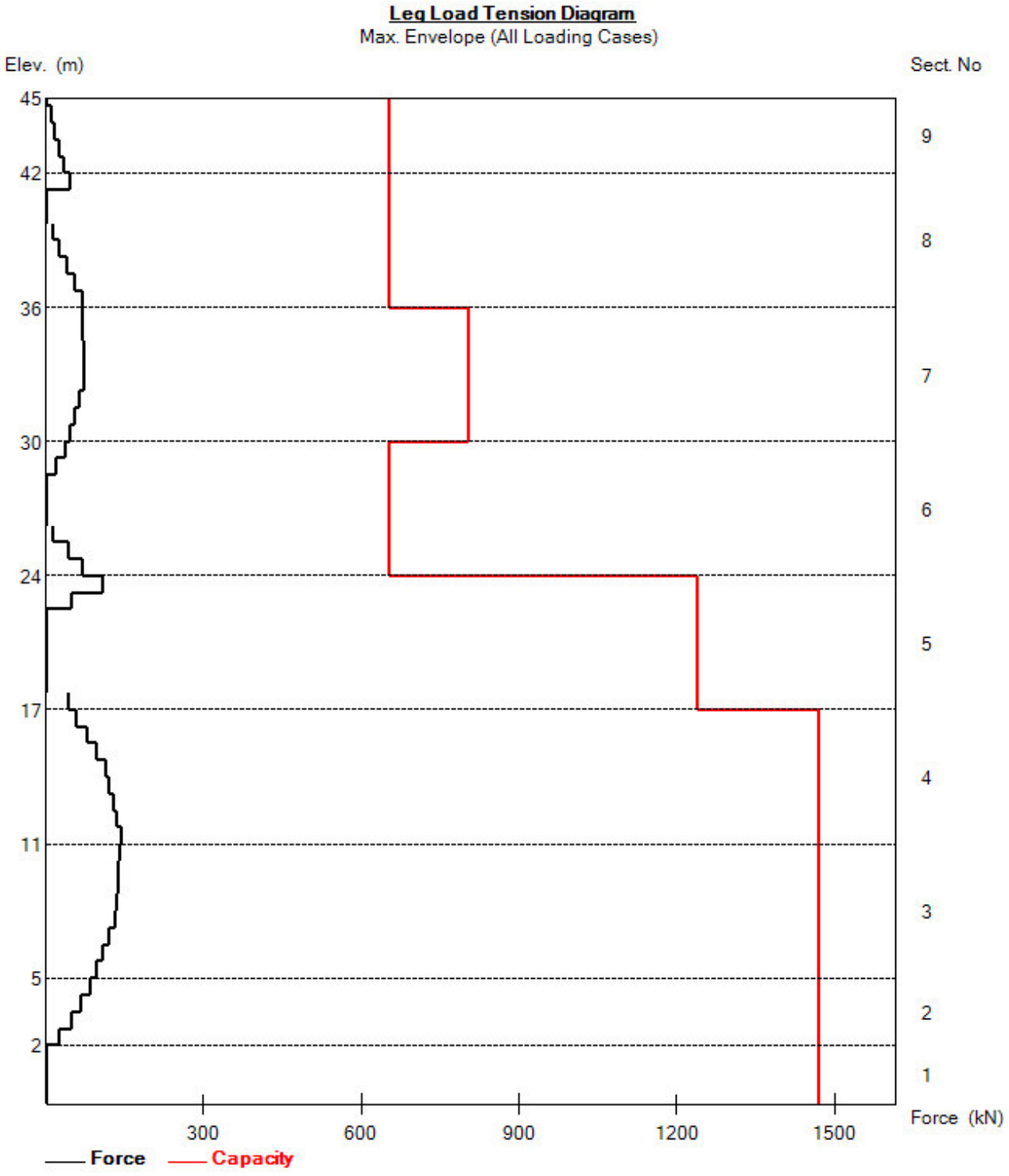
Project Data



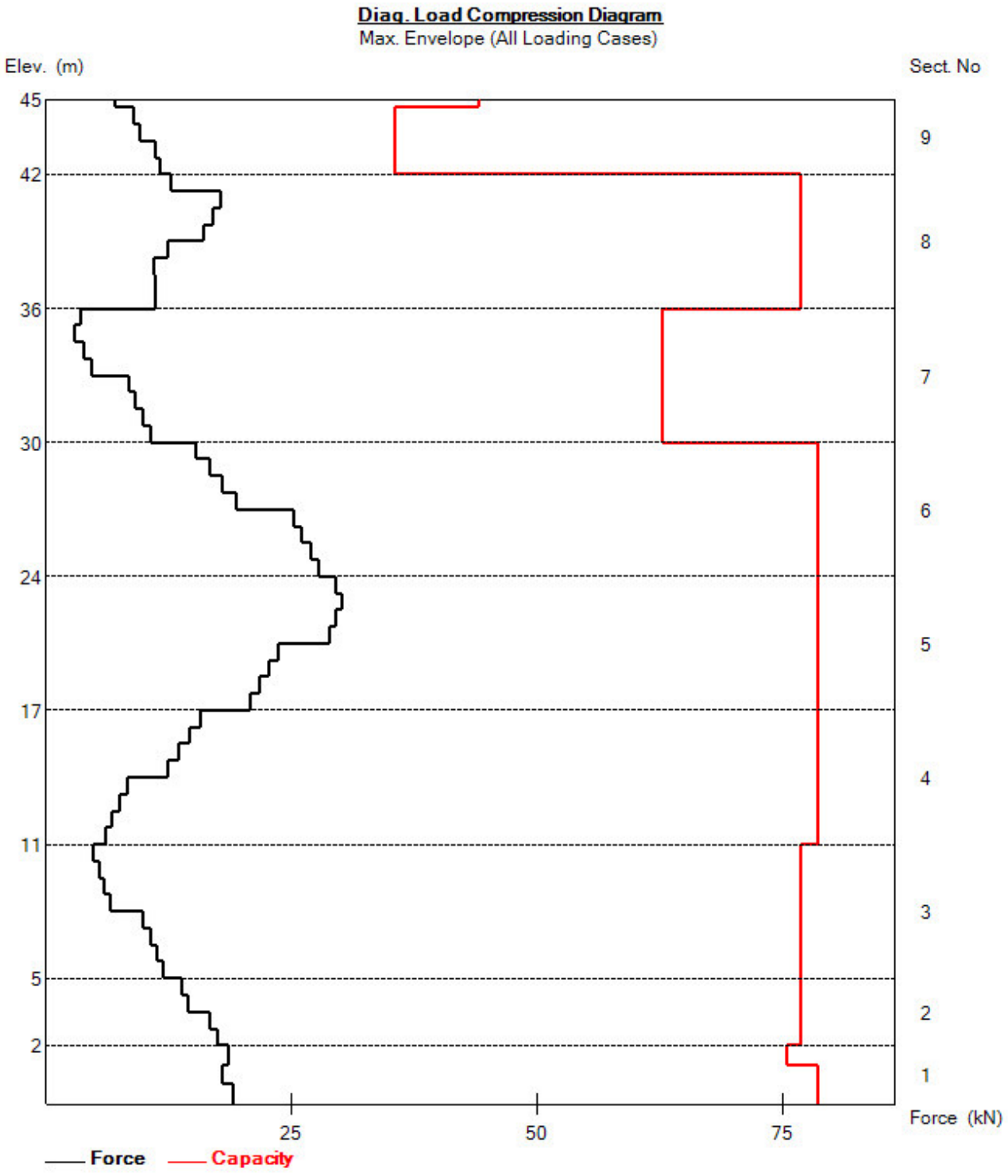
Horizontal Displacement
Under Serviceability Conditions



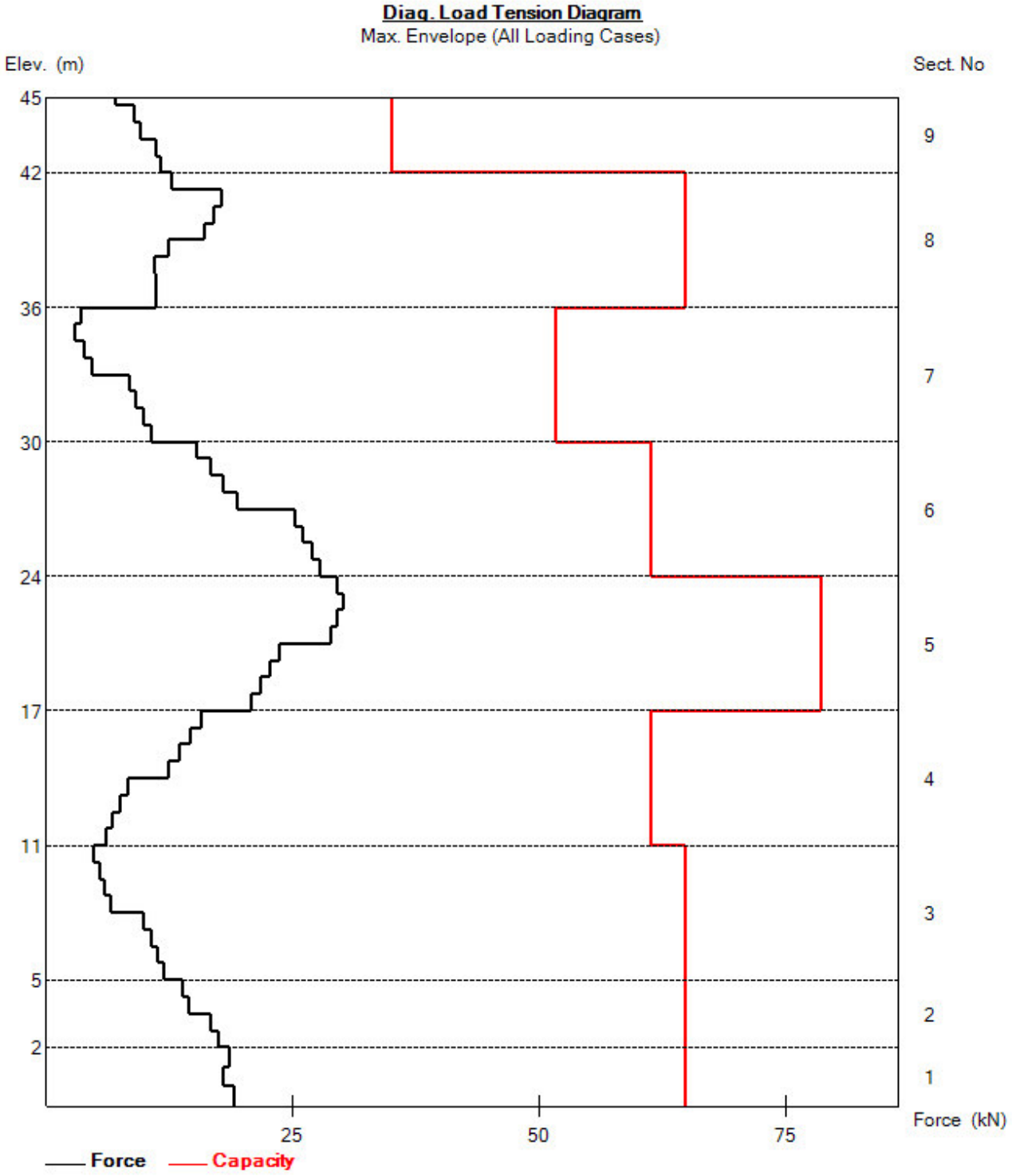
Leg Compression
Class I Reliability



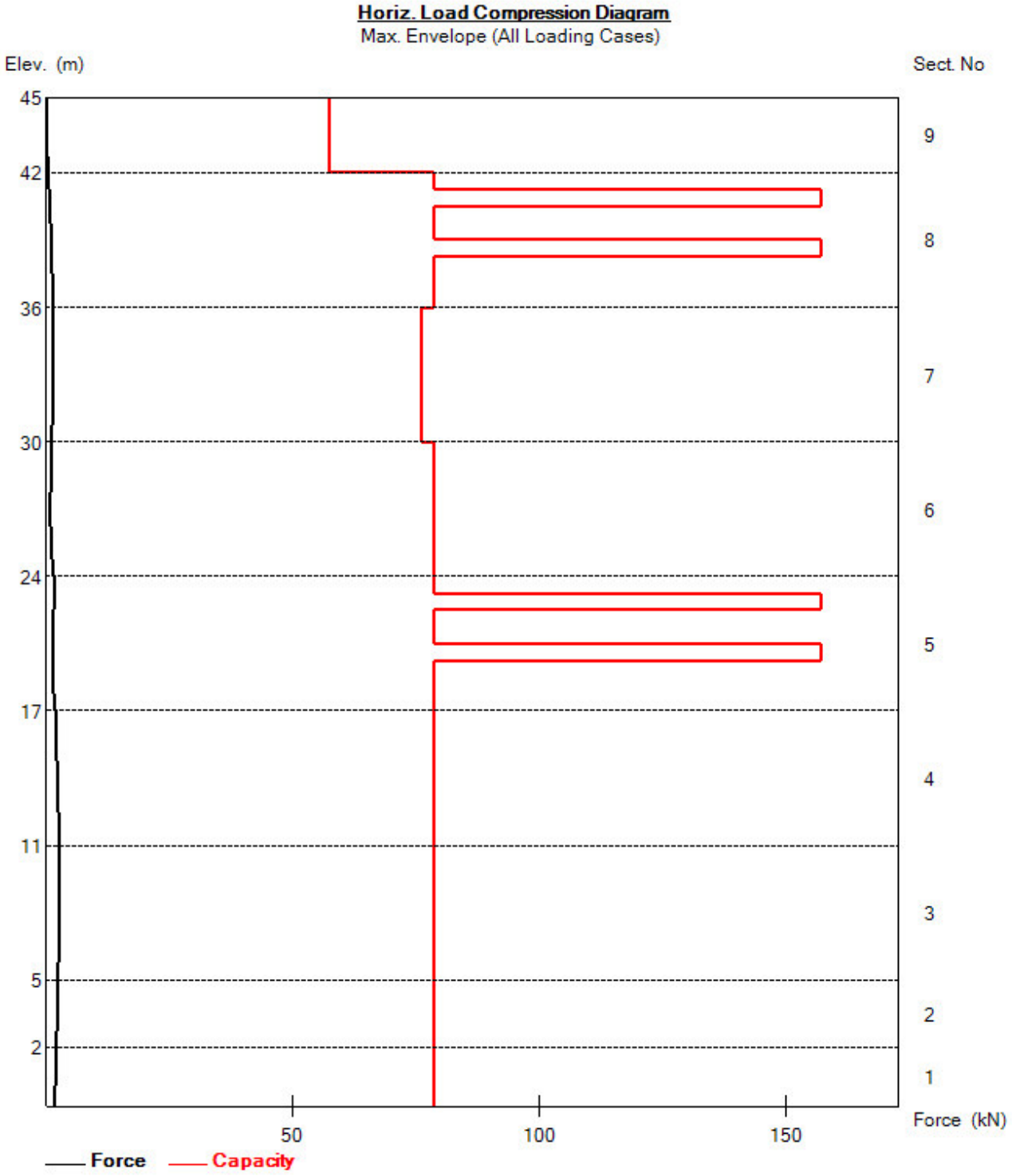
Leg Tensions
Class I Reliability



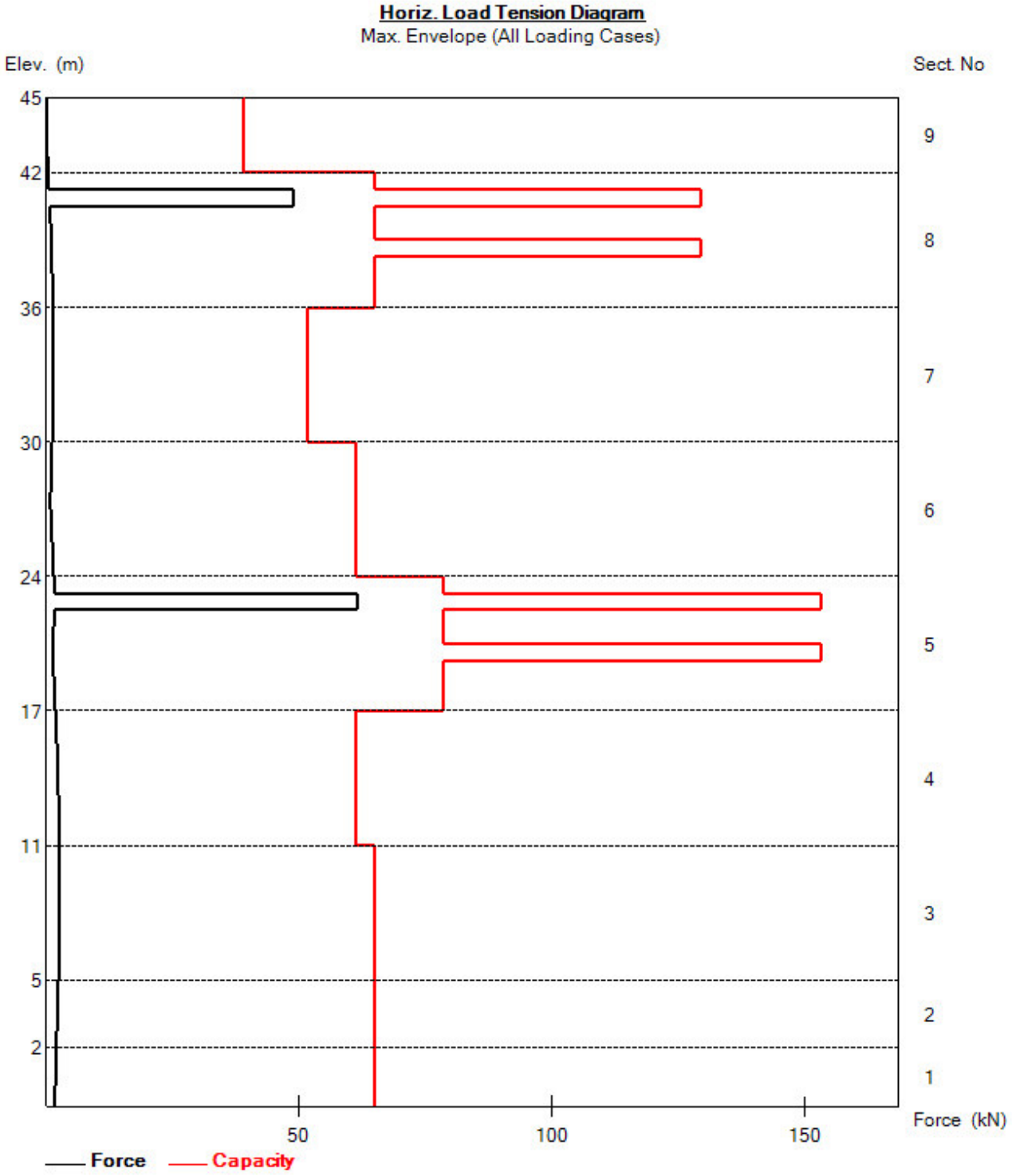
Diagonal Compression
Class I Reliability



Diagonal Tension
Class I Reliability



Horizontal Compression
Class I Reliability



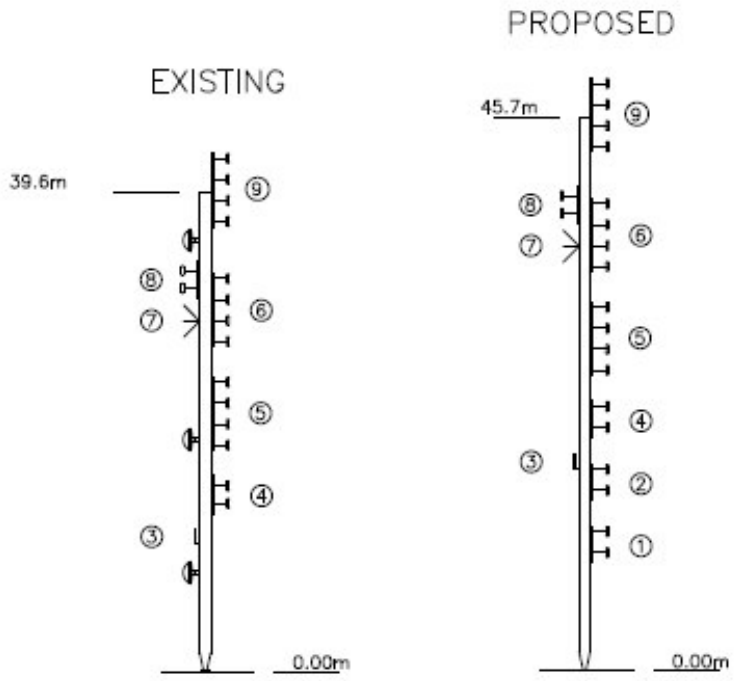
Horizontal Tension
Class I Reliability

Appendix D

PROPOSED ANTENNA ARRANGEMENT

ANTENNA SYSTEMS

ITEM	TYPE	ELEV. (ANTENNA MID POINT)	AZ.	LOCATION	TX LINE
1	SRL-210C-2	10.45M	275°	LEG 3	22mm COAXIAL
2	SRL-210C-2	15.57M	275°	LEG 3	22mm COAXIAL
3	BLUEWAVE (V) (BWY 146Y-4)	17.35M	44°	LEG 1	13mm COAXIAL
4	SRL-210C-2	20.56M	275°	LEG 3	22mm COAXIAL
5	SRL-210C-4	27.41M	275°	LEG 3	22mm COAXIAL
6	SRL-210C-4	35.95M	275°	LEG 3	22mm COAXIAL
7	SRL-227	35.03	36°	LEG 1	13mm COAXIAL
8	SRL-210C-2	37.47	150°	LEG 2	13mm COAXIAL
9	SRL-210C-4	45.70M	275°	LEG 3	22mm COAXIAL



Fisheries and Oceans Canada / Pêches et Océans Garde côtière

drawing title-dessin titre: PROPOSED ANTENNA ARRANGEMENT

drawn-dessine: R.H.

checked-verifie:

approved-approuve:

site: CUSLETT NEWFOUNDLAND

scale-echelle: N.T.S.

project no.:

date-date: MAR. 20, 2018

drawing no.-no du dessin: CUSLETT_VHF_ANTENNA_LAYOUT.DWG

Proposed Antenna Arrangement

Appendix E

Geotechnical Report

Geotechnical Investigation, VHF Tower Installation, Cuslett, NL

Geotechnical Report

Stantec

Prepared for:
Canadian Coast Guard
Marine and Civil Infrastructure
P.O. Box 5667
St. John's, NL. A1C 5X1

Prepared by:
Stantec Consulting Ltd.
141 Kelsey Drive
St. John's, NL A1B 0L2
Tel: (709) 576-1458
Fax: (709) 576-2126

File No: 121621755

Final Report

May 1, 2018

Sign-off Sheet

This document entitled Geotechnical Investigation, VHF Tower Installation, Cuslett, NL was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Canadian Coast Guard (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 

(signature)

Rajib Dey, Ph.D., P.Eng.

Reviewed by 

(signature)

Sterling Parsons, M. Eng., P.Eng.

Table of Contents

LIST OF ATTACHMENTS

LIST OF TABLES

1.0 INTRODUCTION

Acting at the request and authorization of Canadian Coast Guard (CCG), Stantec Consulting Ltd. (Stantec) has completed a geotechnical investigation at the existing VHF tower site located in Cuslett, Newfoundland and Labrador at the coordinates of Latitude: N 46° 58' 27.9"; Longitude: W 54° 9' 14.8".

The purpose of this geotechnical investigation was to assess the subsurface soil and rock conditions in order to facilitate the foundation/anchor design for the proposed new VHF guyed tower. It is understood that the Client is planning to replace the existing 39.6 m VHF Tower with a new 45.7 m Tower.

The scope of work completed for this project was in general accordance with Stantec's proposal dated March 19, 2018 and included the following:

- Conduct a field subsurface investigation consisting of four (4) boreholes. One borehole was located at the tower base, and the remaining three (3) was at 120 degrees apart.
- Laboratory testing on representative samples recovered.
- A geotechnical report presenting the findings of the field investigation and laboratory testing, as well as general comments and recommendations for preliminary foundation design and site development.

This report has been prepared specifically and solely for the proposed development described herein and contains all of the findings of this investigation.

2.0 SITE AND GEOLOGY

The site is located off Route 100, approximately 2 km north of the Town of Cuslett, Newfoundland and Labrador.

At the time of the investigation, the site included two (2) towers and associated equipment, structures/buildings within a fenced area. Thin vegetative and/or exposed weathered bedrock areas were observed across the site.

Based on the surficial geological mapping literature and past experiences in the area, the natural overburden materials in the area consist of a concealed vegetation mat developed on either colluvium surfaces or a thin layer of angular frost-shattered and frost-heaved rock fragments overlying bedrock. The overburden materials are discontinuous. Bedrock geology at the site is mapped as dominantly red mudstone with interbeds of purple and green mudstone of Bonavista Formation.

3.0 METHODOLOGY

The geotechnical investigation was completed from April 6 to April 8, 2018 and consisted of drilling four (4) boreholes using a track mounted CME 55 drill provided by Logan's Drilling Group. Approximate locations

of boreholes drilled are shown on the attached CCG's Drawing: CCG DFO, Cuslett, NL. Boreholes were located in the field by the CCG's surveyor. One (1) borehole (BH 1) was located at the proposed tower base, and three boreholes (BH 2 to BH 4) were located at the proposed three tower anchor locations. Final borehole locations and elevations, shown in Table 3.1, were recorded by All North with survey control referenced to a Survey Monument 619030 (N 5204509.92, E 217043.98) located on site (see attached drawing).

Table 3.1 Final Borehole Coordinates

Borehole	Easting	Northing	Elevation (m)	Comments
BH 1	216993.1	5204521.58	134.19	Tower Center
BH 2	217027.33	5204498.9	133.07	Guy, South East
BH 3	216954.37	5204502.3	130.79	Guy, South West
BH 4	216995.74	5204564.19	131.39	Guy, North

Boreholes were advanced using NW/NQ size core. The depths of the boreholes ranged from 3.1 m to 4.2 m below existing ground surface. Soils were sampled using a 50 mm OD split spoon sampler during the performance of the Standard Penetration Test (SPT). Bedrock was sampled by coring in NQ size. Photos of recovered rock cores from BH 1 to BH 4 locations are attached with this report (see attached bedrock photos). Upon completion, boreholes were backfilled with drilling spoils and surrounding fill materials. It is understood that CCG will assume responsibility for monitoring these test hole locations for any future safety, environmental or other related issues.

The field work was conducted under the supervision of Stantec personnel who maintained detailed logs and obtained representative samples of the various strata encountered. The soils and bedrock were classified in general accordance with the procedures outlined in the attached explanatory key, Symbol and Terms Used on Borehole Records and Test Pit Records. Samples were returned to our St. John's laboratory for visual classification and additional testing. Samples will be stored for a period of three months at which time they will be discarded unless instructions to the contrary are received.

4.0 LABORATORY TESTING

Rock core samples were taken to St. John's laboratory to perform unconfined compressive strength (UCS) tests. UCS testing was performed on three samples obtained from BH 2, BH 3 and BH 4. The results of the laboratory testing are described below and are also shown on the attached Borehole Records.

5.0 SUBSURFACE CONDITIONS

Subsurface conditions observed in the boreholes are summarized in the subsections below and described in detail on the attached Borehole Records along with an accompanying explanatory key: Symbols and Terms used on Borehole and Test Pit Records.

5.1 Organic Soil

A surficial rootmat layer was encountered at BH 4 and had thickness of 0.1 m.

5.2 Fill

At BH 1, a layer of fill was encountered at the ground surface and extended to a depth of approximately 0.6 m below the ground surface. Based on our visual observations in the field, the fill is classified as a red, silty gravel with sand (GM) with trace organics and occasional cobbles. Based on the Standard Penetration Test N-values and drilling performance, the relative density of the fill material can be classified as loose.

5.3 Bedrock

5.3.1 Residual Soil

A layer of highly weathered, decomposed bedrock (residual soil) was encountered at BH 3 and BH 4 at the ground surface or below the organic soil. The thickness of the residual soil layer ranged approximately from 0.6 m to 1.2 m.

5.3.2 Weathered Bedrock

Weathered bedrock was encountered at all borehole locations at depths ranging from the ground surface to a depth of 1.2 m. The weathered bedrock layer was approximately 0.6 m to 1.7 m thick.

Recovered bedrock core consisted of highly weathered, red, mudstone. The Rock Quality Designation (RQD) values ranged from 0% to 31%, indicating a “very poor quality” to “poor quality” rock mass. Photographs of the recovered bedrock core are attached. Based on observation, weathered bedrock can be classified as extremely weak (R0) to very weak (R1).

5.3.3 Bedrock

Bedrock was encountered at all borehole locations below the weathered layer at depths ranging from 1.4 m to 2.3 m below the ground surface.

Recovered bedrock core consisted of slightly weathered to fresh, medium to very thin bedded, moderate to very close discontinuities (fractures), red, mudstone. The Rock Quality Designation (RQD) values ranged

from 52% to 100%, indicating a “fair quality” to “excellent quality” rock mass. Photographs of the recovered bedrock core are attached.

Unconfined compressive strength (UCS) testing performed on three samples obtained from BH 2, BH 3 and BH 4, at corresponding depths of 2.9 m, 2.6 m and 4.1 m, indicated strength of 48.6 MPa, 39.5 MPa and 80.7 MPa, respectively. Based on the laboratory testing, bedrock can be classified as medium strong to strong (R3 to R4).

6.0 DISCUSSION AND RECOMMENDATIONS

Based on the information provided by CCG, it is understood that the existing 39.6 m high VHF tower will be replaced by a new 45.7 m high tower. This geotechnical investigation was carried out to determine the subsurface conditions and provide foundation design recommendations (in accordance with Section 4.0: Geotechnical Investigation outlined in the RFP) for the proposed tower foundation and anchors, as shown on the attached CCG’s Drawing.

The existing guy tower base is currently founded on bedrock. The approximate upper 1.5 m fractured rock was replaced with reinforced concrete and doweled using four (4) 25 mm diameter rebar approximately 0.6 m into the good quality bedrock. The existing tower anchors were installed as deadman anchor (reinforced concrete anchorage) having approximately 1.8 m of granular soil cover and a roughly 0.9 m of granular pad built on grade. The anchors are currently inclined at an angle of approximately 40.5° with horizontal.

Based on the information provided by CCG, information available from site visit, and our current understanding of the work, following comments and design recommendations are provided. It is noted that the comments and recommendations presented in this report are for general preliminary planning and design purposes only and should be reviewed by Stantec once the design details are known.

6.1 Bearing Pressure

Based on ultimate limit states (bearing capacity) analysis, footings may be designed on suitably prepared competent bedrock surface using bearing pressure as follows:

- Footings founded on fair to good quality bedrock (RQD > 50%) may be designed using a factored geotechnical bearing resistance at ultimate limit states of 1,125 kPa.
- A resistance factor of 0.5 was used in the analysis.
- Site preparation should include removal of all fill and loose/fractured rock to expose competent bedrock (RQD > 50%). Hand cleanup of the bedrock footing bearing areas will be required to provide a level surface for the placement of footings as well as to achieve the recommended bearing pressure.
- Settlement of footings on the suitably prepared bedrock surface as described above will be negligible.
- The minimum soil cover or equivalent for frost protection required for this region is 1.2 m.

6.2 Recommended Anchoring Procedure

- Anchor type: Non-shrink cement or resin set anchors
- Allowable bond strength at the competent rock- grout interface should not exceed 450 kPa.
- Grout Type: Grout used in the installation was assumed as a non-shrink grout or resin with a minimum unconfined compressive strength of 30 MPa.
- The upper 1.5 to 2.0 m of bedrock from the surface should be ignored in determining the anchor bond capacity.
- A maximum apex angle of 60° has been assigned for determining the cone of rock mobilized by the anchor. For calculation purpose, the location of the apex of the cone can be assumed at the mid-point of the bond length.
- We recommend performance testing of anchors on test anchors to verify the design capacities of the materials used before the actual anchors for the towers are installed. All anchors installed for the towers should be tested to include a selection of performance and proof testing in general accordance with ASTM 2235 – Rock Bolt Anchor Pull Test, and guidelines set forth in the Post Tensioning Institute documents (6^{th} edition) to ensure the anchors have meet the project requirements.
- Anchor design should also take into consideration the loading direction where loads may not be normal to the rock surface or parallel to the anchor alignment.

6.3 Seismic Site Classification

For seismic response, the site classification was determined using Table 4.1.8.4.A in National Building Code of Canada (NBCC). According to the code, site classification for seismic response would be Site Class “C”.

6.4 Other Design Parameters

Other design parameters such as unit weight and submerged unit weight for soil/rock, friction angle of the soil and earth pressure resistance are provided below in Table 6.1. The design parameters provided below are based on the information obtained from the geotechnical investigation, laboratory testing on rock samples and information available from the literature.

Table 6.1 Design Parameters

Parameter	Value
Unit Weight of Rock, γ_{rock}	26.5 kN/m^3
Dry Unit Weight of Fill, γ_{dry_fill}	18.5 kN/m^3

Submerged Unit Weight of Rock, γ'_{rock}	16.7 kN/m^3
Submerged Unit Weight of Fill, γ'_{fill}	8.7 kN/m^3
Effective Angle of Internal Friction of Fill, ϕ'	32°
Active Earth Pressure coefficient, k_{a_fill}	0.31
Passive Earth Pressure coefficient, k_{p_fill}	3.25

6.5 Quality Assurance/Quality Control

It is highly recommended that a program of quality assurance, quality control and inspection be carried out by geotechnical personnel during earthworks, and foundation construction. Such a program should include verification of excavation bases and approval before placement of additional fill or footing concrete; founding level inspection and approval; compaction testing during fill placement; and field and laboratory testing during placement of granular fill materials.

7.0 CLOSURE

Use of this report is subject to the Statement of General Conditions, attached. It is the responsibility of the Canadian Coast Guard, who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec should any of these not be satisfied. The Statement of General Conditions addresses the following: use of the report; basis of the report; standard of care; interpretation of site conditions; varying or unexpected site conditions; and planning, design, or construction.

We trust this report meets your present requirements. Should any additional information be required, please do not hesitate to contact our office at your convenience.

Sincerely,

STANTEC CONSULTING LTD

Sterling Parsons, M. Eng., P.Eng.
Principal, Senior Geotechnical Engineer
sterling.parsons@stantec.com

Rajib Dey, Ph.D., P.Eng.
Geotechnical Engineer
rajib.dey@stantec.com

REGISTERED PROFESSIONAL ENGINEER
PEGNL Newfoundland and Labrador
Sterling D. Parsons
SIGNATURE
May 1/18
DATE
NEWFOUNDLAND & LABRADOR

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEGNL Newfoundland and Labrador
PERMIT HOLDER
This Permit Allows
STANTEC CONSULTING LTD.
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL 10291
which is valid for the year 2018

APPENDIX

Statement of General Conditions

Symbols and Terms Used on Borehole and Test Pit Records

Borehole Records

Bedrock Core Photos

CCG's Drawing: CCG DFO, Cuslett, NL

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

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BOREHOLE RECORD

BOREHOLE No. **BH 1**
PAGE **1** of **1**

CLIENT **Canadian Coast Guard**
PROJECT **Geotechnical Investigation - VHF Tower Installation**
LOCATION **Cuslett, NL**
DATES (mm-dd-yy): BORING **4-6-18** WATER LEVEL **N/A**

PROJECT No. **121621755**
DRILLING METHOD **Wash Bore**
SIZE **NW/NQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
	134.19						mm		
0		Loose, red, silty GRAVEL with sand (GM); trace organics and occasional cobbles: FILL			SS	1	178	7	
	133.58	Very poor to poor quality, highly weathered, extremely weak, red, Mudstone: WEATHERED BEDROCK			NQ	2	100%	28%	
1									
					NQ	3	100%	20%	
2	131.90	Excellent quality, medium strong, red, Mudstone: BEDROCK			NQ	4	100%	100%	
3					NQ	5	100%	100%	
	130.53	END OF BOREHOLE							
4									
5									

UNCONFINED COMPRESSIVE STRENGTH (MPa)
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
25 50 75 100 125 150 175 200

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded) ⬠ Field Mini Vane
◇ Fall Cone Test ◆ (Remolded) ⬟ Field Mini Vane (Residual)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **BH 2**
PAGE **1** of **1**

CLIENT **Canadian Coast Guard**
PROJECT **Geotechnical Investigation - VHF Tower Installation**
LOCATION **Cuslett, NL**
DATES (mm-dd-yy): BORING **4-6-18** WATER LEVEL **N/A**

PROJECT No. **121621755**
DRILLING METHOD **Wash Bore**
SIZE **NW/NQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
	133.07						mm		
0		Very poor quality, highly weathered, extremely weak to weak, red, Mudstone: WEATHERED BEDROCK			NQ	1	29%	0%	
1					NQ	2	57%	31%	
	131.55								
2		Fair to good quality, medium strong to strong, red, Mudstone: BEDROCK			NQ	3	100%	52%	
3	130.02								
		END OF BOREHOLE							
4									
5									

UNCONFINED COMPRESSIVE STRENGTH (MPa)
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
25 50 75 100 125 150 175 200

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded) ⬠ Field Mini Vane
◇ Fall Cone Test ◆ (Remolded) ⬟ Field Mini Vane (Residual)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **BH 3**
PAGE **1** of **1**

CLIENT **Canadian Coast Guard**
PROJECT **Geotechnical Investigation - VHF Tower Installation**
LOCATION **Cuslett, NL**
DATES (mm-dd-yy): BORING **4-8-18** WATER LEVEL **N/A**

PROJECT No. **121621755**
DRILLING METHOD **Wash Bore**
SIZE **NW/NQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	OTHER TESTS
	130.79						mm		
0		Very poor quality, extremely weak, red, Mudstone: RESIDUAL SOIL (BEDROCK)			SS	1	330	13	
	130.18	Poor quality, highly weathered, weak, red, Mudstone: WEATHERED BEDROCK			NQ	2	100%	29%	
1					NQ	3	100%	64%	
	129.42	Fair quality, medium strong to strong, red, Mudstone: BEDROCK							
2					NQ	4	100%	54%	
3					NQ	5	100%	70%	
	127.13	END OF BOREHOLE							
4									
5									

UNCONFINED COMPRESSIVE STRENGTH (MPa)
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
25 50 75 100 125 150 175 200

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded) ⬠ Field Mini Vane
◇ Fall Cone Test ◆ (Remolded) ⬟ Field Mini Vane (Residual)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **BH 4**
PAGE **1** of **1**

CLIENT **Canadian Coast Guard**
PROJECT **Geotechnical Investigation - VHF Tower Installation**
LOCATION **Cuslett, NL**
DATES (mm-dd-yy): BORING **4-6-18** WATER LEVEL **N/A**

PROJECT No. **121621755**
DRILLING METHOD **Wash Bore**
SIZE **NW/NQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
	131.39						mm		
0	131.34	ROOTMAT							
		Very poor quality, extremely weak, red, Mudstone: RESIDUAL SOIL (BEDROCK)			SS	1	305	15	
					SS	2	356	107/430	
1	130.17								
		Very poor quality, highly weathered, extremely weak, red, Mudstone: WEATHERED BEDROCK			NQ	3	100%	0%	
	129.56								
2		Fair to good quality, medium strong to strong, red, Mudstone: BEDROCK - Interbedded layers of quartz encountered			NQ	4	100%	52%	
3					NQ	5	100%	64%	
					NQ	6	100%	88%	
4	127.17								
		END OF BOREHOLE							
5									

UNCONFINED COMPRESSIVE STRENGTH (MPa)
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
25 50 75 100 125 150 175 200

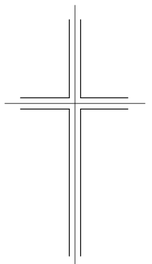
△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded) ⬠ Field Mini Vane
◇ Fall Cone Test ◆ (Remolded) ⬟ Field Mini Vane (Residual)
▽ Hand Penetrometer Test ◥ Torvane

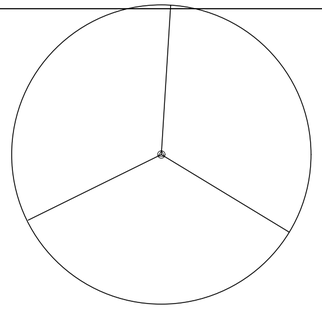
BH 1

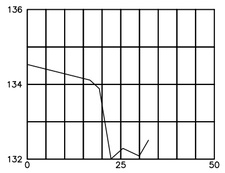
BH 2

BH 3

BH 4







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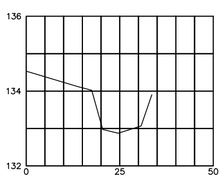

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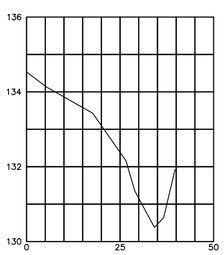

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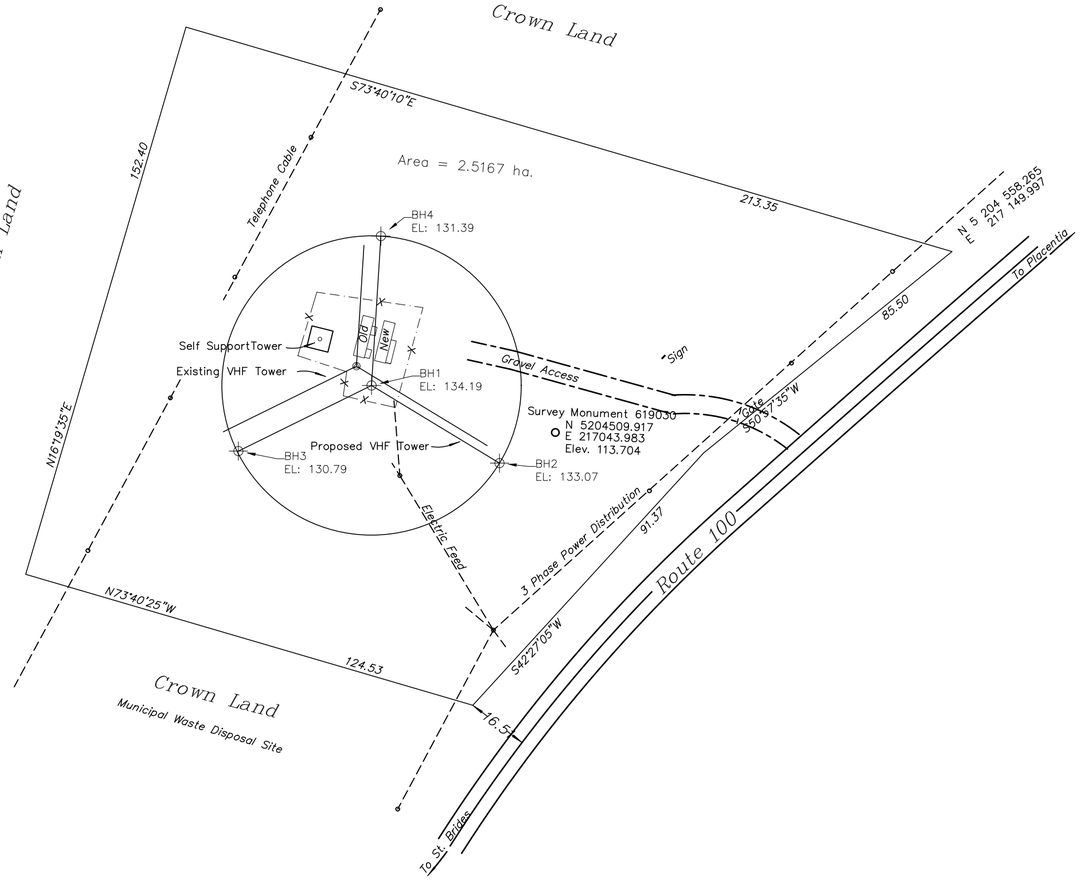


Fisheries and Oceans Coast Guard / Pêches et Océans Garde côtière

Note

Boundary Information as per Plan MT–1256

Reference Monuments

619030	85G4016
N 5 204 509.917	N 5 202 158.282
E 217 043.983	E 216 195.368
Elev. 113.704	Elev. 66.085

no. no	revision revision	date date	by par	approved approuve

Project – projet

Drawing – dessin

CCG DFO

Cuslett

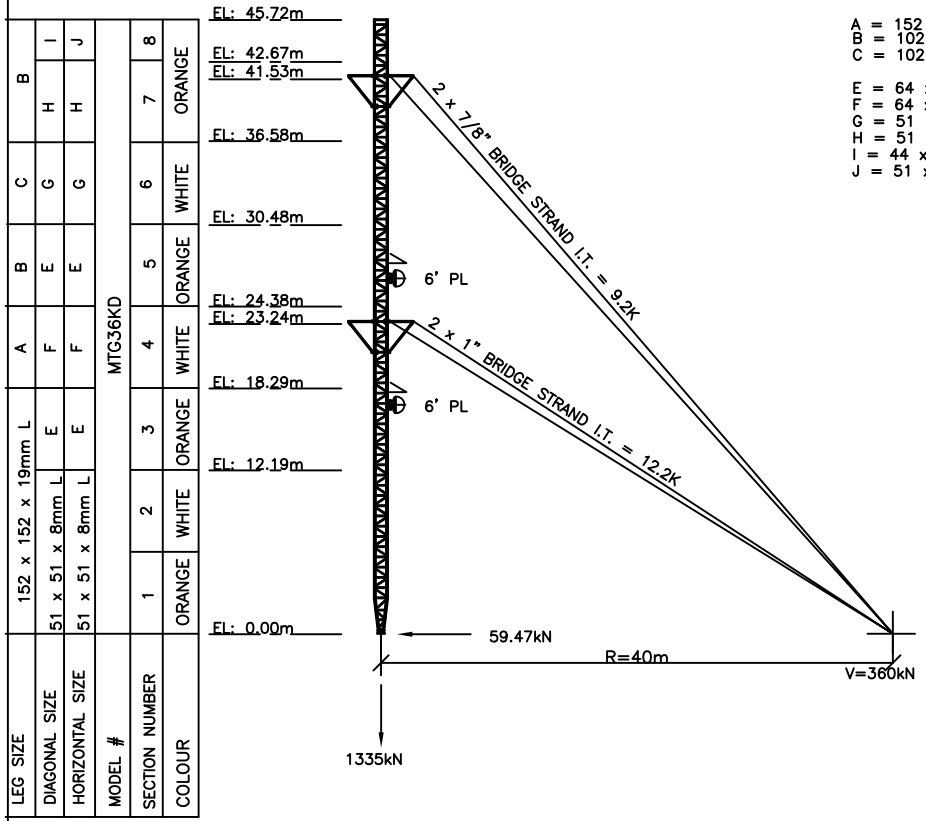
Newfoundland & Labrador

drawn – dessine	designed – déssine par
C. G. Hawco NLS	
date – date	checked – verifie
June 2004	
scale – echelle	approved – approuve
1 : 1000	

project no. – projet no.	drawing no. – no du dessin	sheet – feuille

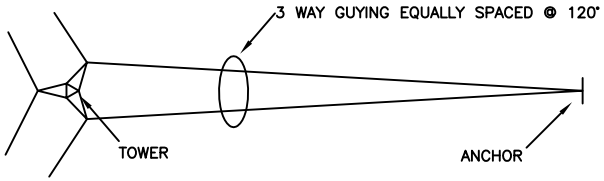
Appendix F

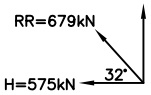
Existing Tower Details



A = 152 x 152 x 16mm L
B = 102 x 102 x 13mm L
C = 102 x 102 x 16mm L

E = 64 x 64 x 6mm L
F = 64 x 64 x 10mm L
G = 51 x 51 x 6mm L
H = 51 x 51 x 8mm L
I = 44 x 44 x 5mm L
J = 51 x 51 x 5mm L





NOTE: LOADS SHOWN ARE ACTUAL LOADS, NOT FACTORED

FOR ANCHOR DROPS REFER TO PLOT PLAN PPCCG1

AS BUILT JULY 2002

Fisheries and Oceans Coast Guard / Pêches et Océans Garde côtière

site
CANADIAN COAST GUARD
PEARCE PEAK, NFLD.

drawing title–dessin titre
TOWER PROFILE FOR
45.72m MTG361KD TOWER
M2007 – 1/4

drawn–dessine: R. DERKS
checked–verifie:
approved for tender–approuve pour l'offre:
project no.:

date–date	scale–echelle	drawing no.–no du dessin	sheet–feuille
03/04/02	NTS	01N0501C00501	1/25

Appendix G

Photos

Cuslett VHF Site

Cuslett Proposed Tower Base Location

Cuslett – Existing Generator Building for Removal

Cuslett – Existing Footings for Removal

Cuslett – Existing Foundation for Removal

Pearce Peak – VHF Tower Existing Condition

Appendix H

Owner Supplied Lighting System

LED Hybrid Beacon (White & Red)

LED-B-HYBRID

FEATURES

- Reduced energy consumption by 90% versus incandescent
- Optical design to reduce ground disturbance
- 10 year durability
- Very stable light output under voltage variations
- Standard 13 ¼" bolt circle
- Controller and power supply are located in a separate box, outside the light unit.

SPECIFICATIONS

Light output	
Lamp type	LED
Light color	White and red
Effective intensity	20K day, 2K night cd; ±25%.
Horizontal coverage	360°
Vertical beam	3°
Expected min. lamp life	10 years +
Electrical value	
Power consumption	60 W day / 20 W night
Power requirements	120/240 Vac 50/60hz
Mechanical	
Beacon weight	11 Kg (24 lbs)
Beacon dimensions (dia. x height)	48,1 cm x 35.5 cm (19" x 14")
Controller weight	11.3 Kg (25 lbs)
Controller dimensions (width x height x depth)	381mm x 444mm x 211mm (15`` x 17.5" x 8.3")
Others	
FAA type	L-865 / L-864
Transport Canada type	CL-865 / CL-864
Configurable for Catenary	L-866-885 / CL-866-885
Operating temperature	-40°C to 55°C (-40°F to 131°F)
Warranty	5 years

ETL CERTIFIED FOR FAA:

- AC 150/5345-43G

COMPLIANT WITH:

- Transports Canada / Transport Canada Standard 621