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**60.96m (200 ft) GUYED TOWER REPLACEMENT
COAST GUARD MEAFORD MCTS SITE
MEAFORD, ONTARIO**

MARITIMES AND CIVIL INFRASTRUCTURE

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SECTION: 011100 GENERAL INSTRUCTIONS

PART 1 - GENERAL

1.1 Minimum Standards

- .1 Perform work in accordance with National Building Code of Canada (NBC) and any other code of provincial or local application. In the case of any conflict or discrepancy, the more stringent requirements shall apply.
 - .1 Meet or exceed requirements of:
 - .1 Contract documents;
 - .2 Specified standards, codes and referenced documents.

1.2 Description of Work

- .1 Work under this Contract includes but is not limited to the provision of all labour, materials, and equipment to replace a guyed VHF tower at the Coast Guard Meaford MCTS Site. The existing 60.96 m (200 ft) tower is to be replaced with a new 60.96 m (200 ft) tower in a new location on the premises. Work includes, but is not limited to:
 - .1 Conduct a geotechnical investigation and report findings.
 - .2 Design, supply, and installation of new 60.96 m (200 ft) guyed tower, new waveguide bridge and posts.
 - .3 Design, supply, installation and new foundation and anchors for guyed tower.
 - .4 Supply and installation of new antennas and all associated cabling.
 - .5 Supply and installation of new grounding system.
 - .6 Demolition and removal of existing tower, foundations, anchors and cabling .

1.3 Work Location

- .1 Work is to be completed at the Coast Guard Meaford MCTS Site. Appendix A: Site Location gives site location details and includes some photos of the existing site. Site coordinates are 44°30'56.00"N - 80°34'0.00"W.
 - .1 Before tendering, Contractors should familiarize themselves with the location, scope of work, site restrictions, and temporary measures (including snow clearing) required for completing the work as specified.



- .2 Contractor should note that this work is to be performed on the site of an existing operational tower where radio frequency transmission and reception is occurring.

1.4 Submittals

- .1 Mandatory submittals and schedule for submission are detailed below and in Appendix E. The following identifies general requirements only. The relevant sections must be consulted for a complete listing of mandatory content. This summary is not an exhaustive list of all submissions required for the duration of the project, as additional submissions may be required after award.
- .2 Detailed Schedule:
 - .1 Deadline: No later than twenty (20) working days following award.
 - .2 Deliverables:
 - .1 The contractor shall furnish a high level schedule outlining the major construction milestones. Schedule shall clearly define the anticipated start and finish of the project.
 - .3 Design Package:
 - .1 Deadline:
 - .1 August 26th.
 - .2 Deliverables:
 - .1 Drawings stamped and signed by a qualified Professional Engineer registered in the Province of Ontario. Drawings to conform to all requirements outlined in Section 033000, and Section 133613
 - .4 Construction Plan:
 - .1 Deadline:
 - .1 No less than 10 working days prior to mobilization.
 - .2 Deliverables:
 - .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 manner in accordance with all legislation, including:
 - .1 Contractor Qualifications (Section 011100 cl. 1.5), to include:
 - .1 Core Project member contact information (site foreman and project manager);



- .2 Complete listing of all Subcontractors.
 - .2 Project specific safety program (Section 013530);
 - .3 Project environmental protection plan (Section 013543);
 - .4 Detailed demolition plan (Section 024116);
 - .5 Concrete construction plan (Section 033000);
 - .6 Tower erection plan (Section 133613);
- .5 Supplemental Material
- .1 Deadline:
 - .1 21 calendar days following acceptance of the works
 - .2 Deliverables:
 - .1 As-built drawings
 - .2 Concrete test results
- 1.5 Fees, Permits, and Certificates
- .1 Contractor shall provide authorities having jurisdiction with all information requested.
 - .1 Contractor shall provide copies to Coast Guard of any documentation submitted to other authorities related to the work described in this document.
 - .2 Contractor shall pay fees and obtain certificates and permits required.
 - .3 Contractor shall furnish certificates and permits when requested.
- 1.6 Temporary Facilities
- .1 Existing communications building can be used for electrical power, small dry storage, and washroom facilities.
 - .2 If additional facilities are required, provide sanitary facilities for work force in accordance with governing regulations and ordinances. Arrange, pay for, and maintain temporary electrical power supply and water supply as required, in accordance with governing regulations and ordinances.
- 1.7 Protection of Existing Work
- .1 Care shall be taken to safeguard any existing structures and/or equipment. Upon completion of the work, all rejected materials, materials declared surplus by Coast Guard, and debris shall be removed from the site.



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1.8 Reference Documents

- .1 The most recent publication or edition of any document referenced in this specification should be used unless the referencing clause states that this clause does not apply.

PART 3 - EXECUTION

3.1 Deadline

- .1 All aspects of the project must be completed before December 2016.



SECTION: 013300 SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 General

- .1 This section specifies general requirements and procedures for the Contractor's submissions of documents to Coast Guard for review.
- .2 Do not proceed with the work until submitted documents or samples have been reviewed by Coast Guard.
- .3 Where items or information is not produced in SI Metric units, converted values are acceptable.
- .4 Contractor's responsibility for errors and omissions in submission is not relieved by Coast Guard's review of the submitted documents.
- .5 Notify Coast Guard, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Coast Guard's review of submission, unless Coast Guard gives written acceptance of specific deviations.
- .7 Make any changes to submissions that Coast Guard may require consistent with Contract Documents and resubmit as directed by Coast Guard.
- .8 Provide Coast Guard with a written notice, when resubmitting, of any revisions other than those requested Coast Guard.

1.2 Submission Requirements

- .1 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .2 Allow three (3) working days, or as stipulated in the specifications, for Coast Guard to review the submission.
- .3 The Contractor's Engineer shall stamp and sign any submissions requiring a Professional Engineer's seal certifying his approval of samples, verification of field measurements, and compliance with Contract Documents.
- .4 Accompany submission with cover letter, in duplicate, containing:
 - .1 Date;
 - .2 Project title and number;
 - .3 Contractor's name and address;



- .4 Identification and quantity of each document or sample;
- .5 Other pertinent data.
- .5 Submissions shall also include:
 - .1 Preparation and revision dates;
 - .2 Project title and number;
 - .3 Name and address of: Subcontractor, Supplier, and Manufacturer.
- .6 Once reviewed by Coast Guard, copies should be distributed.

1.3 Engineering Plans

- .1 Engineering plans supplied by the Contractor must be original plans in paper form and CD-ROM, giving all details required by these specifications and the information specified in the S37-13. The unit system shall be the metric system. The plans must be approved by Coast Guard before proceeding with fabrication or construction, as the case may be.
- .2 Engineering plans shall be sealed by a Professional Engineer licensed to practice in the province of Ontario, and shall have at least 5 years of experience in tower design to CSA S37.
- .3 Any changes to Engineering Plans must be approved by Coast Guard. Changes will be highlighted on Engineering Plans and an As-Built set of Engineering Plans will be submitted at the conclusion of the project.
- .4 Engineering Plans shall contain (but not be limited to) the following data:
 - .1 Reference design standard.
 - .2 All design loads for specified load conditions.
 - .3 All analysis, calculations, and reactions for foundations, guys, and tower. A capacity profile of tower giving designed % load capacity for tower legs, diagonals, guys, and foundations should also be provided.
 - .4 Leg diameters for each section, types of connections and typical details.
 - .5 Details of ice guards, attachments of antennas, anti-climb devices and transmission line placement.
 - .6 Any other information deemed relevant by the Design Engineer
- .5 As-Built shall contain (but not be limited to) the following data:
 - .1 Pulse charts.



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.2 Any other information deemed relevant by the Design Engineer



SECTION: 013530 HEALTH AND SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 General

- .1 Observe construction safety measures of National Building Code 2005, Part 8, Provincial Government, Worker's/Workmen's Compensation Board and municipal authority provided that in any case of conflict or discrepancy the more stringent requirements shall apply.
- .2 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.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations, and Quebec Safety Code for the construction industry (latest revision).
- .4 Deliver copies of WHMIS data sheets to Coast Guard on delivery of materials.
- .5 The Contractor shall implement a safety program which shall address all elements of the work.

1.2 Bid Submittals

- .1 The Contractor shall submit as part of the bid written safety policies for the Contractor and all Sub-Contractors including safety equipment and training information.
 - .1 If Contractor has previously submitted written safety policies to Coast Guard – Central and Arctic, and these policies have not been revised since submittal, Contractor need not resubmit. Contractor shall indicate that policies were previously submitted in their bid submittal.

1.3 Contract Submittals

- .1 Within 5 days of award of Contract, submit to Coast Guard two copies of Contractor's and Sub-Contractor's Project specific safety program including:
 - .1 A listing of all activities specific to the project and their Health & Safety risks or hazards.
 - .2 Detailed descriptions of how the activities are to be carried out as well as methods for mitigating hazards and risks.
 - .3 A listing of personnel responsible for health and safety measures, and Emergency procedures.



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- .4 Proof of training for all employees working at heights and proof of rescue training for at least one employee working on site.



SECTION: 013543 ENVIRONMENTAL PROCEDURES

PART 1 - GENERAL

1.1 Scope of Work

- .1 The Contractor must implement and enforce the following procedures throughout the duration of the work to mitigate potential negative impacts on the surrounding environment.

1.2 References

- .1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.

- .1 Canadian Environmental Protection Act

1.3 Submittals

- .1 Contractor shall submit an environmental protection plan

- .1 Deadline:

- .1 With Construction Plan

- .2 Deliverables:

- .1 Submit a plan addressing procedures to be implemented to mitigate any negative impact on the environment. Detail:

- .1 Equipment features (age, spill containment);

- .2 Staging, refueling, and cleaning areas;

- .3 Clean-up and/or containment procedures (including concrete/grout);

- .4 Waste disposal methods and sites;

- .5 De-watering plan.

PART 2 - PRODUCTS

2.1 General

- .1 Avoid use of hazardous products. Use environmentally friendly products where practical.

PART 3 - EXECUTION



3.1 Construction Area

- .1 Confine construction activities to as small an area as practical.
- .2 Establish material storage, cleaning, and refueling areas where impacts to the surrounding environment will be negligible or readily mitigated.

3.2 Stockpiling of materials

- .1 Materials must be stockpiled as far from the shoreline as practical. Tarps must be used to control dust and run-off.
- .2 Stockpiled excavated materials shall be skirted using filter fabric to control run-off of fines during rain.

3.3 Disposal of Wastes

- .1 Clean-up the site at the end of each working day.
- .2 All waste material to be disposed of in a legal manner at a site approved by local authorities. Transporter/hauler must be appropriately licensed.
 - .1 Recycle or reuse materials where possible.
- .3 Fires and burning of rubbish on site not permitted.
- .4 Do not bury rubbish and waste materials on site.

3.4 Clearing and Grubbing

- .1 Only clear vegetation that interferes with construction.

3.5 Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
 - .1 Suspend works during periods of heavy rainfall and add temporary covers to discourage run-off.
 - .2 Water pumped from excavation shall be adequately treated to ensure that water returning to the watercourse contains minimal fines. Procedures anticipated for preventing the pumping of fines shall be identified in the environmental protection plan, and may include the following:
 - .1 The use of filter bags;
 - .2 Straw bale check dams or silt fence;
 - .3 Discharge through naturally occurring vegetation.



- .3 The means for controlling silt run-off shall be dependent on the site and the quantity of water pumped, and shall be to the discretion of the CCG site staff.
- .4 Sediment control measures shall be inspected and improved/cleaned/replaced as necessary.

3.6 Pollution Control

- .1 Provide methods, means, and facilities to prevent the contamination of soil, water, and atmosphere from the discharge of pollutants produced by construction operations.
- .2 Vehicles, machinery, and equipment shall be in good repair, equipped with emission controls as applicable and operated within regulatory requirements.
- .3 Abide by local noise by-laws.
- .4 Avoid unnecessary idling of vehicles or heavy machinery.
- .5 Limit use of equipment around the shoreline where possible.
- .6 Implement and maintain dust and particulate control measures in accordance with provincial requirements:
 - .1 All bulk material haul equipment shall be appropriately tarped. Watertight vehicles shall be used to haul wet materials
 - .7 Designate a cleaning area for tools to limit water use and runoff. Do not allow deleterious materials to enter waterways. Ensure emptied containers are sealed and stored safely for disposal.
 - .8 The contractor shall take all necessary precautions to guard against the release of any noxious substance or pollutant to the environment. In the event of any spill the Contractor shall take immediate action to contain the release and mitigate any impact.
 - .1 Materials and equipment to intercept, contain, and clean-up any spill or other release shall be maintained on site throughout the construction period and must be readily accessible at all times.
 - .2 Any uncontrolled release of a known contaminant (spills, fire/smoke) shall be reported to appropriate Provincial Authority and Coast Guard. Spills of deleterious substances to be immediately contained and cleaned up in accordance with provincial regulatory requirements.
 - .3 Provincial Authority: Ontario Spills Action Centre 1-800-268-6060

3.7 Traffic

- .1 Minimize soil compaction by driving, parking vehicles, and walking, etc. on existing paved roadways/laneways. If soil is impacted by compaction, compensate by restoring areas with new soil, as required.



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- .1 Avoid the use of heavy machinery in areas of sensitive slopes. Avoid using machinery on land during wet weather.



SECTION: 014500 QUALITY CONTROL

PART 1 - GENERAL

1.1 Inspection

- .1 Canadian Coast Guard or its representative shall have access to the work at all times. If parts of the work are prepared off-site or in a shop, access shall be given to such work throughout the duration of the project.
- .2 In the event the work must be submitted to special testing, inspection or approvals prescribed by Canadian Coast Guard in these specifications or provided for in work-site regulations, the request for inspection must be made without unreasonable delay.
- .3 The below list identifies key milestones where the Canadian Coast Guard will require an opportunity to take samples/inspect:
 - .1 Subgrade verification: The Coast guard will inspect the subgrade upon completion of the excavation
 - .2 Concrete testing: The contractor will be responsible to test concrete for air, slump and strength during the pour.
 - .3 Final completion: The Coast guard will conduct a final inspection upon completion.

1.2 Procedures

- .1 Provide Canadian Coast Guard with advance notice whenever testing is required in accordance with these specifications, so that all parties involved can be present.
- .2 Provide necessary manpower and installations for obtaining and handling samples and material on site.
- .3 Provide access to site if the site is of remote nature whereby the contractor is responsible for providing access to the site

1.3 Rejected Work

- .1 Remove defective work, whether incorporated into the work or not, which has been rejected by Canadian Coast Guard as failing to comply with the contract documents. Replace or re-execute in accordance with the Contract Documents.



1.4 Tests and Mixture Formulas

- .1 Supply test reports and required mixture formulas.

1.5 Factory Tests

- .1 Submit test certificates as prescribed in the relevant section of the specifications.

1.6 Acceptance of Work

- .1 Canadian Coast Guard will make acceptance visits of work executed by the Contractor at critical milestones identified in the following sections.
- .2 The Contractor shall inform Canadian Coast Guard at least three (3) working days before these inspection visits.
- .3 All work shall be completed in compliance with the specifications before requesting the visit for inspection. If the work is not completed or deemed non-compliant, the Contractor shall be responsible for all costs incurred for subsequent inspections.



SECTION: 024116 STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work under this section consists of the provision of all labour, materials, and equipment necessary to complete the following activities:
 - .1 Demolition of existing steel tower and associated guys and hardware;
 - .2 Demolition of guy anchors;
 - .3 Demolition of existing concrete tower foundation;
 - .4 Demolition of existing waveguide bridge and foundations;
 - .5 Disposal of all demolished waste at a licensed waste disposal facility.

1.2 References

- .1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.
 - .1 Canada Labour Code Part II - January 2008.
 - .2 NRC-CNRC National Building Code of Canada 2005.
 - .3 Ontario Occupational Health and Safety Act and Regulations, 2009.
 - .4 CSA S350-[M1980(R1998)], Code of Practice for Safety in Demolition of Structures.

1.3 Submittals

- .1 Contractor to provide demolition plan.
 - .1 A plan for dropping the existing tower shall be provided to Coast Guard for review. Tower Demolition Plan shall be reviewed and sealed by a professional engineer with experience in tower failure mechanisms. Tower Demolition Plan shall take into account the structural condition of the tower as provided in Appendix D: Existing Tower Details, as well as any other details deemed pertinent to the engineer. Tower Demolition Plan shall be submitted to Coast Guard before demolition work



commences.

.2 Deadline:

.1 With Construction Plan.

.3 Deliverables:

.1 Method of demolition including all associated tasks and schedule;

.2 The ultimate disposal location of all waste materials and debris.

.1 Include documentation detailing regulatory approval for waste disposal facility and transporter.

.3 Submit copies of certified receipts from the disposal sites for all material removed from the work site upon request.

.4 Work under this section shall not proceed until written approval of the demolition plan has been received from the Coast Guard.

1.4 Existing Conditions

.1 Photos of the site are provided in appendix A.

.2 Drawings for the existing tower, guy anchors and foundations to be demolished are provided in appendix D.

PART 3 - EXECUTION

3.1 General

.1 Tower may not be felled.

.2 Salvage the following materials:

.1 Existing obstruction lights for install on new tower;

.2 Antennas, to be turned over to CCG.

.3 Items to be demolished are indicated in clause 1.1 of this section, as well as in Appendix B: Drawings.



- .4 Coast guard shall disconnect cabling as necessary prior to Contractor commencing demolition activities.
- .5 Ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .6 If safety of structure being demolished appears to be endangered, take preventative measures, stop work, and immediately notify Coast Guard.
- .7 At end of each day's work, leave work in safe and stable condition.
- .8 Dispose of:
 - .1 Old cables.
 - .2 Tower c/w all guys and guy hardware.
 - .3 Existing wave-guide bridge.
 - .4 Foundations.
- .9 Dispose of all materials in accordance with applicable regulations. Contractor is responsible for transportation of demolished materials from site to appropriate waste handling facility. See Appendix D: Existing Tower Details for information on existing tower.

3.2 Demolition

- .1 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.
- .2 Remove tower from its foundation ensuring the tower base plates remain intact.
- .3 Demolish all existing concrete foundations in their entirety. Drawings are provided in Appendix B.
- .4 Ensure that demolition does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .5 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.
- .6 Existing anchors are to be cut off at grade.



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3.3 Disposal

- .1 All material is to be disposed of off-site and a licensed disposal/recycling facility.

3.4 Restoration

- .1 The site in its entirety must be restored to an equal or greater condition after completion of construction.



SECTION: 033000 CONCRETE WORK

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work of this section includes the design of:
 - .1 One [1] reinforced concrete tower foundation.
 - .2 Three [3] reinforced concrete guy anchor.
 - .3 Two [2] waveguide post foundations.
- .2 Work of this section includes the supply of all labour, material, and equipment, necessary to complete the following activities:
 - .1 Construction of the tower foundation, and guy anchors;
 - .2 Construction of waveguide bridge foundations.
 - .3 Coast Guard representative shall inspect sub-grade upon completion of any excavation where a design bearing surface is to be achieved. If sub-grade is deemed unsuitable, Coast Guard representative shall advise repair requirements.

1.2 References

- .1 Work under this section shall be undertaken in strict conformance with all listed references, In the case of any conflict or discrepancy the more stringent requirements shall apply.
 - .1 Canada Labour Code Part II - January 2008
 - .2 NRC-CNRC National Building Code of Canada 2010
 - .3 Ontario Occupational Health and Safety Act and Regulations
 - .4 CAN/CSA-A23.1-04 Concrete Materials and Methods of Concrete Construction
 - .5 CAN/CSA A23.2-04 Methods of Test and Standard Practices for Concrete
 - .6 CAN/CSA A23.3-04 Design of Concrete Structures
 - .7 CAN/CSA-G30.18 Billet Steel Bars for Concrete Reinforcement



- .8 CAN/CSA S269.3 Concrete Formwork
- .9 ACI Specification 306 Cold Weather Concreting (if relevant)

1.3 Performance Requirements

- .1 The foundation shall be designed to perform as reasonably expected for a life of 50 years.

1.4 Submittals

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.

.1 Foundation Design Package

.1 Deadline:

- .1 August 26th.

.2 Deliverables:

- .1 Foundation design package shall include drawings(s) showing plan and section views of the foundation.
- .2 Drawing shall be sealed and signed by an engineer licensed to practice in the province of Ontario.

.2 Foundation Construction Plan:

.1 Deadline:

- .1 Furnish with Construction Plan (Section 011100)

.2 Deliverables:

- .1 Provide a high level summary of mix properties and admixtures to demonstrate compliance with Coast Guard Criteria and completed foundation design;
- .2 Concrete placing plan, identifying the location of the source of ready mix concrete, the haul route and any other relevant information required to demonstrate a plan for getting the concrete into the forms in the required amount of time;
- .3 Finishing procedures;
- .4 Curing methods and schedule;



- .5 Clean-up procedures; and,
- .6 Mitigation measures to account for hot or cold temperatures where reasonably anticipated during the construction period.

1.5 Quality Assurance

- .1 Coast Guard's minimum inspection requirements are detailed below. The Contractor shall be responsible to notify Coast Guard of the date and time that the works may be inspected. Notice must be provided no less than three (3) working days in advance to permit scheduling of quality assurance testing. All deficiencies in the works identified at the time of inspection shall be remedied to the satisfaction of Coast Guard, by the Contractor at their expense. Work shall not progress until inspections have been completed and the Contractor has been provided with written notice to proceed with the works.
 - .1 Upon completion of formwork and placement of reinforcement.
 - .2 During execution of concrete placement.
- .2 The Contractor shall be responsible to arrange for concrete testing on site the day of the pour. This shall include at minimum a test for slump, air entrainment and strength (3 cylinders, one [1] 7 day, and two [2] 28 day).
 - .1 Extra concrete cylinders shall be cast and broken to determine foundation strength prior to tower erection. This will be coordinated by CCG staff upon request from the contractor.

PART 2 - MATERIALS

2.1 General

- .1 All materials shall conform to specifications referenced in CAN/CSA-A23.1-04.

2.2 Concrete

- .1 Concrete supplier shall be a holder of valid "Certificate of Ready Mixed/Mobile Mix Concrete Production Facilities" as issued by the 'Ready Mixed Concrete Association of Ontario' (RMCAO).
- .2 Concrete mix to be determined by Contractor and shall be indicated on Engineering plans.
 - .1 The use of calcium chloride as an admixture is not permitted.



PART 3 - EXECUTION

3.1 General

- .1 Concrete must be placed, finished, and cured in accordance with the Contractor's submitted construction plan and the contractor's engineered drawings.

3.2 Design Requirements

.1 Foundations

- .1 The Contractor's Engineer must design a suitable load bearing foundation for the tower in consideration of the specific soil conditions obtained through a subsurface geotechnical investigation.
 - .1 Any soil characteristics outlined in the attached drawings are considered to be incorrect and are not to be used.
 - .2 A foundation design based on "normal" soil conditions is unacceptable.
 - .3 The foundation design shall account for loads imparted by the new tower and any other loads that could be reasonably anticipated to affect the foundation. All loads shall be identified on the finalized drawings.
 - .4 The drawings shall be signed and stamped by an engineer licensed to practice in the province of Ontario.
 - .5 The drawings shall include references to all applicable standards. This being a design for a federal agency, the Canada labour code and National building code (most recent editions) shall be included.
 - .6 The design shall clearly indicate in the notes all loads considered in the design of the foundation.
 - .7 The design shall include the results of a geotechnical investigation
 - .1 Exploration is to be undertaken at four (4) locations. One borehole shall be advanced in the vicinity of each anchor location and at the proposed base of the tower.
 - .2 All boreholes are to be advanced to a depth suitable to appropriately assess the site's soil capacity. This shall be determined by the engineer responsible for the design. Should bedrock be encountered boreholes are to be advanced a sufficient distance to determine the presence of rock as well as its bearing quality.
 - .3 Bidders shall identify in their submissions their proposed methods of investigation and detail any/all equipment and subcontractors contemplated to be employed in the performance of the work.



- .4 The submitted report is to detail the following information:
 - .1 Description of the soil strata according to the Unified Soil Classification System (USCS)
 - .2 Depths at which strata changes occur referenced to a site benchmark elevation
 - .3 Standard Penetration Test (SPT) blow counts (N) for each soil layer
 - .4 Soil density for each soil layer
 - .5 Internal angle of friction for each soil layer
 - .6 Cohesion for each soil layer
 - .7 Ultimate bearing capacities for each soil layer or at the recommended bearing depth(s)
 - .8 For expansive soil conditions, the active zone of influence and recommendations for design
 - .9 Elevation of free water encountered and the ground water depth below grade to be considered for design
 - .10 Frost depth to be considered for design
 - .11 Anticipated sulphate content of groundwater and soils
 - .12 Anticipated classification of the soils in accordance with Ontario Occupational Health and Safety Act.
 - .13 Other pertinent soil design data and recommendations
 - .14 Foundation recommendations in consideration of the anticipated loading, native material properties, access to the site; and contractor availability/expertise.
 - .15 General topographic information for the site, include photographs and rough topographic sketch detailing:
 - .1 Site benchmark location and elevation
 - .2 Offsets or swing ties to borehole locations.

3.3 Preparation

- .1 Preparation shall not commence until bearing surfaces have been inspected by Coast Guard.
- .2 Remove all loose and deleterious material.
- .3 Construct forms and reinforcement in accordance with the engineer's specifications.
- .4 All exposed 90° edges shall be chamfered.

3.4 Placement

- .1 Concrete placement shall not commence until formwork and reinforcement have been inspected by Coast Guard.
- .2 Contractor shall place finish and cure concrete as per CAN CSA A23.1 making all adjustments necessary to account for climatic conditions anticipated during the curing period.



- .3 Concrete shall be placed in one continuous pour.
 - .1 The development of cold joints shall be avoided. Alternately, cold joints must be previously approved in writing by CCG.
- .4 Finish exposed concrete surfaces to provide a lightly brushed non-skid surface, unless otherwise specified in the submitted design.
- .5 Cut control joints where specified.
- .6 Contractor shall provide samples as required during placement operation for the performance of quality assurance testing.
- .7 Concrete shall be finished so as to slope gently away from the center of the slab. No water shall pond on the finished surface.

3.5 Curing

- .1 Shall be undertaken in accordance with CAN CSA A23.1 and the Contractor's approved Construction Plan.
 - .1 Curing regimen employed must take into account local climatic conditions reasonably anticipated to occur during the curing period.

3.6 Inspection

- .1 Concrete pour(s) to be witnessed by Coast Guard representative. Concrete testing to CAN/CSA-A23.2 by testing laboratory is the responsibility of the contractor. Contractor shall provide samples as required during concreting operation for test purposes.



SECTION: 133613.13 STEEL TOWERS

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work in this section consists of the following:
 - .1 Design, supply, and installation of the new 60.96m (200 ft) guyed tower.
 - .2 Supply and install of fall arrest system.
 - .3 Design, supply, and install of anti-climb system.
 - .4 Supply and install of new antennas and associated cabling.
 - .5 Transfer of existing obstruction lights.

1.2 References

- .1 CSA S37-13 - Antenna Towers and Antenna Supporting Structures
- .2 CAN/CSA-W47.1 - Certification of Companies for Fusion Welding of Steel Structures
- .3 CAN/CSA W59 - Welded Steel Construction (Metal-Arc Welding)
- .4 Canada Labour Code Part II – January 2008
- .5 Health and Welfare Canada Limits of Exposure to Radio-Frequency Fields Frequencies from 3KHz – 300GHz, Safety Code 6
- .6 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011
- .7 National Building Code of Canada – 2005
- .8 TC CAR Standard 621.19 - Standards Obstruction Markings
- .9 SSPC-SP 1 Solvent Cleaning
- .10 SSPC-SP 7/NACE No. 4, Brush-Off Blast Cleaning



1.3 Submittals

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.
- .2 Erection Plan:
 - .1 Deadline:
 - .1 With construction plan.
 - .2 Deliverables:
 - .1 Plan must clearly demonstrate procedures and methods to be employed to:
 - .1 Remove the tower from its foundation;
 - .2 Place tower on new foundation;
 - .3 Monitor that turn of nut has been completed;
 - .4 Field remedies to address any damage to the coating system incurred during erection;
 - .5 Coast Guard reserves the right to request additional documentation verifying the suitability of the proposed labour and equipment anticipated to be employed in the erection of the tower. Certification required may include:
 - .1 Crane certification/helicopter capacity.
- .3 Tower Design Package
 - .1 Deadline:
 - .1 August 26th.
 - .2 Deliverables:
 - .1 Tower design package shall include drawings(s) showing plan and section views of the tower, as well as all other requirements identified in this section.
 - .2 Drawing shall be sealed and signed by an engineer licensed to practice in the province of Ontario.

1.4 Guarantee

- .1 The Contractor shall guarantee that all material and workmanship used in the fabrication and construction of this tower is in accordance with all applicable specifications listed in this Section.



- .2 For a period of three years from the date of the installation, the Contractor shall replace, free of charge, all defective components. A failure of 10% or more of a particular item shall be interpreted as failure in all similar units. All these items shall be replaced by units of a superior design at no cost to Coast Guard.

1.5 Materials Supplied by Coast Guard

- .1 Coast Guard shall supply: a qualified person to test the antenna cabling, keyed padlocks for the anti-climb panels, poly-phase lightning arrestors, and “Do Not Climb” signage.

1.6 Quality Assurance

- .1 Coast Guards minimum inspection requirements are detailed below. The Contractor shall be responsible to notify Coast Guard of the date and time that the works may be inspected. Notice must be provided no less than three (3) working days in advance to permit scheduling of quality assurance testing. All deficiencies in the works identified at the time of inspection shall be remedied to the satisfaction of Coast Guard, by the Contractor at their expense. Work shall not progress until inspections have been completed and the Contractor has been provided with written notice to proceed with the works:
 - .1 During erection to confirm all procedures are being followed.

PART 2 - MATERIALS

2.1 General

- .1 Structural steel shall conform to CSA Standard G40.21, Grade 300W, or better. All materials used in the tower to be new and in conformance with requirements of CSA S37-13.
- .2 All mounts, mount hardware, and line hangers shall be heavy-duty hot dip galvanized or stainless steel.
- .3 Guys shall be one continuous length Grade 180 Guy Strand for diameters 13mm (1/2 in) and below, or Bridge Strand for diameters greater than 13mm (1/2 in) unless otherwise approved by Coast Guard. Cut ends of strand shall be capped with a stainless steel hose clamp or ear clips. Provide full articulation at each end of guy as per CAN/CSA S37-13 by means of shackles.
- .4 Turnbuckles and shackles shall be Crosby or approved equivalent, manufactured from AISI 1035 steel, heat treated, and shall be hot dip galvanized. Provide locking device for turnbuckle, vinyl coated cable or approved equal.



- .5 Antennas are to have ice guards located at least 2 feet above them of sufficient size to completely shield the antenna from falling ice. Mid level obstruction lights shall also be protected by ice guards.
- .6 Bolts shall be hot-dip galvanized with hexagonal heads and be supplied with hexagonal nuts. The unthreaded part of the bolt shall be long enough for full bearing of the adjoining parts and enough washers shall be placed on each bolt under the nut to prevent the nut from reaching the end of the bolt threads when tightened.

PART 3 - EXECUTION

3.1 Design

- .1 The 60.96m (200 ft) tower shall be designed in accordance with CSA S37-13 to support all antennas indicated in Appendix C: Antenna and Cable Schedule. The antenna indicated in Appendix C should be considered to be 85% of the capacity of the tower to allow for future antenna.
- .2 The Contractor shall design all tower accessories, including new mounts for all antennas, climbing facility with a fall arrest assembly, anti climb panels, and ice shields.
- .3 All antennas, lines and mounts should be incorporated in the tower design.
- .4 The tower shall be designed by a qualified professional engineer registered in Canada, holding a certificate to practice, with a minimum of 5 years experience in tower design to CAN/CSA S37-13.
- .5 The tower shall be designed to resist all loads specified in CAN/CSA S37-13 as well as maximum loads caused by all equipment installed in the towers as described in these specifications and plans. Site specific wind pressure is to be used as per CAN/CSA S37-13.
- .6 Unless otherwise specified, loads shall be determined in accordance with CAN/CSA S37-13 Antennas, Towers and Antenna Supporting Structures, latest edition; reliability Class I.
- .7 Tower sections are to be parallel for the length of the structure (no tapered sections may be used).
- .8 The bottom section of the tower is to have articulation to the tower base foundation. Tower manufacturer is to supply an unpainted galvanized 'star mount base' assembly or other approved structural fitting and a receiving plate mount that attaches to the tower base foundation.
- .9 Anchorage steel below grade that is not encased in concrete shall be galvanized and further corrosion protection shall be provided.



- .10 Contractor shall submit Engineering Plans outlining materials, dimensions, loading and any other pertinent details for tower construction to Coast Guard for approval prior to fabrication.
- .11 The tower design package shall include pulse tables for the new tower. The pulse tables shall be provided at 5°C increments for temperatures ranging between -20°C and 40°C.

3.2 Fabrication

- .1 The Contractor shall provide a copy of Canadian Welding Bureau (CWB) certification to the Coast Guard for the tower fabricating company and for each worker assigned to this project.
- .2 Each tower segment shall be designated with a number that is easily read after galvanizing. This mark shall be stamped into each piece in such a manner, or in such a place, as will not injure or reduce the strength of the piece. The marks on like pieces shall be in the same relative position on each piece. The markings indicated on each piece shall correspond with that shown on the erection drawings.
- .3 All members shall be fabricated in accordance with the Engineering Plans and as per CSA S37-13.
- .4 All like parts shall be interchangeable. All like parts shall have the same number.
- .5 In any bending or reworking of any material, methods employed shall ensure that the physical properties of the material are not impaired.
- .6 All welding shall be performed in accordance with CSA Standard W59 latest revision and shall be undertaken by a fabricator approved by the Canadian Welding Bureau to the requirements to CSA Standard W47, latest revision.
- .7 Special mounting arrangements shall be incorporated into the tower sections for the secure mounting of:
 - .1 All hoisting grips, cable clamps, and grounding kits for each run of cables.
 - .2 All lighting fixtures, junction boxes, and cable supports.
 - .3 Fall arrest system extension where it extends above the top of the tower;
 - .4 Ground lugs or grounding attachments at the bottom level of the star mount.
- .8 The Contractor shall ensure that electrical continuity exists between all tower sections.

3.3 Climbing Apparatus

- .1 The tower shall be equipped with a climbing apparatus complete with a fall arrest rail, in compliance with applicable CSA S37-13 requirements.



- .2 The climbing apparatus shall provide an unobstructed climbing path and maintain the required climbing clearance radius as per CSA S37-13.
- .3 Climbing apparatus configuration, shall comply with CSA S37-13 and Canada Labour Code. Rungs shall be horizontal, have adequate clearance and line up vertically.

3.4 Fall Arrest System

- .1 The Contractor shall supply and install a Fall Arrest Rail to meet CSA S37-13 requirements and CSA Z259.2.4-15.
- .2 The fall arrest rail shall be free from obstructions for the complete height of the tower.
- .3 The fall arrest rail shall be supported at spans not more than 1 m, or to meet the manufacturer's instructions.
- .4 The fall arrest rail shall run up the tower or ladder in a manner to facilitate climbing. The fall arrest rail shall be straight and true to prevent trolley binding.
- .5 The extension of the fall arrest rail beyond the top of the tower must be structurally supported for the entire height.
- .6 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.
- .7 Rail system is to be "Miller" type with trolley or approved equivalent.
- .8 The fall arrest system shall be supplied complete with one (1) new CSA approved trolley that will be turned over directly to the Coast Guard at the completion of the contract.
- .9 Trolley shall be supplied with permanently attached lock safe swivel clips for attachment to front D ring of CSA Approved full body harness.

3.5 Anti-Climb Panels

- .1 The tower shall include one (1) set of anti-climb panels.
- .2 Each panel shall be 3.05m (10 ft) in height.
- .3 The anti-climb shall incorporate a framed, heavy gauge expanded wire mesh cage which shall be bolted flush to the tower face using round headed hardware that cannot be used as a step or hand hold.
- .4 The anti-climb panels each will have a barrier panel internal to the tower at the top, bottom, or mid-level to prevent access.
- .5 The anti-climb shall be hinged on two faces; the climbing face and the transmission line face.



- .6 Operable panels shall be framed, hinged on one vertical side, with a combined latching mechanism.

3.6 Galvanizing

- .1 All materials, structural steel, pipe and fittings, including bolts, nuts and washers shall be hot dip galvanized to the requirement of CSA S37-13 and CSA-G164 and as otherwise specified therein.
- .2 All materials shall be completely fabricated before galvanizing (except the tapping of nuts).
- .3 Before galvanizing, the steel shall be thoroughly cleaned of all paint, grease, rust, scale or other materials that will interfere with proper binding of the zinc with the steel.
- .4 Tests for thickness and uniformity of coating shall be made as considered necessary by Coast Guard. Tests shall be conducted in full accordance with the requirements of CSA S37-13. If required, contractor shall pay for testing, all costs to be included in the tender price.
- .5 The Contractor shall touch up in the field all steel members of the tower where the galvanized finish has been scraped or chipped during erection using zinc-enriched or Galvicon paint, or an approved equal.
- .6 Steel members that have a slightly damaged finish shall be given three coats of zinc-enriched paint applied according to the manufacturer's printed instructions.
- .7 Contractor shall warranty all galvanizing work for a period of not less than three (3) years.

3.7 Surface Preparation

- .1 Galvanized steel must be cleaned prior to painting in accordance with SSPC –SP-1 – “Solvent Cleaning”.
- .2 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.
- .3 Care should be taken to remove as little zinc as possible while maintaining desired toughness.
- .4 After sweep blasting, the coating system should be applied ideally the same day and a max of one day later.
- .5 Grit shall not be recycled.



3.8 Painting

- .1 Tower painting will be carried out in the factory and shall be applied in 7 equal and alternating bands of International Orange and White according to the requirements of Transport Canada TC CAR Standard 621.19. Painting and proper drying will be done prior to delivery.
- .2 All paint shall be applied in shop conditions as per manufacturer's instructions, evenly spread and free from all marks, stains, defects and flaws.
- .3 All surfaces of the tower are to be painted with the exception of the areas on the mating surfaces of leg splice plates and attachment points for grounding lugs to ensure good electrical connection for grounding purposes.
- .4 Coating System to be water based Acrylic (no Alkyds are acceptable). To be applied as per manufacturer's specifications. Acceptable Products:
 - .1 Primer: Devflex 4208 Acrylic @ 1.5 – 2.0 mils dft. Finish: Devflex 4208 Acrylic @ 1.5 – 2.0 mils dft. or,
 - .2 Single coat: 'Sico' Aqualux 522-121/516, 2.5-3 mils dft. or,
 - .3 Approved equal.
- .5 Care shall be taken to ensure galvanized members are kept clean and free of all oils and contaminates during material handling process.
- .6 The Contractor shall field paint all steel members of the tower where the painted finish has been scraped or chipped during erection in the field.
- .7 The Contractor shall be responsible for damage done by paint spraying or dripping on the Owner's or other's property.
- .8 Contractor shall warrant all painted items for three (3) years for 90% coverage.
- .9 For the three years any damage to the paint from normal environmental conditions prevalent at the site shall be repaired by the Contractor at no cost to the Owner in a manner approved by the Owner.

3.9 Handling of Material and Transportation

- .1 The tower and parts are to be built so they may be safely transported to the site from the manufacturer's premises.
- .2 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.
- .3 Special care shall be taken to ensure that galvanizing is not damaged during handling and erection of materials.



- .4 Storage of materials on the site will be the responsibility of the Contractor.

3.10 Tower Installation

- .1 Prior to site mobilization, Contractor shall submit a Construction Plan detailing construction tasks, methods, and equipment required to complete work to Coast Guard for review. Construction Plan should include methods of completing work, equipment required, as well as hazards and mitigation for hazards for each work task.
- .2 The contractor shall give Coast Guard a written notice ONE WEEK prior to the commencement of the standing of the tower.
- .3 The contractor shall be responsible to obtain accurate measurements pertaining to elevation differences between the tower base and guy anchors.
- .4 The tower shall be erected in a manner that will not bend, scrape, distort, or injure the component parts of the galvanizing.
- .5 Every failure of the tower sections to join together properly shall be reported to the Coast Guard.
- .6 Upon completion of erection, the tower shall be inspected by the Contractor for damage. Any damaged or missing items, including nuts, bolts, etc., shall be replaced. The tightness of all bolts shall be rechecked at this time.
- .7 The Contractor shall be responsible to ensure that no members of the tower are overstressed during erection.
- .8 Any members damaged during erection shall be replaced at the Contractor's cost.
- .9 The Contractor shall be responsible for any damages done to the work of others, or to adjoining structures and property during erection.
- .10 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.
- .11 The tension calculations shall consider the ambient temperature at the time of adjustment.
- .12 Full consideration of anchor location with respect to the tower base must be incorporated into the calculation of correct guy tensions.
- .13 The Contractor shall use a three-transit set up to complete final adjustment of vertical alignment and twist and to ensure it meets the requirement of CSA S37-13 for vertical alignment and twist.
- .14 Install no-climb sign on the access panel of the lower anti-climb (sign to be provided by Coast Guard).



- .15 The Contractor is responsible for establishing temporary obstruction lighting in accordance with Transport Canada requirements.

3.11 Guys

- .1 The top and bottom guy at each anchor location shall be equipped with two 1.82m (6 ft) guy markers installed in front of the guy grounding connections.
- .2 Guy markers shall be yellow weather resistant material and vandal resistant. Field drill 25 mm holes at 250 mm spacing to render these useless for other purposes.
- .3 On each guy, a large U-Bolt clip is to be installed 305 mm (1 ft) in front of the grounding connection and guy markers on each guy to protect the connections from ice damage. Guy markers can be cut into shorter pieces to fit around the ground connections.

3.12 Transmission Lines

- .1 All transmission lines shall be as indicated in Appendix C: Antenna and Cable Schedule. All cabling shall be supported at intervals and with materials as recommended by manufacturer. The cables are to be supported by proper hoisting grips during installation.
- .2 All lines shall be mounted on the outside of the tower. Location of cabling is to be submitted to the Coast Guard for approval, and shall be represented on the stamped tower drawings
- .3 Antennas shall be mounted to the tower leg at the azimuth indicated in Appendix C: Antenna and Cable Schedule.
- .4 The use of wrap lock/tie wrap devices to secure TX lines is not acceptable.
- .5 Cables to antennas 2 to 5, shall run from the CCG equipment building via a new waveguide bridge (see Section 323000) to the antennas. Transmission lines shall be routed through existing building entry panel. Contractor shall provide any materials required for weather proof cable entry.
- .6 The cables are to be terminated at the upper end with connectors appropriate for that cable.
- .7 The free ends will extend into the equipment buildings/racks and will be terminated by the contractor at a location to be determined by Coast Guard at the time of installation.
- .8 Cable and connector types are specified in Appendix C: Antenna and Cable Schedule.
- .9 Every effort shall be made to ensure that the external connections are made waterproof using the best commercial practice.



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3.13 Testing of Cables

- .1 The Contractor shall inform the Coast Guard at least three days in advance of the installation of the cables and antennas so that Coast Guard can perform quality checks after the connectors and all supports and grounding kits are in place.



SECTION: 260527 GROUNDING

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work in this section consists of supply and installation of ground system comprising: copper-clad steel ground rods and tinned copper ground cable complete with exothermic ground rod connections.

1.2 References

- .1 Canada Labour Code Part II – January 2008
- .2 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011
- .3 National Building Code of Canada – 2010
- .4 CAN/CSA S37-13 Antennas, Towers, and Antenna-Supporting Structures
- .5 CAN/CSA C22.1-15 Canadian Electrical Code
- .6 Ontario Provincial Standard Specification – OPSS 1010 Material Specification for Aggregates – Base, Sub-base, Select Sub-grade, and Backfill Material
- .7 Ontario Provincial Standard Specification – OPSS 1004 Material Specification for Aggregates – Miscellaneous

1.3 Disposal of Wastes

- .1 All excess materials shall be disposed of in a legal manner by Contractor.

1.4 Submittals

- .1 Submittals shall be forwarded to Coast Guard in accordance with the provisions of section 013300.
- .2 Construction procedures
 - .1 Deadline
 - .1 With construction plan
 - .2 Deliverables
 - .1 As-built drawings



1.5 Existing conditions

- .1 The existing grounding may not be reused.
- .2 Before commencing work under this section the Contractor must establish the location of all buried services which may interfere with the execution of the work.

PART 2 - PRODUCTS

2.1 Materials

- .1 Ground rods shall be 19mm (3/4 in) diameter copper-clad steel, 3m (10 ft) in length.
- .2 Ground cable shall be 4/0 AWG stranded tinned copper conductor.
- .3 Ground cable/rod connections shall be made with exothermic connectors.
- .4 Granular 'A' backfill shall be to OPS 1010.
- .5 Clear stone shall be to OPS 1004.

2.2 Quality Control

- .1 Grounding work shall be undertaken to industry standards for Telecommunication Tower Sites and any deviation from these industry standards shall be made known to Coast Guard.

PART 3 - EXECUTION

3.1 General

- .1 Contractor shall field verify all dimensions and details before proceeding with work.
- .2 Safeguard existing antennas, transmission lines, and other tower attachments, as well as the tower members and connections; do not alter or otherwise impair the performance of any of these items during the course of work without written approval of Coast Guard.
- .3 Ensure buildings, generator, and fencing are not disturbed by excavation and backfill activities.
- .4 Any areas requiring excavation shall be investigated by Contractor to ensure they are free of any underground utilities. If the location of underground utilities interferes with the installation of grounding system, notify Coast Guard.
- .5 In areas where topsoil is present, strip 152 mm (6 in) topsoil and stockpile. Upon completion of backfilling, spread topsoil evenly over affected areas.



3.2 Site Grounding Installation - General

- .1 Approximate locations and quantities of ground rods are indicated in Appendix B: Drawings. Contractor shall field verify all ground rod and cable installation locations to ensure there is sufficient access for drilling/excavation equipment.
- .2 All ground cables will be buried 610 mm (24 in) below grade.
- .3 All trenches shall be backfilled to 152 mm (6 in) below grade with imported Granular 'A' fill. Backfill in 6 inch lifts and compact to 95% standard proctor.
 - .1 Top 152 mm (6 in) of backfill in compound area shall be 19 mm (5/8 in) clear stone.
 - .2 Top 152 mm (6 in) of backfill in non-compound, areas shall be stripped topsoil. Import additional topsoil as required.

3.3 Site Grounding Installation - Tower Ground Ring

- .1 Supply and install three [3] ground rods 120° apart in a 2 m (6.5 ft) diameter ring around the new tower base.
- .2 Supply and install 4/0 AWG tinned copper cable in a 2 m (6.5 ft) diameter loop. Connect cable to the ground rods using exothermic welded connections.
- .3 Supply and install three [3] lengths of 4/0 AWG tinned copper cable from exothermic welded connections to each leg of new tower. Cables shall be protected in 1 in PVC conduit above grade which shall extend to the lesser of 305 mm (12 in) above grade or to the top of concrete tower foundation. PVC should extend down 152-203 mm (6-8 in) into soil.
- .4 Supply and install 4/0 AWG tinned copper cable from the "Tower Ground Ring" to emergency generator.

3.4 Site Grounding Installation – Guy Anchor Ground

- .1 Supply and install one [1] ground rod approximately underneath the guy grounding connections. Supply and install a 4/0 AWG tinned copper cable from the ground rod to the guy cable.
 - .1 Ground rod connection should be exothermic, while guy connection should be connected via an appropriate Burndy KSU tinned-copper connector or equivalent.
 - .2 Ensure wire does not touch guy grip, and that cable is routed with minimal bends.
- .2 Supply and install two [2] additional ground rods 6 m (20 ft) beyond tower guy anchor, forming a 'V' as per Appendix B: Drawings.
- .3 Supply and install 4/0 AWG tinned copper cable, connecting the three ground rods at each guy using exothermic welded connections.



3.5 Site Grounding Installation - Waveguide Ground

- .1 Supply and install 4/0 AWG tinned copper cable from two new waveguide piers to existing ground system.

3.6 Site Grounding Installation – Gate Grounding

- .1 Supply and install 4/0 AWG tinned copper cable underneath existing roadway at main access gate. Attach ground cable to fence gate posts on either side of gate opening.

3.7 Site Grounding Installation – Fence Grounding

- .1 All site fencing within 3.05 m (10 ft.) of the grounding electrode system, or any object grounded to the grounding electrode system, shall be bonded to the external grounding electrode system in the future. Supply but do not connect grounding leads to fence posts.

3.8 Site Grounding Installation – Cable Entry Port Grounding

- .1 Supply and install 4/0 AWG tinned copper cable from new data entry port to existing ground system.



SECTION: 265536 OBSTRUCTION LIGHTING

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work in this section consists of the reinstallation of an obstruction lighting system to conform to the latest edition of TC CAR Standard 621.19, National Electrical Manufacturers' Association (NEMA) and this specification.

1.2 References

- .1 CSA S37-13 - Antenna Towers and Antenna Supporting Structures
- .2 Canada Labour Code Part II – January 2008
- .3 TC CAR Standard 621.19 - Standards Obstruction Markings
- .4 National Building Code of Canada – 2005
- .5 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011

PART 2 - MATERIALS

2.1 General

- .1 Existing lighting is to be salvaged and reinstalled on the new tower.
- .2 Lighting controller shall be salvaged in its current location.
- .3 New power cables shall be supplied and installed, and shall be Teck 90.
- .4 Cable fittings shall be water-tight and designed specifically for use with Teck 90 cables.

PART 3 - EXECUTION

3.1 Design

- .1 Contractor shall provide drawings and schematics indicating all elements of the system to Coast Guard for approval. Contractor shall also supply a Maintenance and Operations manual for lighting system.
- .2 A complete spares package to replace any component in the control panel shall be supplied, as well as a spare light sensor.



3.2 Controller

- .1 The lighting controller shall remain in its current location, and shall be reconnected to operate as it currently is operating.

3.3 Photocell

- .1 The existing photo cell shall be re-used.
- .2 The contractor shall relocate the photocell through the new cable entry port to the new waveguide bridge, after construction of the new tower and wave-guide bridge.

3.4 Installation Details

- .1 The lighting system power cables shall have a junction box with a drip loop on the tower just above the Waveguide Bridge junction. The junction box shall have a screened end drip tube on the bottom.
- .2 Mid level junction boxes shall be aluminum and have a screened end drip tube on the bottom. The power cable from the equipment shelter shall enter the box at the top via a serviceable loop.
- .3 The power to the top of the tower shall come from the top of the box. It shall also have a serviceable drip loop.
- .4 Every effort shall be made to ensure that the external connections are made waterproof using the best practices.
- .5 All junction boxes shall have drip loops on all the cables in and out of the box.
- .6 All junction boxes shall have screened end drain tubes on the bottom.
- .7 All lighting cables are to have an individual drip box and drip loop installed just above the Waveguide Bridge except for the photocell circuit which can be one continuous length of cable.



SECTION: 312310 EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 General

- .1 Work under this section consists of the excavation for the new guyed tower foundation and anchor locations.

1.2 References

- .1 Canada Labour Code Part II – January 2008
- .2 CSA-S37-13 - Antenna Towers and Antenna Supporting Structures
- .3 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011
- .4 Ontario Provincial Standard Specification – OPSS 1010 Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material
- .5 Ontario Provincial Standard Specification – OPSS 1004 Material Specification for Aggregates – Miscellaneous

PART 2 - EXECUTION

2.1 Excavation

- .1 Excavation for tower foundations and anchors shall be undertaken as per Engineering Plans submitted by contractor.
- .2 Keep excavations free of water while work is in progress.

2.2 Backfill

- .1 Backfill for tower foundations and anchors shall be undertaken as per Engineering Plans submitted by contractor.



SECTION: 323000 SITE IMPROVEMENTS

PART 1 - GENERAL

1.1 Scope of Work

- .1 This section covers the design, fabrication, supply and installation of miscellaneous site structures such as guy anchor bollards.

1.2 References

- .1 CSA-S37-13 - Antenna Towers and Antenna Supporting Structures
- .2 CAN/CSA-W47.1 - Certification of Companies for Fusion Welding of Steel Structures
- .3 CAN/CSA W59 - Welded Steel Construction (Metal-Arc Welding)
- .4 Canada Labour Code Part II – January 2008
- .5 Ontario Occupational Health and Safety Act and Regulations for Construction Projects – 2011
- .6 National Building Code of Canada – 2010

PART 2 - EXECUTION

2.1 Bollards

- .1 At each guy anchor, there shall be three (3) bollards installed.
- .2 The bollards are to be located on each side of the anchor and one at the end of the anchor on the side opposite to the direction of the guy, so as to best protect the guy anchor and tie plate from being struck.
- .3 The bollards are to be comprised of 150mm (6 in) diameter galvanized steel pipe, 3.05 m (10 ft) in length. This shall be imbedded in a 1.8 m (6 ft) long 457mm (18 in) diameter concrete filled sono tube.
- .4 The galvanized pipes are to be top filled with concrete to provide a crown. The bollard, including cement and pipe, is to be painted international orange or hazard yellow.

2.2 Waveguide Bridge

- .1 The waveguide bridge shall provide support for cabling and complete protection for the antenna, ground, and power cabling running from the Coast Guard shelter. In addition, the waveguide bridge shall provide easy access to all cables it protects.



- .2 Maximum spacing between waveguide bridge posts shall be 3.05 m (10 ft).
- .3 The waveguide bridge must be independent of and not directly connected to the tower structure or building. The waveguide bridge shall be designed to carry all initial and proposed cables or conduits as indicated on the antenna and transmission line schedule. The waveguide bridge shall support the cables at intervals to prevent sagging and to meet the manufacturer's standards.
- .4 Waveguide protection should incorporate a peaked, sloped or horizontal roof of solid plate construction located above the standard channel support for the cables and conduit.
- .5 The Contractor shall provide a suitable adjustable plate extension to the Waveguide Bridge to protect the lines between the building and the tower. This plate must taper to the full width of the building cable entrance and the tower.
- .6 Design, supply, and install a waveguide bridge from the existing Coast Guard equipment building to the new tower as per the drawings in Appendix B. Waveguide bridge shall support all lighting cables, as well as cables to antennas 2 to 5. See Appendix F for photos of existing CCG waveguide bridge.

2.3 Cable Entrance Panel

- .1 Install cable entrance panel (CommScope 204673-6 6 Port Entrance Panel, 2 x 3) on the inside and outside of equipment shelter in location specified in Appendix B. Installation to meet manufacturer's standards.
- .2 Modify flashing to ensure weather and moisture resistance.
- .3 Supply and install appropriate cap and boot assemblies for specified cables.



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canadian
Coast Guard

Garde côtière
canadienne



APPENDIX A: SITE LOCATION



44°30'56.00"N - 80°34'0.00"W



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canadian
Coast Guard

Garde côtière
canadienne



Meaford site looking East



Meaford site looking Southwest



Fisheries and Oceans
Canada

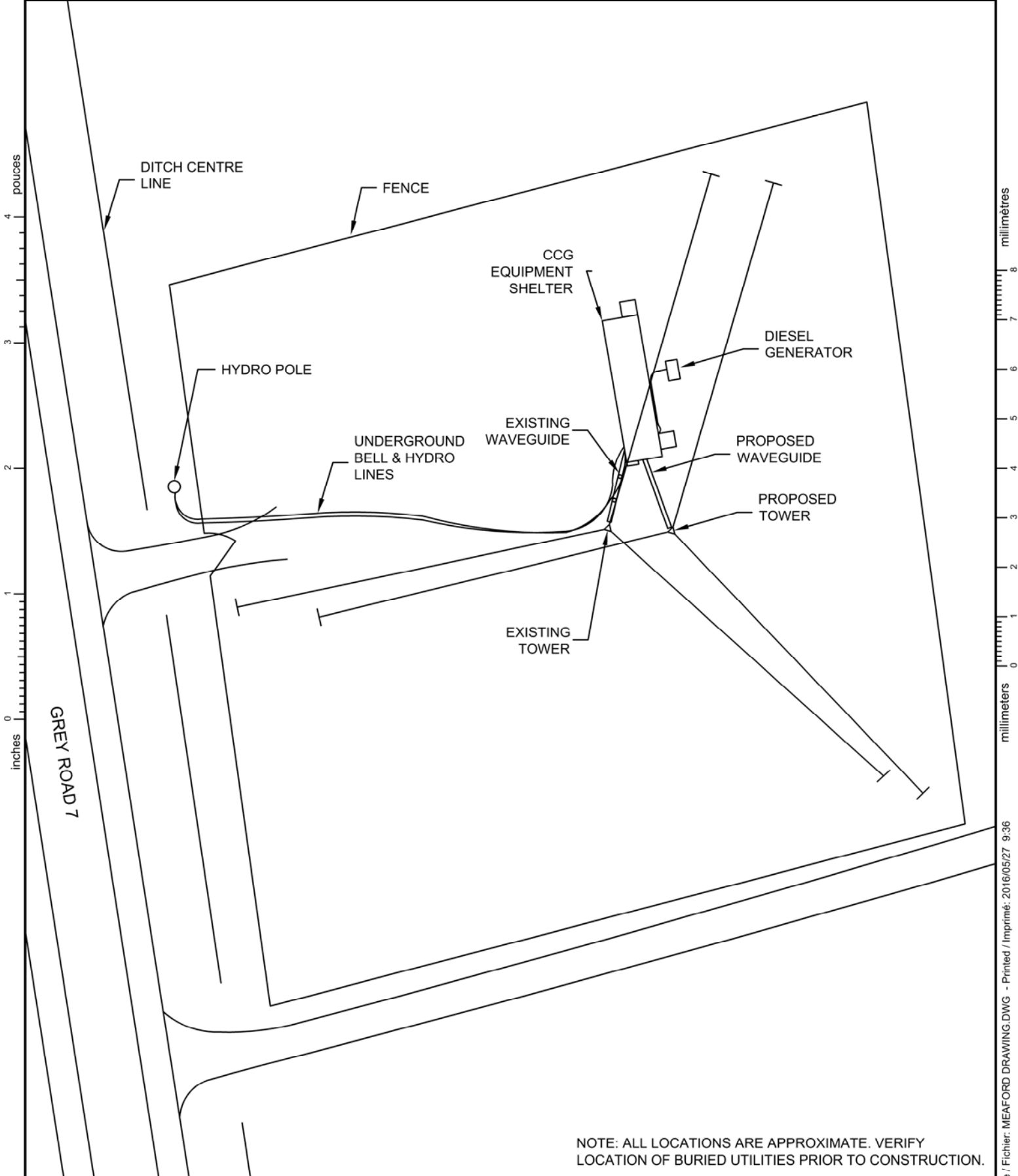
Pêches et Océans
Canada

Canadian
Coast Guard

Garde côtière
canadienne

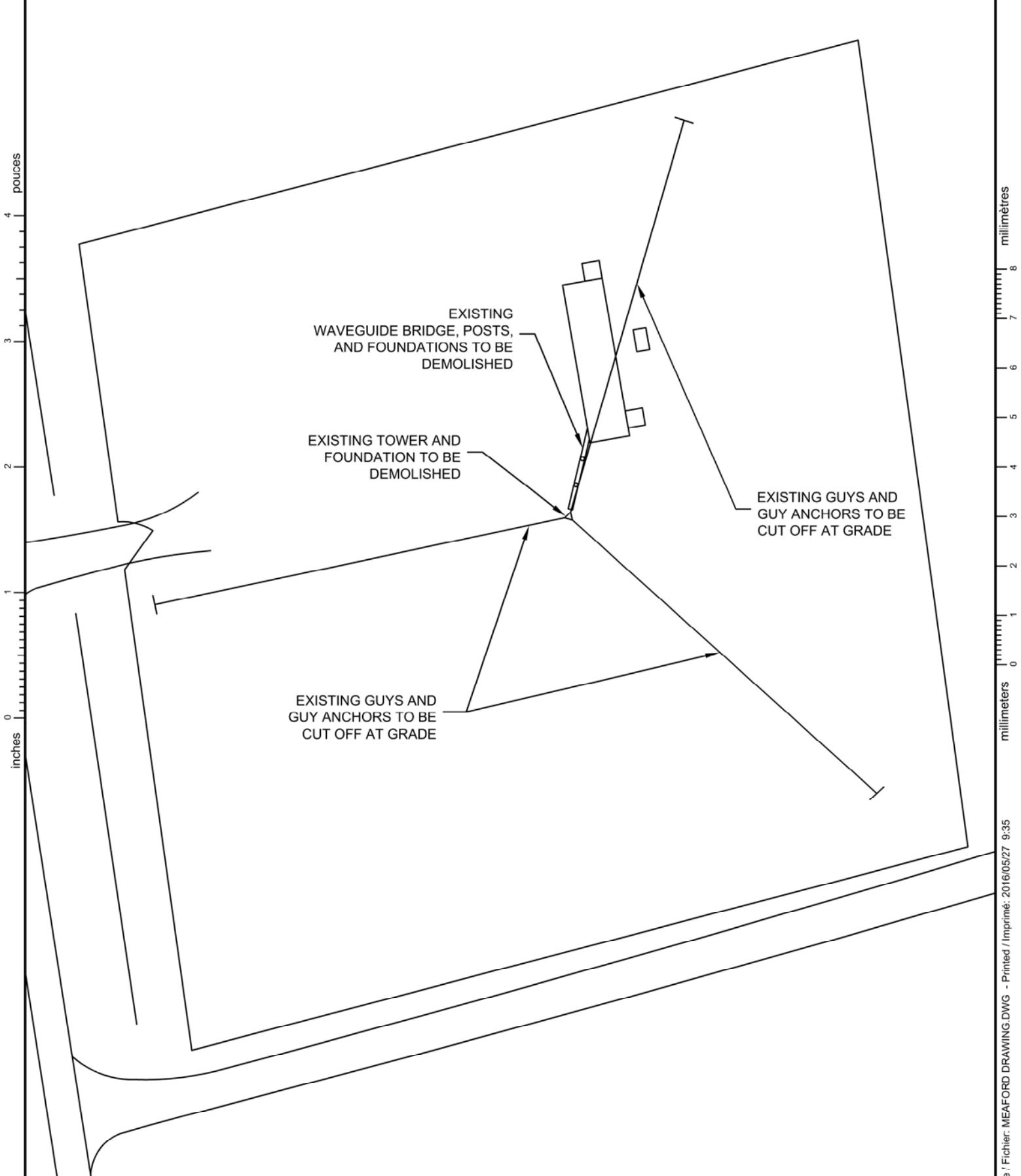



APPENDIX B: DRAWINGS

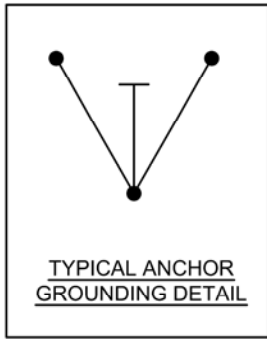


NOTE: ALL LOCATIONS ARE APPROXIMATE. VERIFY LOCATION OF BURIED UTILITIES PRIOR TO CONSTRUCTION.

 Fisheries and Oceans Canada Canadian Coast Guard	Pêches et Océans Canada Garde côtière Canadienne	Asset - Actif	designed - conception date BH 2016-05-24	
		Drawing - Dessin	approved - approuvé date APPROVED YYYY-MM-DD	
CCG ref. no. - no. réf. GCC EWT-8055-159	scale - échelle NTS	MEAFORD MCTS TOWER REPLACEMENT SITE PLAN		drawing no. - no. dessin sheet-feuille TBD 01/03
			rev 8 1/2" X 11" 0 File / Fichier: MEAFORD DRAWING.DWG - Printed / Imprimé: 2016/05/27 9:36	



 Fisheries and Oceans Canada Canadian Coast Guard	Pêches et Océans Canada Garde côtière Canadienne	Asset - Actif	designed - conception	date	
		MEAFORD MCTS TOWER REPLACEMENT		BH	2016-05-24
CCG ref. no. - no. réf. GCC EWT-8055-159		scale - échelle	Drawing - Dessin	approved - approuvé	date
NTS		DEMOLITION PLAN	APPROVED	YYYY-MM-DD	
			drawing no. - no. dessin	sheet-feuille	rev
			TBD	02/03	0



inches 0 1 2 3 4

millimètres 0 1 2 3 4 5 6 7 8

10' GROUNDING ROD (TYP.)

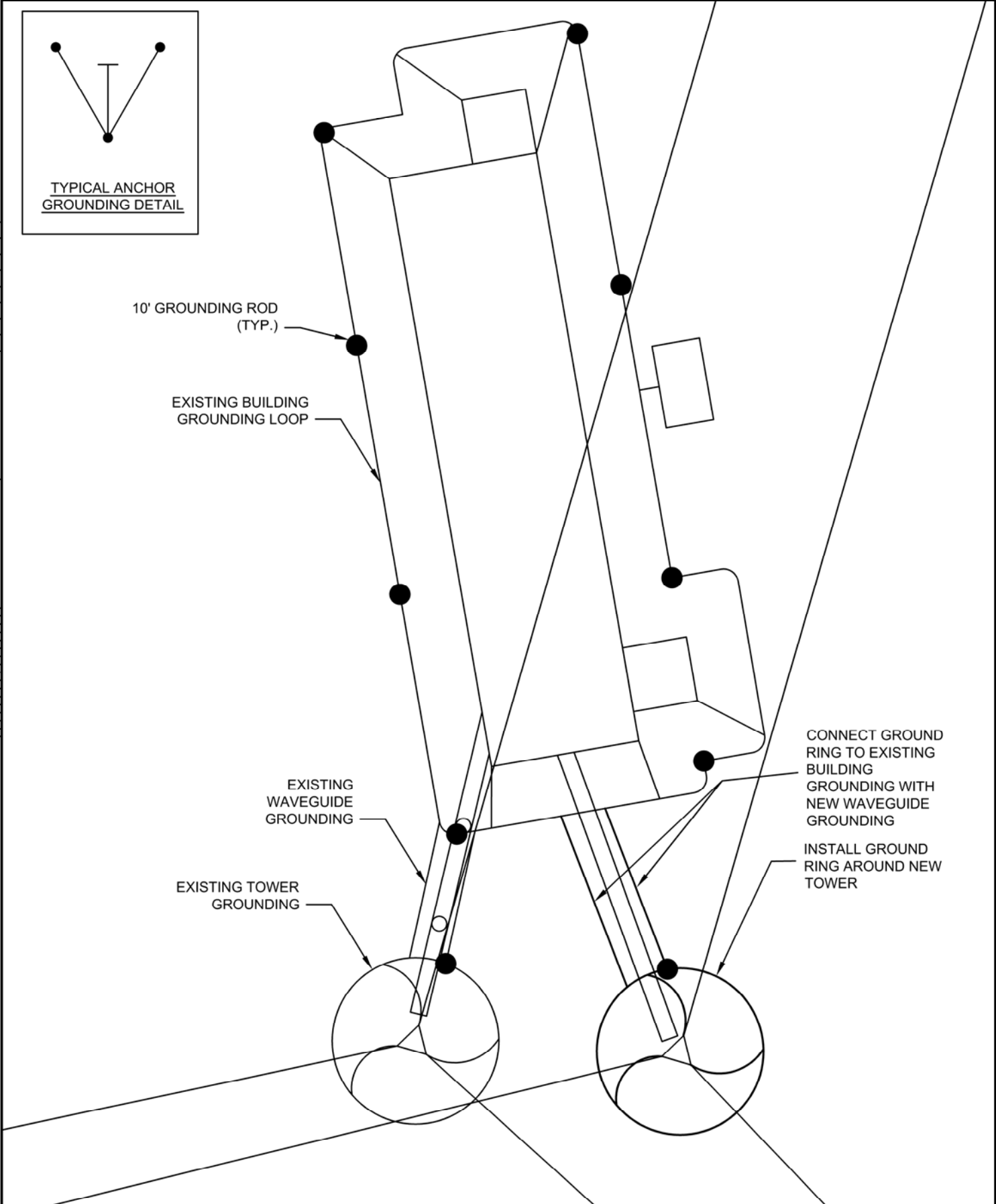
EXISTING BUILDING GROUNDING LOOP

EXISTING WAVEGUIDE GROUNDING

EXISTING TOWER GROUNDING

CONNECT GROUND RING TO EXISTING BUILDING GROUNDING WITH NEW WAVEGUIDE GROUNDING

INSTALL GROUND RING AROUND NEW TOWER



<p>Fisheries and Oceans Canada Canadian Coast Guard</p>	<p>Pêches et Océans Canada Garde côtière Canadienne</p>	<p>Asset - Actif</p>	<p>designed - conception BH</p>	<p>date 2016-05-24</p>	
		<p>Drawing - Dessin</p>	<p>approved - approuvé APPROVED</p>	<p>date YYYY-MM-DD</p>	
<p>CGG ref. no. - no. réf. GCC EWT-8055-159</p>	<p>scale - échelle NTS</p>	<p>MEAFORD MCTS TOWER REPLACEMENT TOWER GROUNDING</p>	<p>drawing no. - no. dessin TBD</p>	<p>sheet-feuille 03/03</p>	<p>rev 0</p>

File / Fichier: MEAFORD DRAWING.DWG - Printed / Imprimé: 2016/05/27 9:36 8 1/2" X 11"



APPENDIX C: ANTENNA AND CABLE SCHEDULE

#	Elev (m)	Antenna	Owner	Azimuth	TX-Line	Connector
1	61.0	Flashing Beacon	CCG	-	Teck90	
2	66.05	SRL210-C4	CCG	10	AVA5-50FX	78EZNF
3	59.44	SRL210-C4	CCG	10	AVA5-50FX	78EZNF
4	56.38	SRL210-C4	CCG	10	AVA5-50FX	78EZNF
5	47.24	SRL210-C4	CCG	10	AVA5-50FX	78EZNF
6	30.0	Double Obstruction Lights	CCG	-	Teck90	



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canadian
Coast Guard

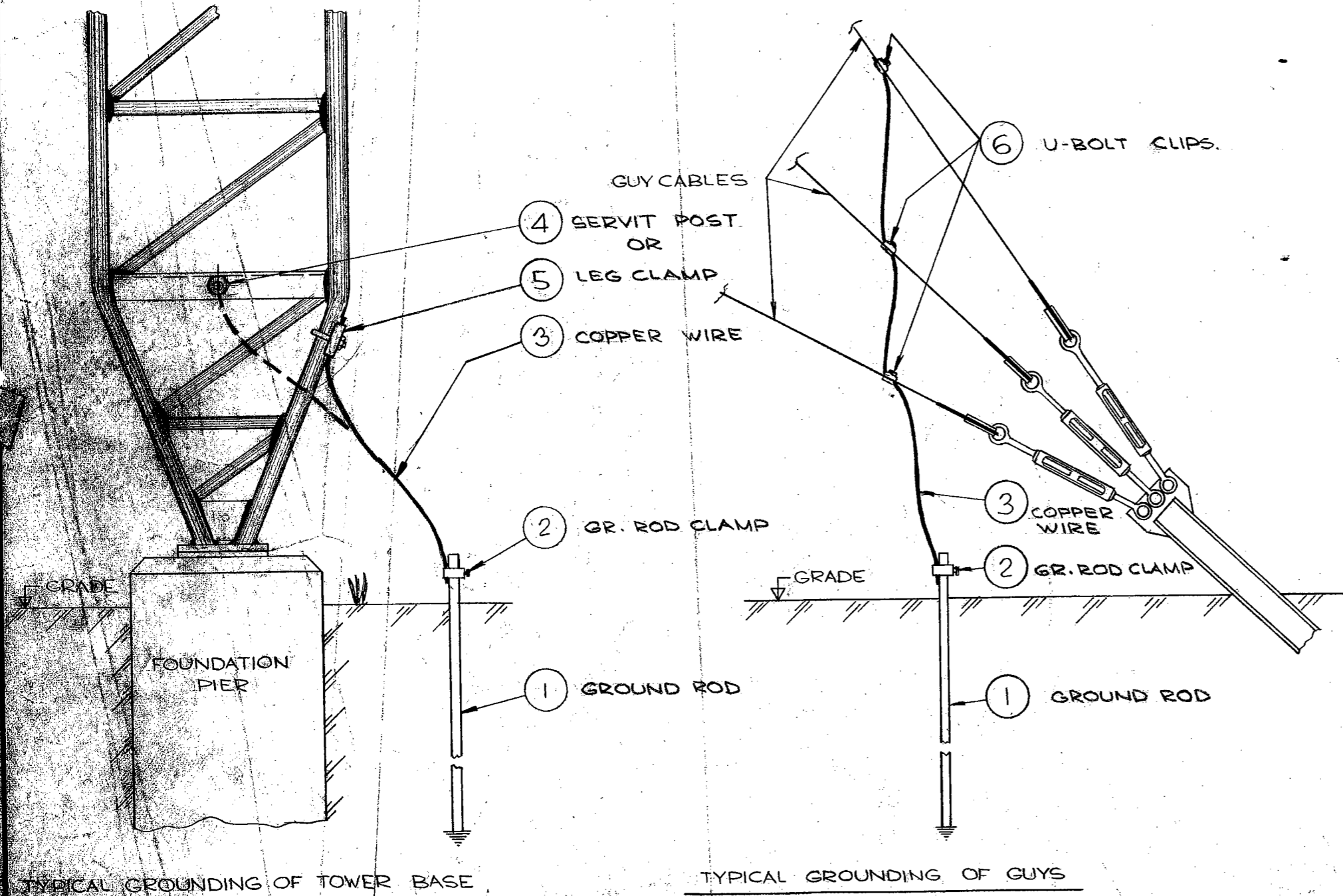
Garde côtière
canadienne



APPENDIX D: EXISTING TOWER DETAILS

NOTE:-

TO PREVENT GALVANIC CORROSION AT CLAMPING POINTS
 "TIN" COPPER WIRE WITH 50-50 SOLDER OR WRAP
 WITH TIN FOIL
 USE SWEEPING RADII ON GROUND WIRE RUN



TYPICAL GROUNDING OF TOWER BASE

TYPICAL GROUNDING OF GUYS

NOTE: For Rock Site BEND GROUND ROD & BURY

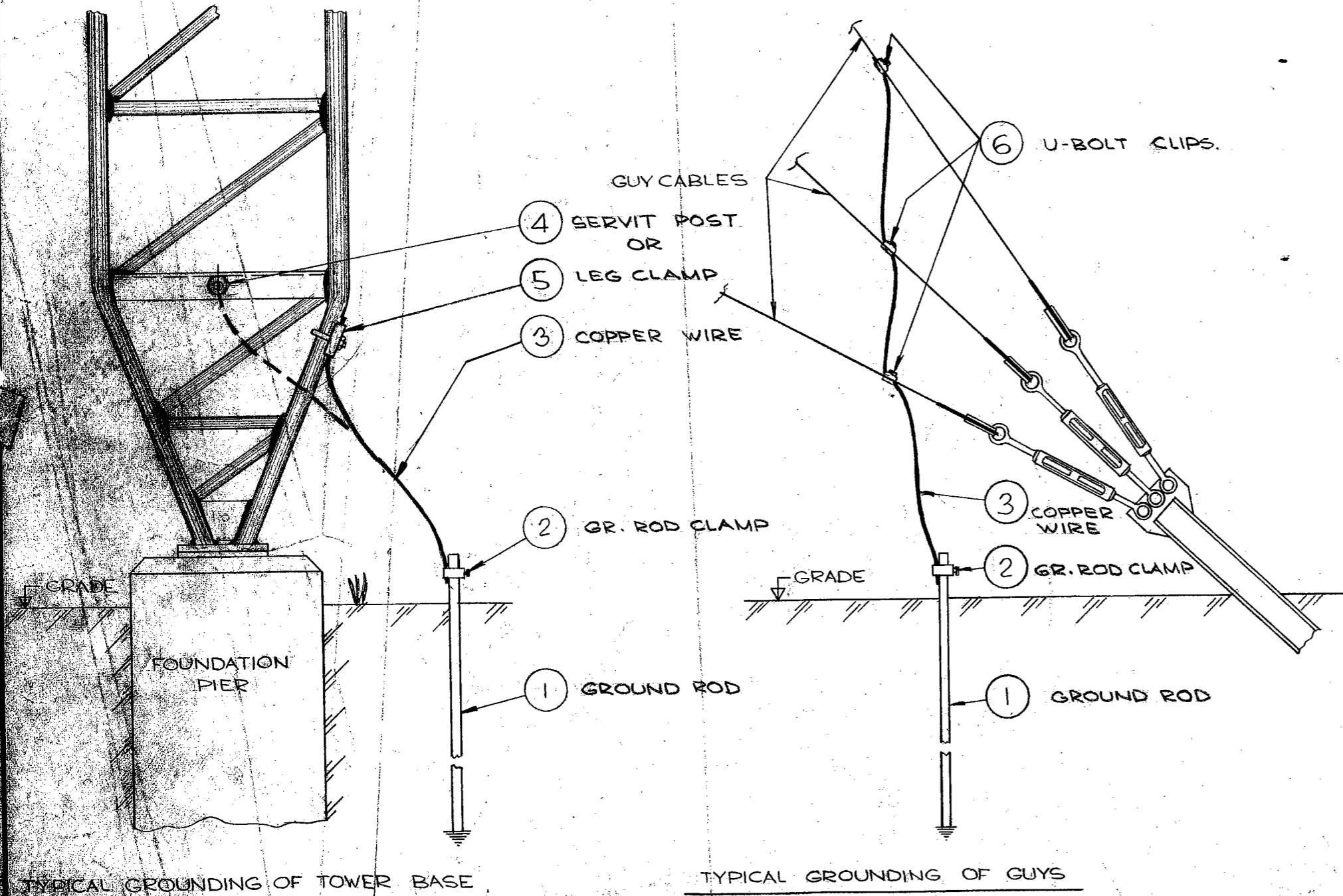
ITEM	PART N ^o	DESCRIPTION	QTY
6		U-BOLT CLIP (SIZE AS SPECIFIED)	A.R.
5	13951-4	LEG GROUND CLAMP ASS'Y	1
4	K2C23B1	BURNDY SERVIT POST C/W 3/8" NUT & LOCKW.	1
3	#4	COPPER WIRE (FLAMESEAL AS SPECIFIED)	A.R.
2	13951-3	GROUND ROD CLAMP ASS'Y	A.R.
1		5/4" x 8' LG. STEEL GALV. GROUNDING ROD	A.R.

TYPICAL GROUNDING KIT FOR A.W. GUYED TOWERS

SCALE: *1/2"*
 DATE: DEC 17 71
 APPROVED BY: *J. Lupton*
 CHECKED BY:
 DRAWN BY: *W. J. G.*
 REVISED:
 THE WIND TURBINE COMPANY OF CANADA LTD.
 ELMIRA ONTARIO
 NO B-11 176-F

NOTE:-

TO PREVENT GALVANIC CORROSION AT CLAMPING POINTS
 "TIN" COPPER WIRE WITH 50-50 SOLDER OR WRAP
 WITH TIN FOIL
 USE SWEEPING RADII ON GROUND WIRE RUN

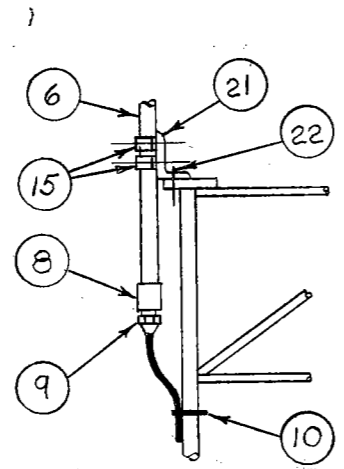
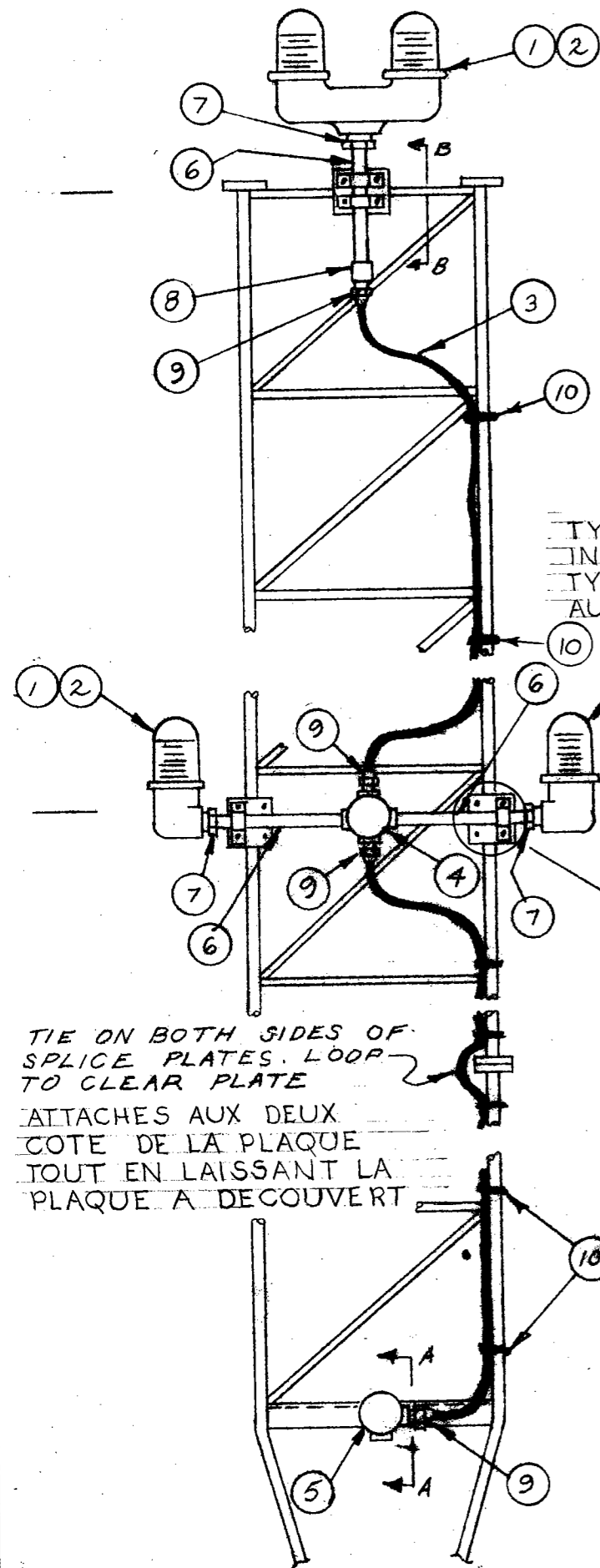


NOTE: For Rock Site Bend Ground Rod & Bury.

ITEM	PART N ^o	DESCRIPTION	QTY
6		U-BOLT CLIP (SIZE AS SPECIFIED)	A.R.
5	13951-4	LEG GROUND CLAMP ASS'Y	1
4	K2C23B1	BURNDY SERVIT POST C/W 3/8" NUT & LOCKW.	1
3	#4	COPPER WIRE (FLAMESEAL AS SPECIFIED)	A.R.
2	13951-3	GROUND ROD CLAMP ASS'Y	A.R.
1		3/4" x 8' LG. STEEL GALV. GROUNDING ROD	A.R.

TYPICAL GROUNDING KIT FOR A.W. GUYED TOWERS

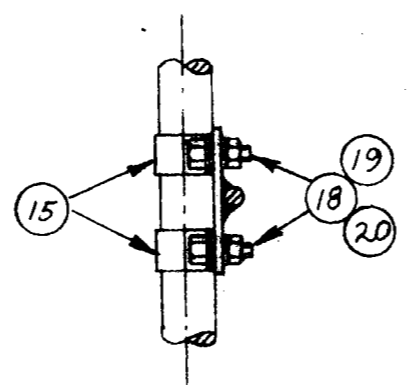
SCALE: *1/2"*
 DATE: DEC 17 71
 APPROVED BY: *J. Lupton*
 CHECKED BY:
 DRAWN BY: *W. J. G.*
 REVISED:
THE WIND TURBINE COMPANY OF CANADA LTD.
 ELMIRA ONTARIO
 NO B-11 176-F



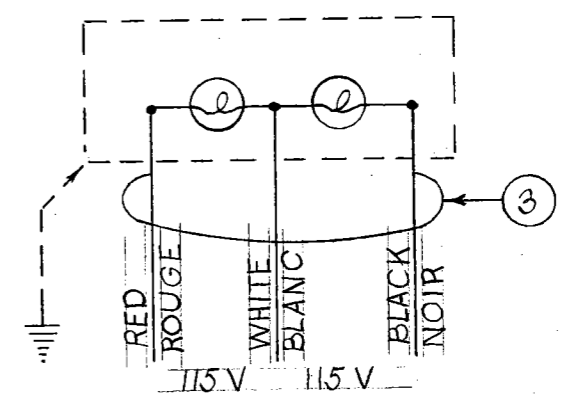
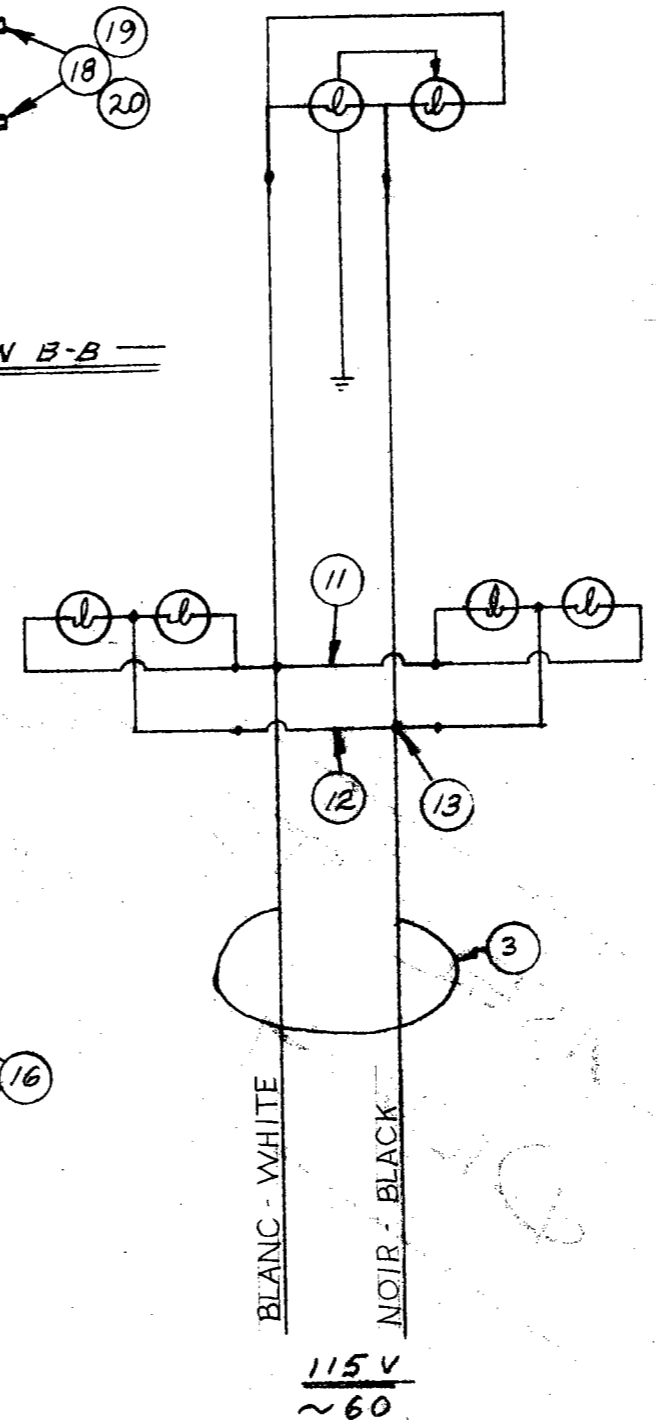
SECTION C-C
* ALTERNATE - ALTERNANTE

TYRAP EVERY 3'-0" TO INSIDE LEG.
TYRAP TOUT LES 3 PIEDS AU DEDANS DU POTEAU.

INTERMEDIATE LIGHTS NOT REQUIRED ON TOWERS LESS THAN 150'
LUMIERES INTERMEDIAIRES NON REQUIS SUR LES TOURS MOINS DE 150 PIEDS.



SECTION B-B

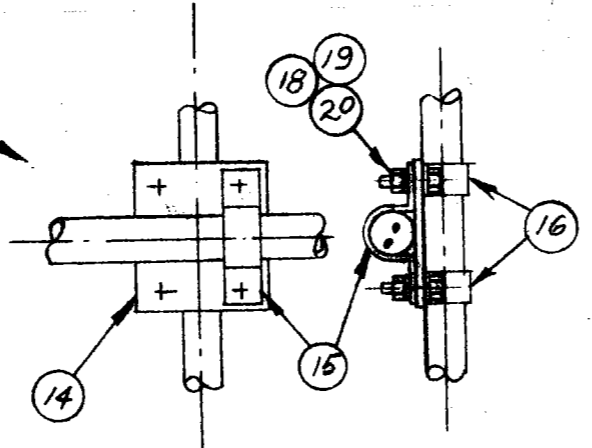


THREE WIRE ARRANGEMENT
ARRANGEMENT A TROIS FILS

151' TO 300' 0'
TO 150'

ITEM	PART N°	DESCRIPTION	QTY
* 22		GR. 5 BOLT ASS'Y	2 2
* 21		D.O.L. BRACKET	1 1
20		3/8" φ LOCKWASHER	14 6
19		3/8" GR. 5 HEX NUT	14 6
18		3/8" x 1 1/4" GR. 5 CAPSCREW	12 4
17		3/8" x 1 1/2" GR. 5 CAPSCREW	2 2
16	10529-	LEG CLAMP	4 0
15	11483-5	CONDUIT CLAMP	4 2
14	11483-4	CONDUIT R.	2 0
13	#2	MARR CONNECTOR	8 4
12		#12 FLAMESEAL BLACK	6 2
11		#12 FLAMESEAL WHITE	6 2
10	MX-525	TY-RAPS	4 8 4/8
9	2232T&B	CONNECTOR	4 2
8		3/4" STRAIGHT COUPLING	1 1
7		1" x 3/4" RED BUSHING	3 1
6		3/4" x 13" AL. NIPPLE	3 1
5	GRJS-75	3/4" CONDULET (3/16" DRILL)	1 1
4	GRJS-75	3/4" CONDULET	1 0
3	NMW-10	2" 12 ENDUREX	4 8 4/8
2	116A21TS	8000 HR LAMP	6 2
1	44507-A	DOUBLE OBSTR. LIGHT	3 1

TIE ON BOTH SIDES OF SPLICE PLATES. LOOP TO CLEAR PLATE
ATTACHES AUX DEUX COTE DE LA PLAQUE TOUT EN LAISSANT LA PLAQUE A DECOUVERT



SECTION A-A

LIGHTING KIT - COFFRET DE LUMIERES

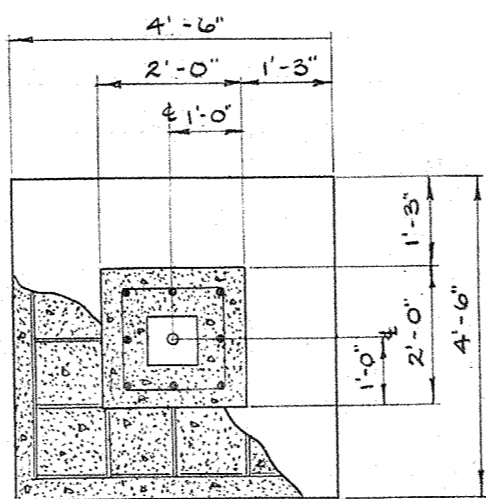
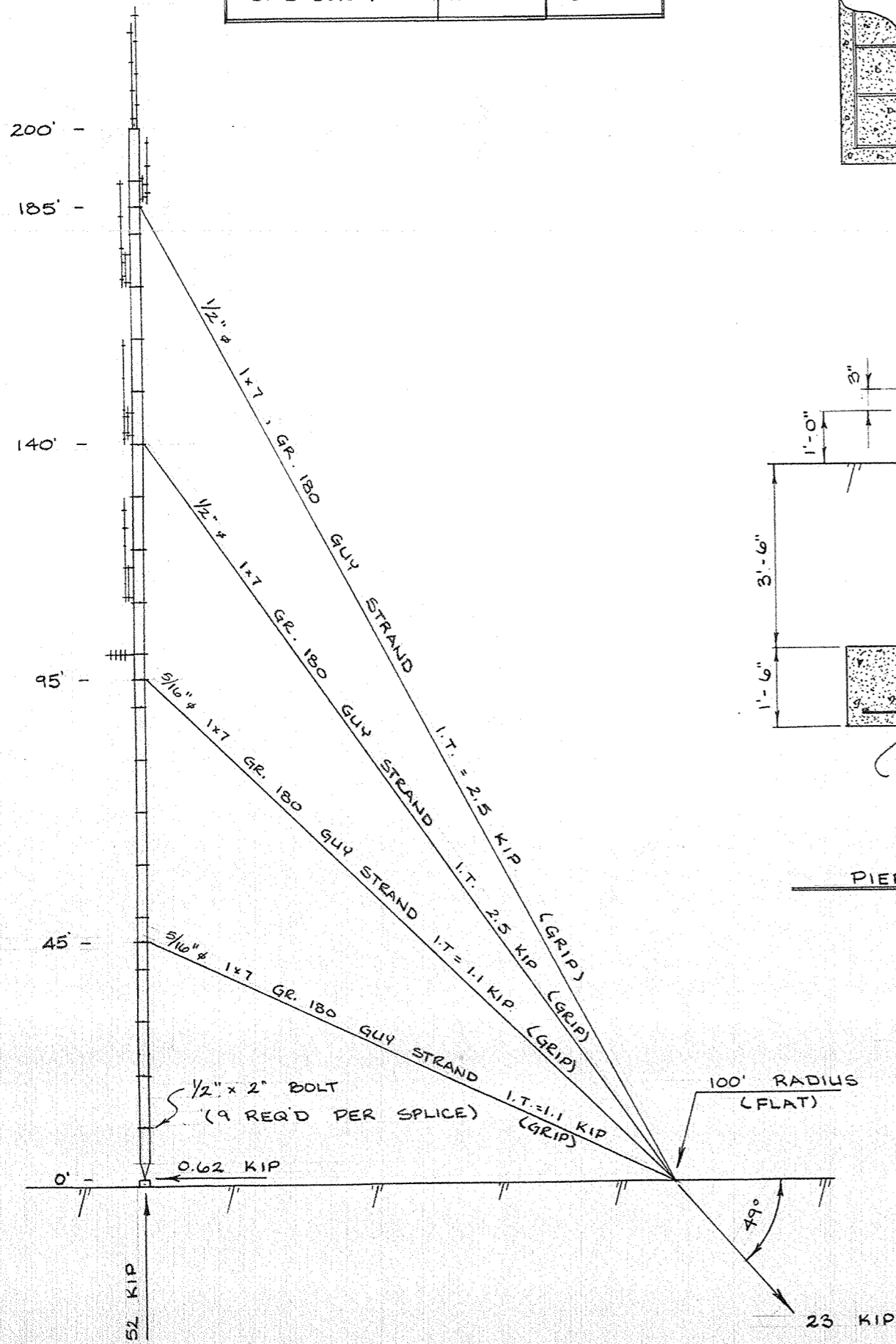
SCALE: A APPROVED BY: D.C. Bulline DRAWN BY: G.H. Wight
 DATE: MAR. 6. 75 CHECKED BY: [Signature] REVISION:
THE WIND TUNNIE COMPANY OF CANADA LTD. NO. B-14801-AC
 ELMIRA - ONTARIO

TOWER SECTION

- B. - BASE SECTION *24383-1
- R. - REG. SECTION *24380-1
- G₁ - GUY SECTION *24382-1
- G₂ - GUY SECTION *24381-3
- G₃ - GUY SECTION *24382-3
- T. - TOP SECTION *24384-1

ANTENNA LOADING		
ANTENNA	ELEV.	AZ. °
DB 222	TOP	240°
SRL 224	TOP	OMNI
DB 212	190'	185°
SRL 210 C4	180'	350°
SRL 210 C4	150'	350°
SRL 210 C4	120'	350°
SRL 302 A	100'	315°

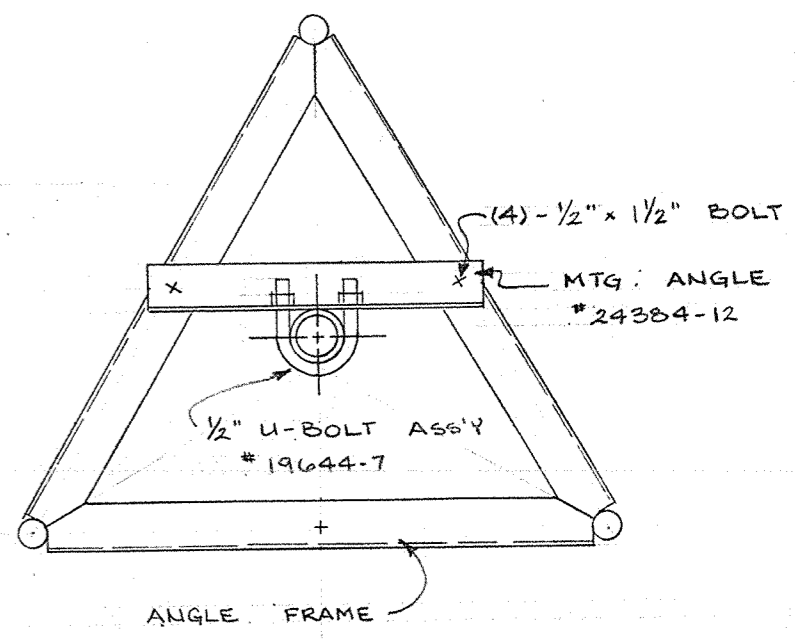
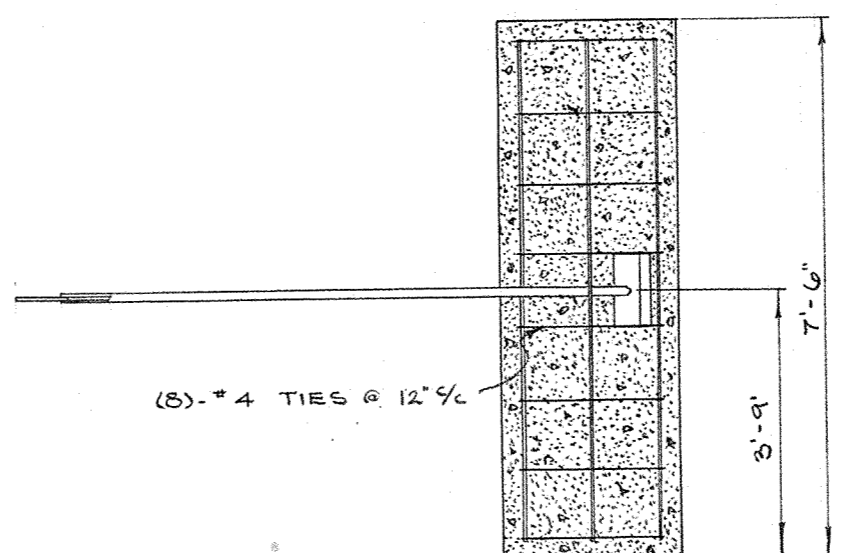
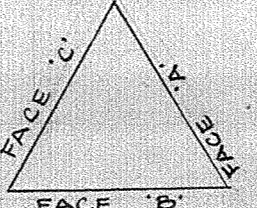
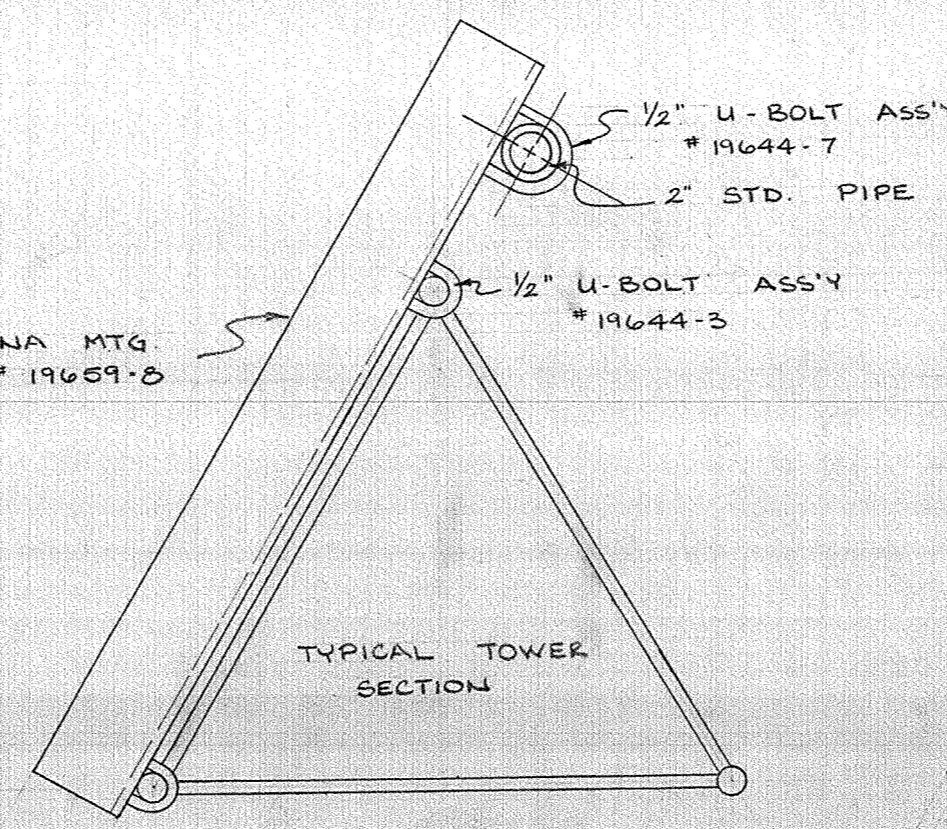
MARKINGS	LEG	DIAGONAL	HORIZONTAL	B.	R.	R.	G.	R.	R.	R.	R.	R.	R.	R.	R.	R.	R.	T.
	1/4" S.R. BAR	5/8" S.R. BAR (REG)	5/8" S.R. BAR															



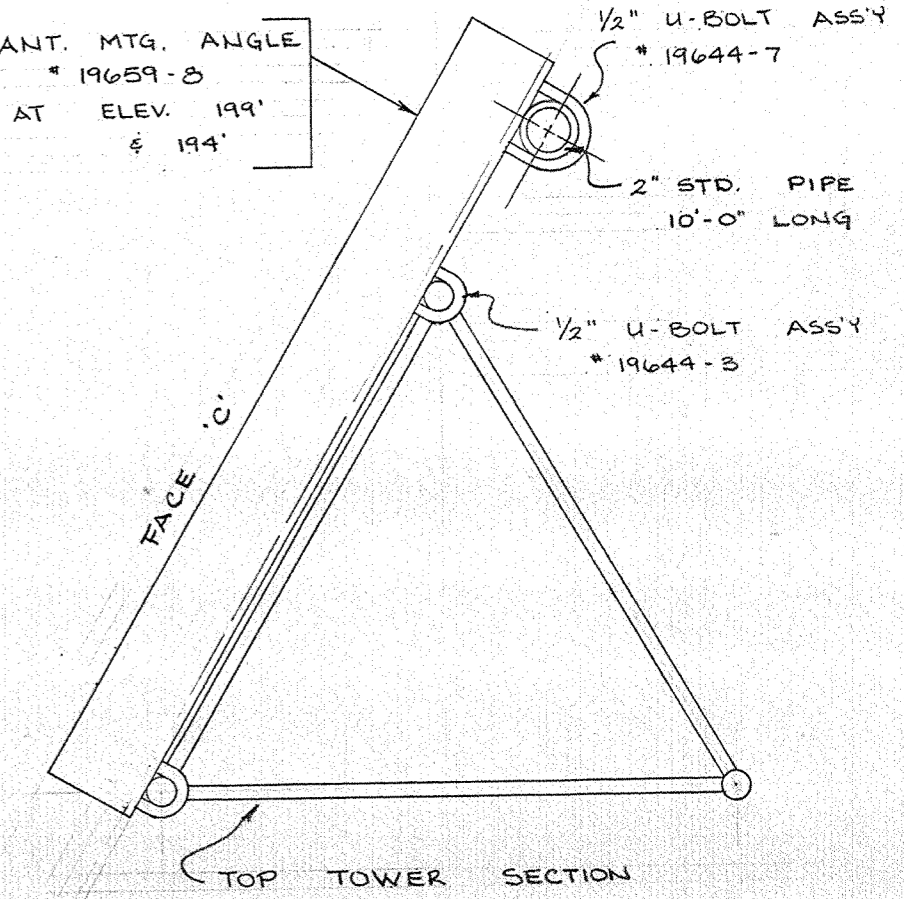
SEE FOUNDATION INSTRUCTIONS AX 901-905

FOUNDATION DETAIL

DESIGN SPECIFICATION
CSA S87-1976
ZONE 'A'
CLASS II



ANTENNA IS MOUNTED TO 2" STD. PIPE 10'-0" LONG SUPPLIED.



ANTENNA	MTG. ANGLE		FACE	PIPE LENGTH
	UPPER	LOWER		
DB 212	189'-6"	185'-6"	'A'	5'-0"
SRL 210 C4	174'-6"	170'-6"	'B'	5'-0"
SRL 210 C4	144'-6"	140'-6"	ANY	5'-0"
SRL 210 C4	114'-6"	110'-6"	ANY	5'-0"
SRL 302 A	102'-0"	98'-0"	ANY	5'-0"

bob No. 5453

200' - 2400 A.W. TOWER - MEAFORD UNION GAS

SCALE AS NOTED	APPROVED BY	DRAWN BY P.H.P.
DATE NOV. 3, 1982	CHECKED BY	REVISED JAN. 28/85 'A'
THE WIND TURBINE COMPANY OF CANADA LTD. ELMIRA - ONTARIO		NO C-20835-B



January 16th, 2014

Canadian Coast Guard
520 Exmouth St.,
Sarnia, ON
N7T 8B1

Attention: Blair Young

Dear Mr. Young,

Re: Structural analysis of an existing 61 m Union Gas
 Guyed Tower, Meaford, ON.
 Skyward Towers File: 8001

We have completed our structural analysis of the existing Union Gas tower in Meaford, ON and are pleased to submit our report for your attention.

We trust that the analysis and recommendations presented in the report will meet your requirements.

However, please do not hesitate to contact us if you have any questions, or require any further information regarding this study.

Regards,
Skyward Towers Inc.

A handwritten signature in black ink, appearing to read "Mircea Teodorescu", with a long horizontal flourish extending to the right.

Mircea Teodorescu, P.Eng.



Cc: File

STRUCTURAL ANALYSIS

OF

**Existing 61 m Union Gas AWGT
Meaford, ON**

**PREPARED FOR:
Union Gas
Site: Meaford, ON**

**PREPARED BY:

SKYWARD TOWERS INC.
65 Raglin Road
Cambridge, Ontario
Canada, N1T 1X9
File # 8001**

1.0 Introduction

At the request of Canadian Coast Guard, we have performed a structural analysis of the tower for the existing antenna and transmission line loading, in order to determine whether it satisfies the structural strength and serviceability requirements of CAN/CSAS37-01 under existing condition. The tower was designed by The Wind Turbine Company of Canada Ltd. in 1982.

The existing tower is a 61 m all-weld guyed tower, with a triangular cross section.

2.0 Terms of Reference

The following documents and drawings were examined:

Tower Profile:	The Wind Turbine Company of Canada Dwg. # C-20835-B
Tower Foundations:	The Wind Turbine Company of Canada Dwg. # C-20835-B
Antenna Loading:	as per our inspection dated October 29, 2013
Soils Report:	Not available; we assumed normal dry soil conditions in our calculations, with an ultimate bearing pressure of 250 kPa

3.0 Analysis Parameters

The following criteria were used in the analysis.

1. Analysis Standard: CSA Standard S37-01
2. Basic Wind Speed: 370 Pa. Site-specific reference velocity pressure.
3. Radial Ice Thickness: Class II (25 mm)
4. Importance Factor: $\gamma=1.0$
5. Serviceability Factor: $\tau=1.0$
6. Speed Up Factor: $C_a=1.0$
7. The tower is assumed to be in good, non-corroded condition.

4.0 Design Method (Analysis)

The existing tower was analyzed using a comprehensive computer program entitled TowerSoft Engineering's TSTower software suite for communication structures. The analysis was performed in conformance with CSA S37-01 Standard and for 370 Pa wind pressure along with half this wind pressure and 25 mm solid radial ice (Class II). The wind and ice are applied to the structure, all appurtenances and antennas.

Graphical and tabular results are presented in Appendix B. The analysis also allowed 5 percent over-stress due to program design variance. Detailed computer output is on file at the Skyward Towers headquarters in Cambridge.

5.0 ANALYSIS RESULTS

5.1 Antenna and Transmission Line Loading

Table 1. Antenna Loading

Elevation (m)	Antenna	Azimuth (deg.)	Transmission Lines	Status
61.0	Dipole antenna	omni	LDF4	Existing
58.7	SRL480	omni	LDF7	Existing
57.9	Yagi antenna	200	LDF4	Existing
56.4	SRL210-C2	240	LDF4	Existing
52.4	SRL210-C4	0	LDF4	Existing
47.2	SRL210-C4	0	LDF4	Existing
35.0	SRL210-C4	0	LDF4	Existing
32.0	Corner reflector	260	LDF4/LDF5	Existing
29.9	Coast guard antenna	120	LDF2	Existing

5.2 Analysis Results

5.2.1 Tower Mast

Member	Elevation (m)	Maximum stress ratio
Legs	0 – 61	0.6
Bracings	0 – 61	0.5

**Maximum Stress Ratio: 1.00=Full Allowable, 1.05 is considered tolerable.*

5.2.2 Guy Cables

There are no calculated overloads in the guy cables.

5.2.3 Foundations

There are no calculated overloads on the tower and guy anchors foundations.

5.2.4 Tilt and Twist at Antenna Elevations

The tower was analyzed for the serviceability limit states as specified in CAN/CSA-S37-01, Section 5.4, using a serviceability factor of 1.0. The calculated twist and tilt at the top of the tower is 3.7 degrees.

5.3 Conclusions

With the antenna arrangement as described in Table 1 the tower satisfies the structural strength requirements of CAN/CSA-S37-01.

6.0 Conclusions and Recommendations

1. The existing tower is *structurally* adequate to accommodate the existing loading as shown in Table 1.
2. The tower foundation is *structurally* adequate to support the existing loading.
3. The twist and tilt values should be reviewed by the client.
4. Any future changes in loading should be reviewed by a professional engineer qualified in tower design.

Should any questions arise concerning this report please contact the undersigned.

Prepared by,



Mircea Teodorescu, P.Eng.



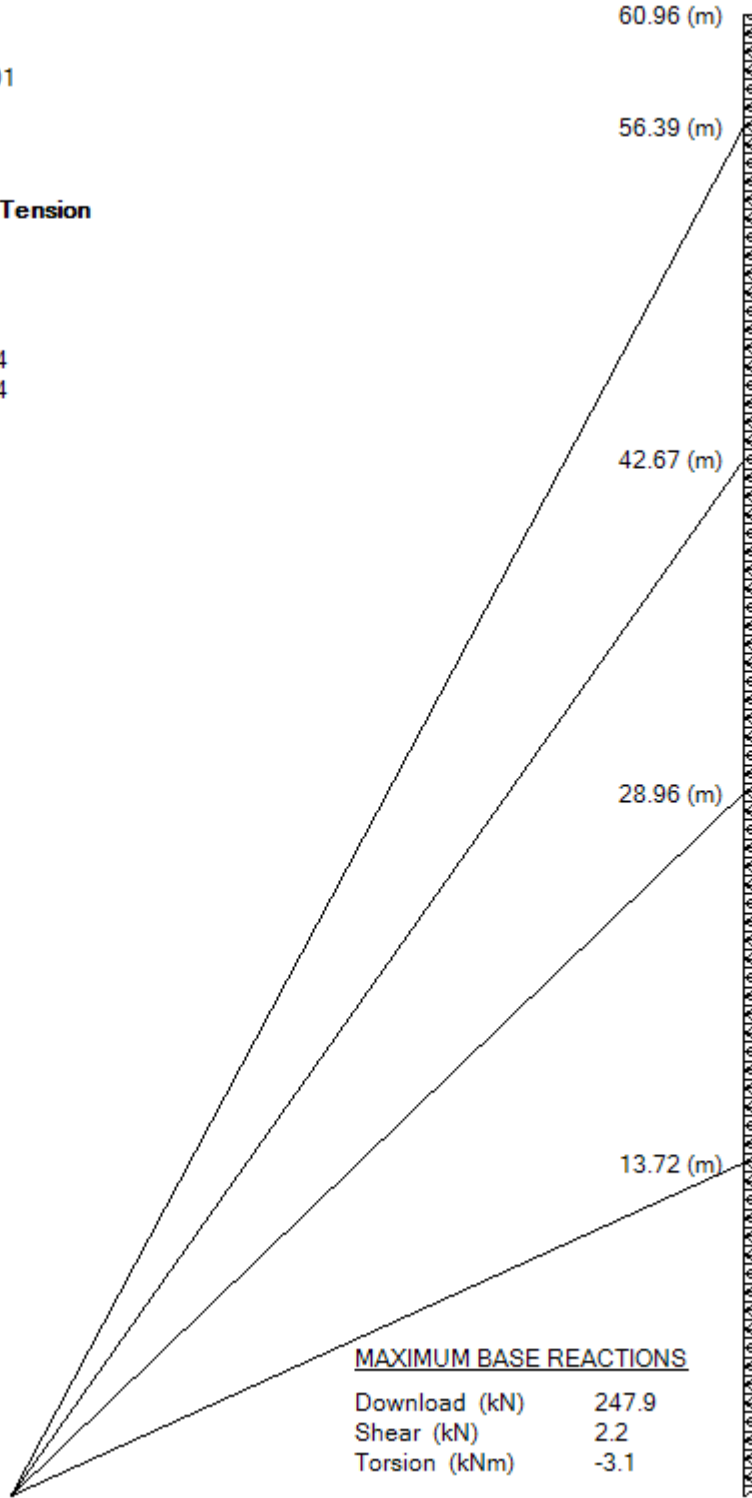
APPENDIX A:
TOWER PROFILE DRAWING

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 Contract: 8001
 Project: 200 ft. guyed tower
 Date and Time: 01/16/14 2:21:47 PM
 Revision: 1
 Site: Meaford
 Engineer: MT

DESIGN SPECIFICATION

Design Standard: CSA - S37 - 01
 Wind pressure = 370.11 (Pa)
 Ice thickness = 24.89 (mm)

Elev. (m)	Guy Size	Init. Tension (kN)
13.72	3-GS 5/16	4.94
28.96	3-GS 5/16	4.94
42.67	3-GS 1/2	11.34
56.39	3-GS 1/2	11.34



MAXIMUM BASE REACTIONS

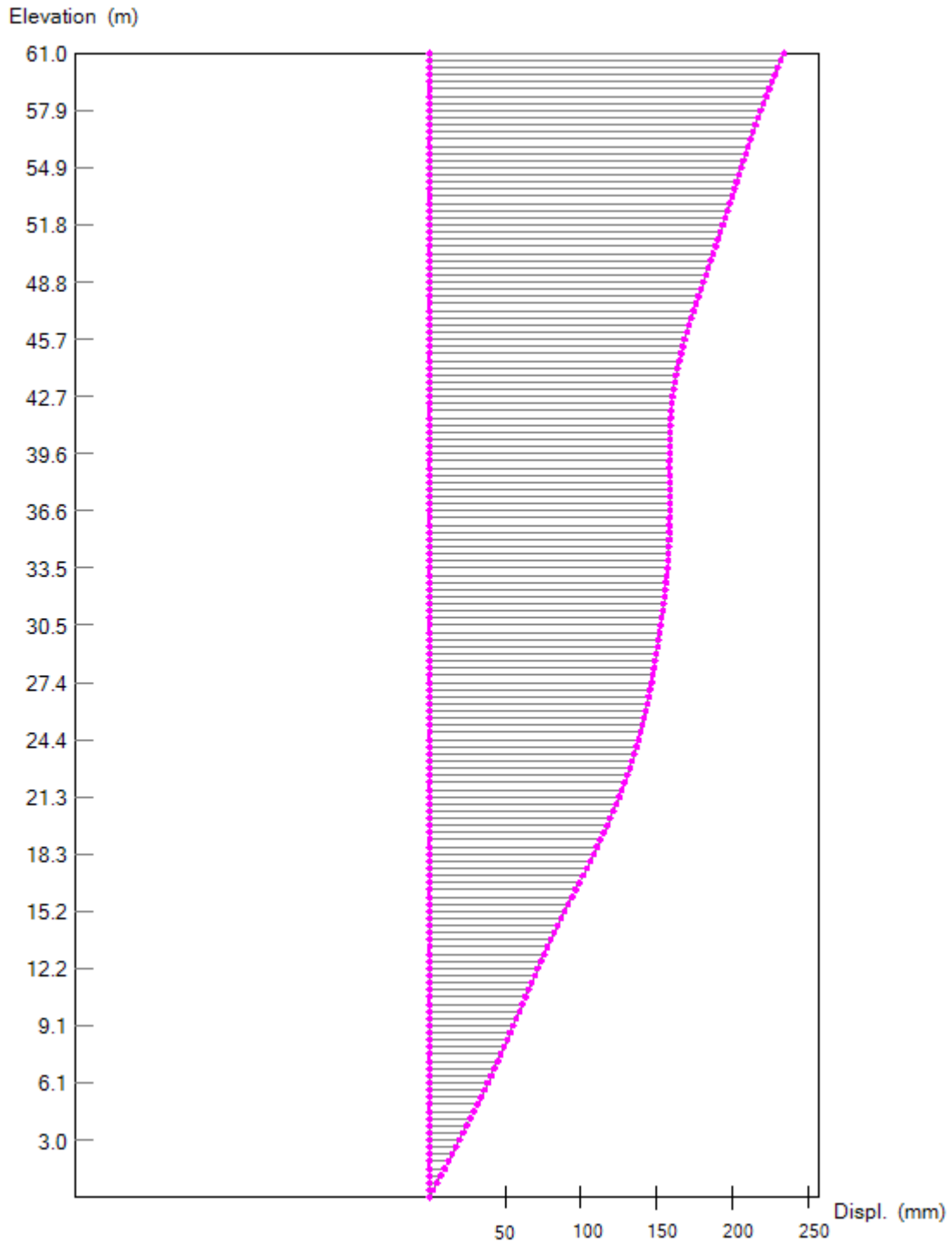
Download (kN)	247.9
Shear (kN)	2.2
Torsion (kNm)	-3.1

APPENDIX B:

ANALYSIS RESULTS

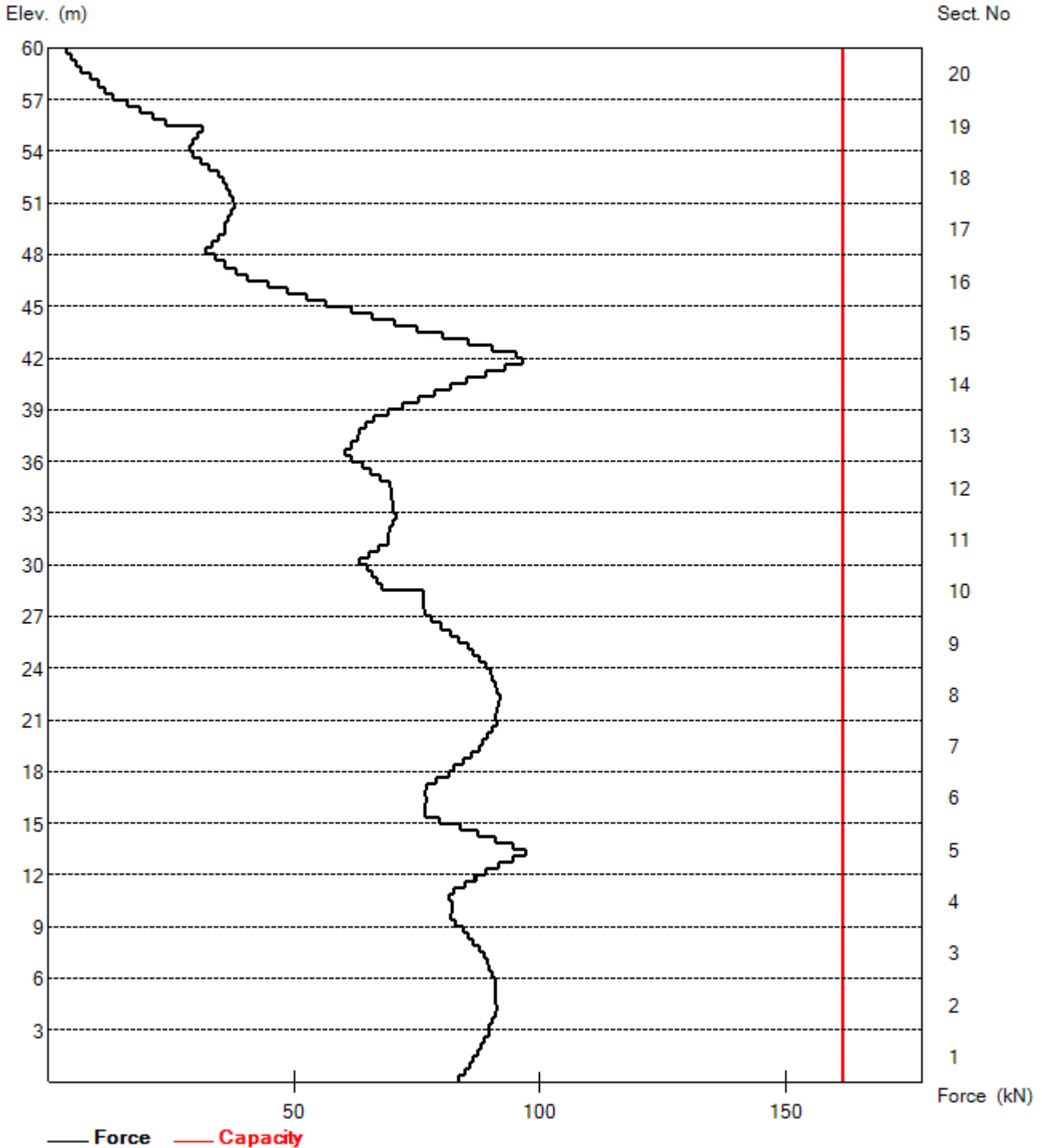
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Project: 200 ft. guyed tower
Date and Time: 01/16/14 2:22:53 PM
Revision: 1
Site: Meaford
Engineer: MT

Horizontal Displacement Diagram
Max. Envelope (All Loading Cases)



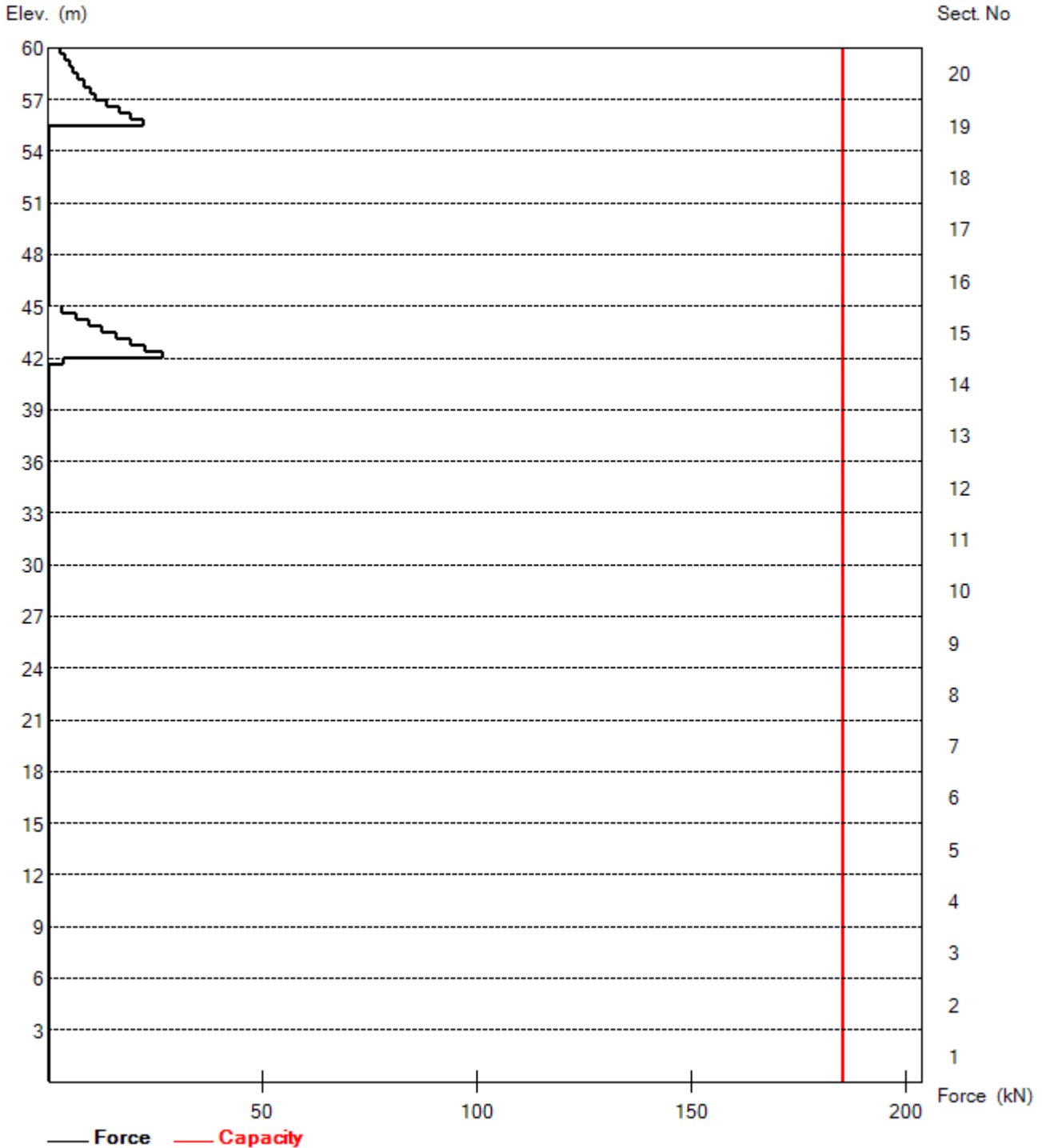
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 Contract: 8001
 Project: 200 ft. guyed tower
 Date and Time: 01/16/14 2:22:53 PM
 Revision: 1
 Site: Meaford
 Engineer: MT

Leg Load Compression Diagram
Max. Envelope (All Loading Cases)



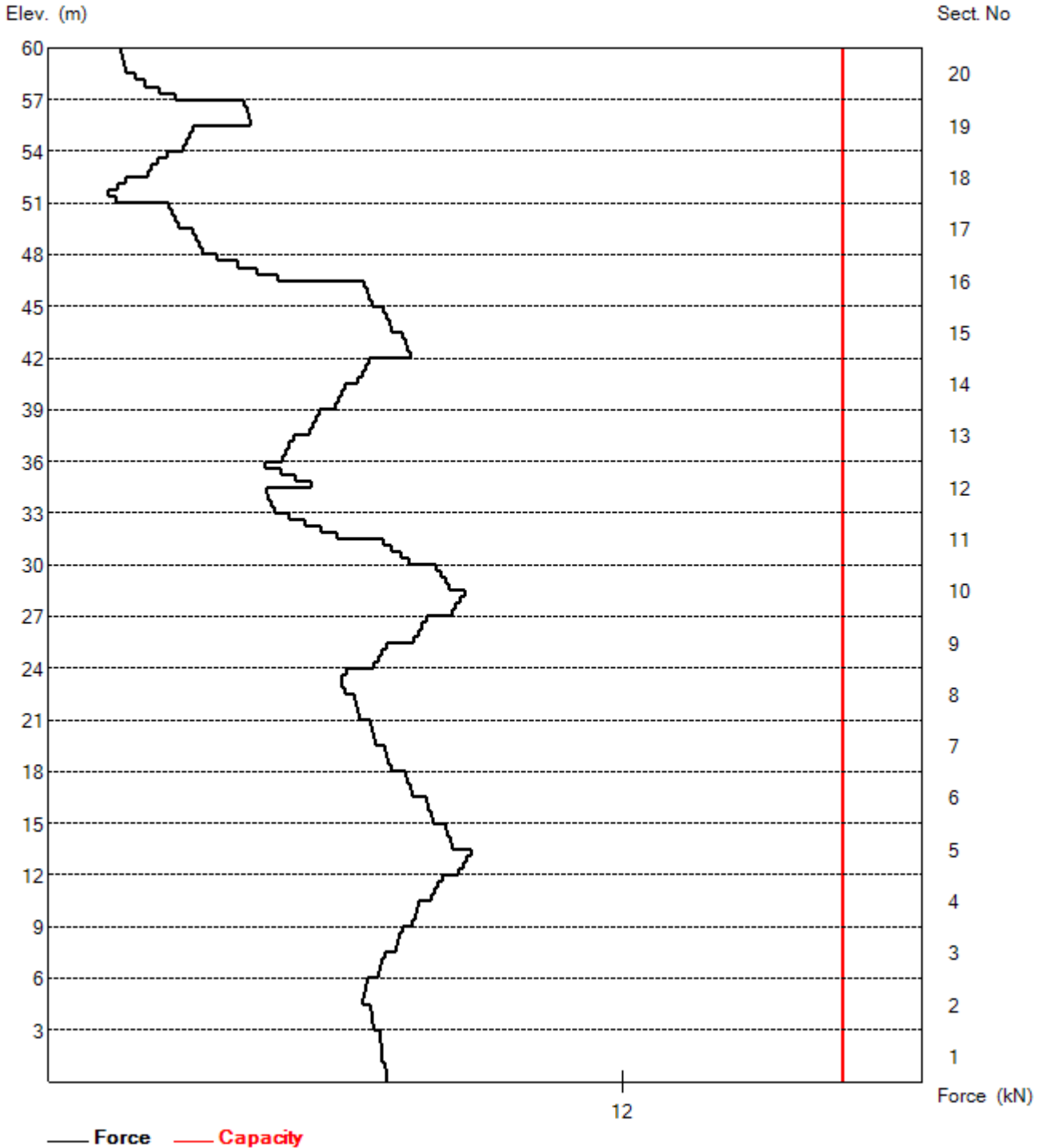
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 Contract: 8001
 Project: 200 ft. guyed tower
 Date and Time: 01/16/14 2:22:53 PM
 Revision: 1
 Site: Meaford
 Engineer: MT

Leg Load Tension Diagram
Max. Envelope (All Loading Cases)



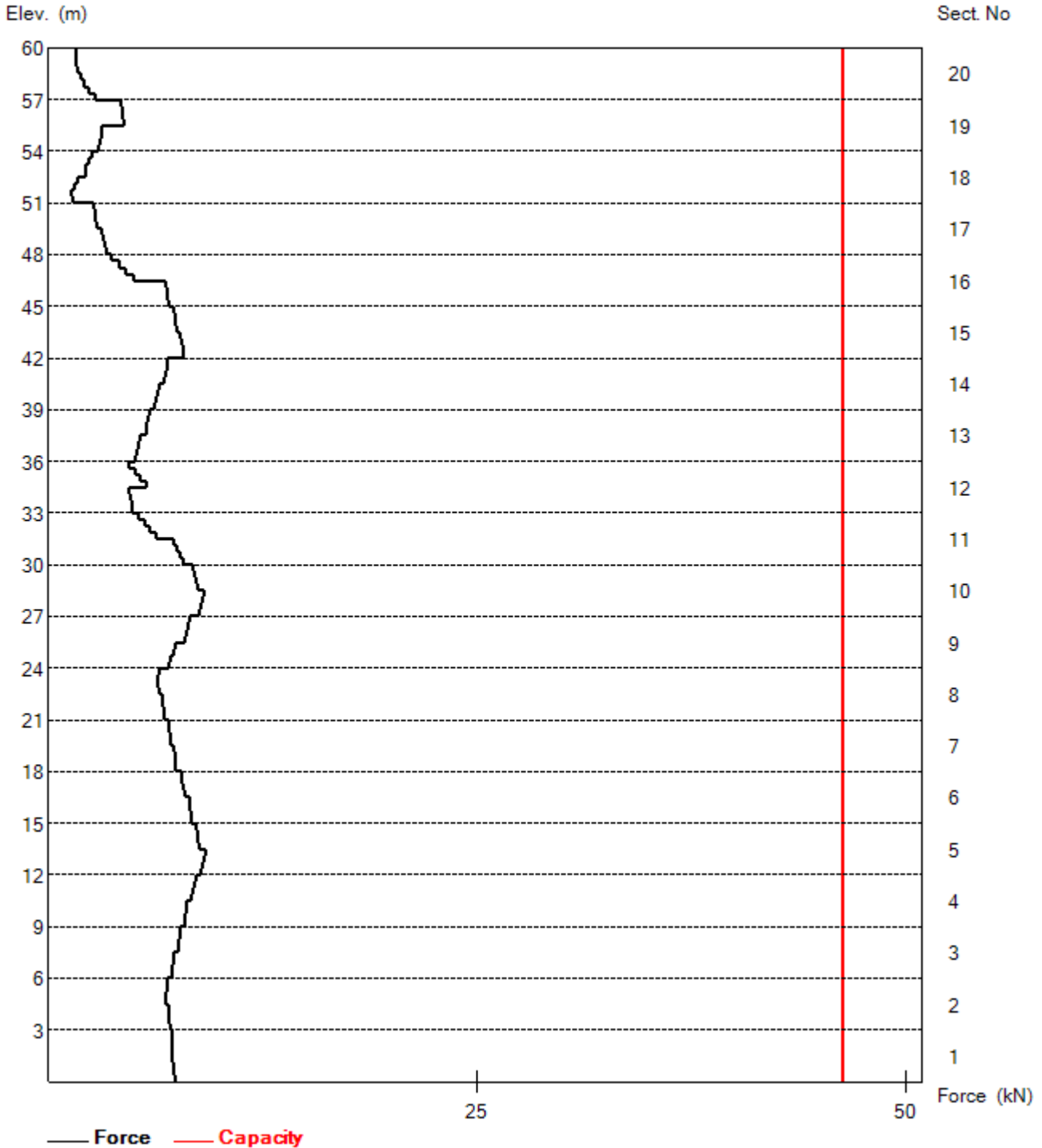
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 Contract: 8001
 Project: 200 ft. guyed tower
 Date and Time: 01/16/14 2:22:53 PM
 Revision: 1
 Site: Meaford
 Engineer: MT

Diaq. Load Compression Diagram
Max. Envelope (All Loading Cases)



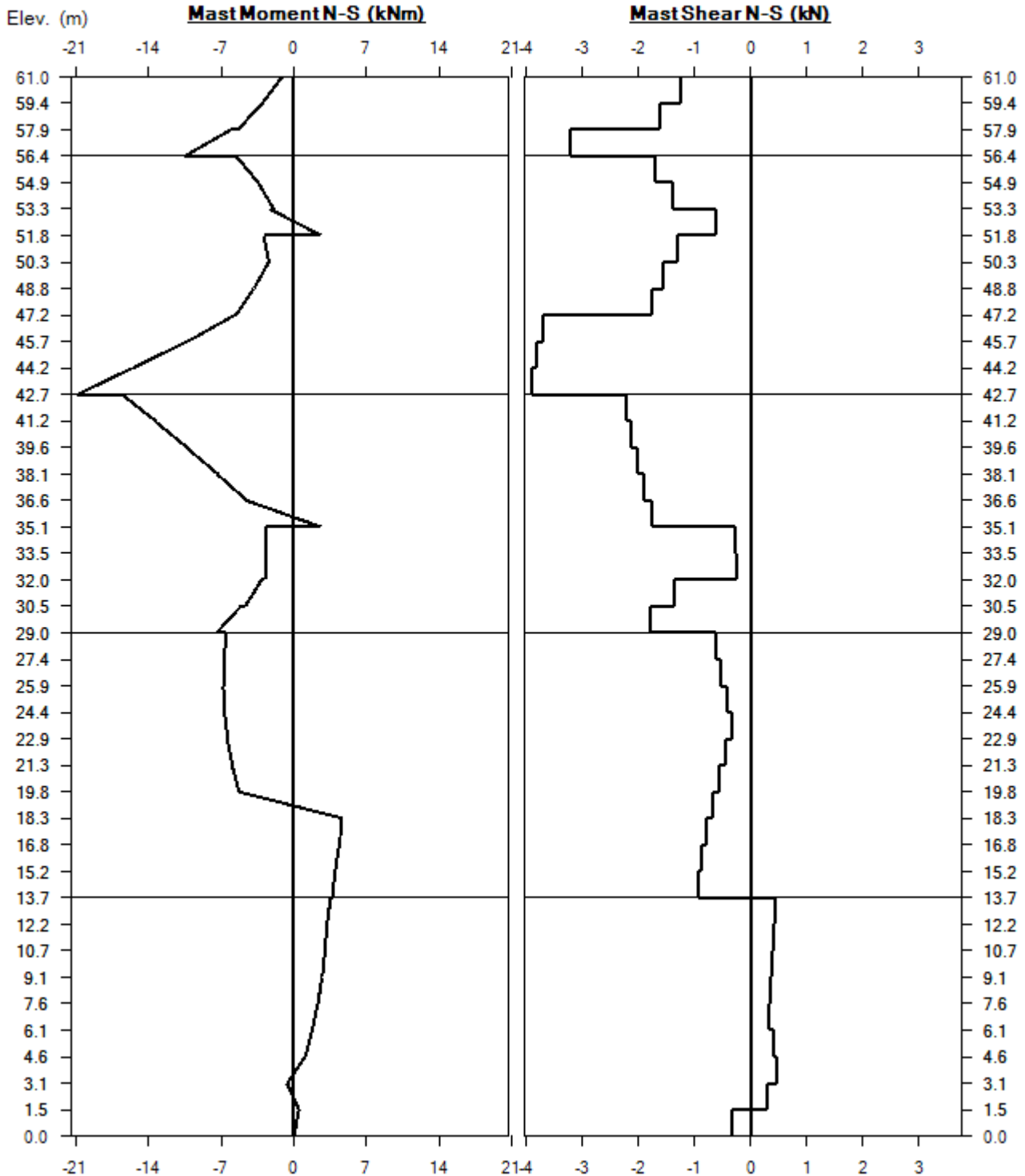
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 Contract: 8001
 Project: 200 ft. guyed tower
 Date and Time: 01/16/14 2:22:53 PM
 Revision: 1
 Site: Meaford
 Engineer: MT

Diag. Load Tension Diagram
Max. Envelope (All Loading Cases)



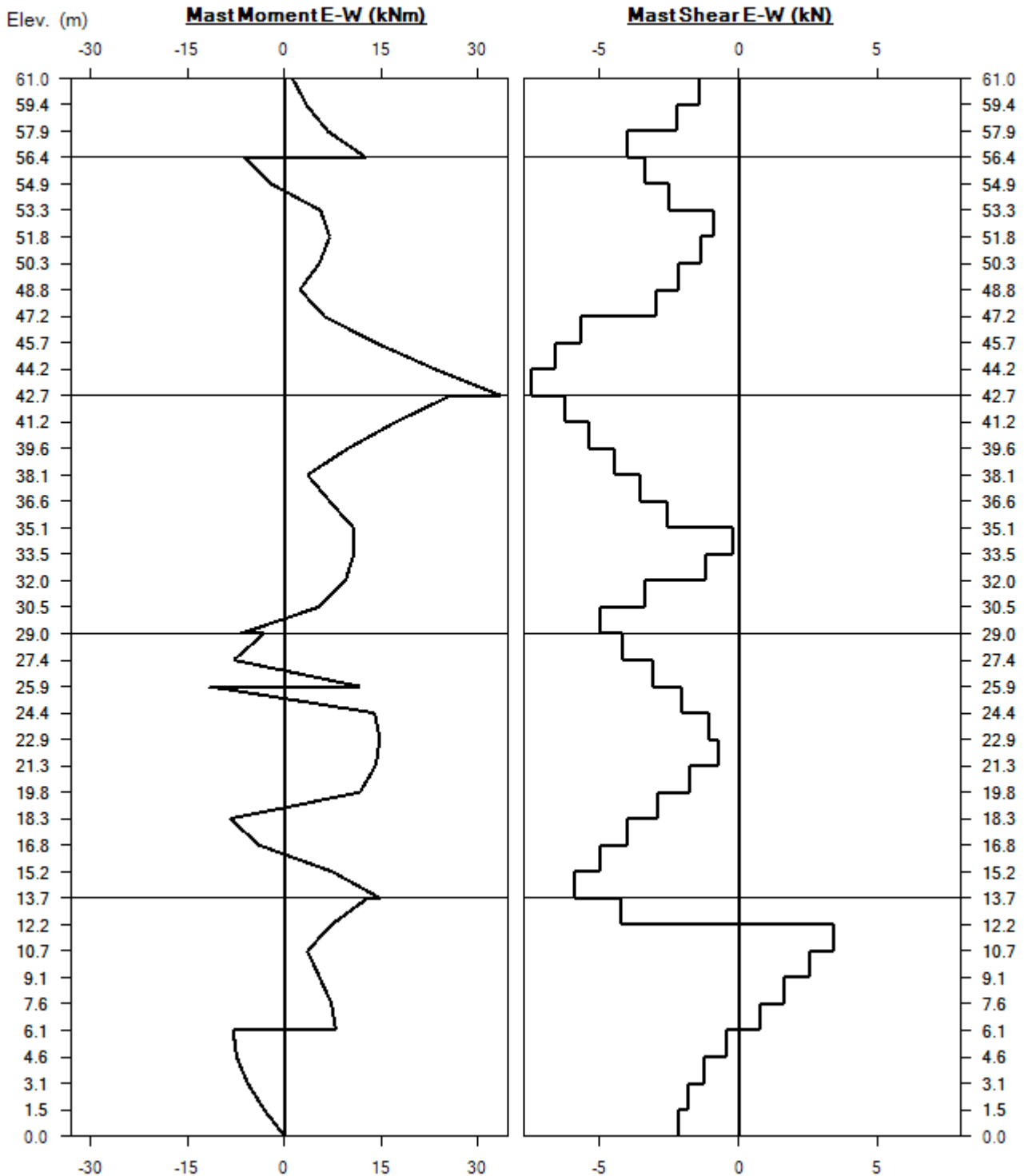
File: M:\Drawings\Year 2013 Jobs\8001 (Coast Guard) 200 ft. GT, Meaford, ON\07 - Analysis\8001.out
 Contract: 8001
 Project: 200 ft. guyed tower
 Date and Time: 01/16/14 2:22:53 PM
 Revision: 1
 Site: Meaford
 Engineer: MT

Max. Envelope (All Loading Cases)



File: M:\Drawings\Year 2013 Jobs\8001 (Coast Guard) 200 ft. GT, Meaford, ON\07 - Analysis\8001.out
 Contract: 8001
 Project: 200 ft. guyed tower
 Date and Time: 01/16/14 2:22:53 PM
 Revision: 1
 Site: Meaford
 Engineer: MT

Max. Envelope (All Loading Cases)



STANDARD CONDITION FOR THE PROVISION OF PROFESSIONAL ENGINEERING SERVICES FOR EXISTING STRUCTURES BY SKYWARD TOWERS

All engineering services are performed on the basis that the information used is current and correct.

This information may consist of, but is not necessarily limited to:

- 1) information supplied by the client regarding the structure and its components, cupola, foundations, soil conditions, antenna and feedline loading on the structure, and other site-specific information.
- 2) Information from quality documents and/or drawings in the possession of Skyward Towers Inc. or acquired from field inspections

It is the responsibility of the client to ensure that the information provided to Skyward Towers Inc., and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications provided, and are in non-corroded condition and have not deteriorated. Therefore, we assume that the member capacities have not changed from the “as new” condition.

All services will be performed to meet the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed to in writing. If wind and ice loads or other relevant parameters are to be different than the minimum values recommended by the standards, the client shall specify the requirement. Otherwise, all work will be performed to meet the requirements of the latest revision of CSA standard S37.

All services are performed in accordance with generally accepted engineering principles and practices. Skyward Towers Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.



Inspection Report

61 m Guyed Tower
in Meaford, Ontario

Our Project No. 8001

Prepared for
Canadian Coast Guard

by
Skyward Towers Inc.

January 17, 2014

1. TOWER INFORMATION

Site Name: Meaford

Coordinates: Latitude: 44° 30' 56.61" N
Longitude: 80° 34' 0.7" W

Site Location: Meaford, ON

Tower Height: 61 m

Face Width: 0.61 m

Panel Height: 0.38 m

Tower Description: All-weld down triangular cross-section tower, guyed at 56.6, 126.6, 193.3, 266.6 and 335.4 ft. elevation

Tower Manufacturer: The Wind Turbine of Canada Ltd.

Rigging Company: unknown

Date of Inspection: October 29, 2013

Inspectors: Mircea Teodorescu P.Eng., Sean McLea

Weather: Sunny, -2°C, 10 km/h wind

Report Preparation: Mircea Teodorescu, P.Eng.

SUMMARY

At the request of Canadian Coast Guard, an inspection of the 61 m Union Gas guyed tower in Meaford, ON, was carried out by Mircea Teodorescu, P.Eng. and Sean McLea on October 29, 2013.

The tower was checked for compliance with CAN/CSA-S37-01.

Our work included checking the alignment and verticality of the tower, guy tensions and turnbuckle gaps, and a visual inspection of the tower members, visible portions of the foundation, and antenna installations.

It is important to note that this report does not comment on the structural adequacy of the tower, only its physical condition that can be reasonably ascertained by visual inspection.

Please see Section 3.0, Recommendations, for a list of remedial work to be performed.

2. OBSERVATIONS

A description of the work performed is given in Appendix E. We observed the following:

2.1 Overall Tower

- Tower verticality and straightness are within the allowable range given in CAN/CSA-S37-01 (see Table 1);
- Twist is within the allowable range given in CAN/CSA-S37-01 (see Table 2);
- See Photos 1 to 3 for overall views of the tower and compound.

Table 1 Tower Verticality and Straightness

Reference Elevation	Deviation along Axis 1	Deviation along Axis 2	Verticality		Straightness	
			Resultant Deviation	Allowable Resultant Deviation	Resultant Deviation between Elevations	Allowable Deviation between Elevations
m	mm	mm	mm	mm	mm	mm
56.39	21.75	-19.17	28.99	112.78	5.76	27.43
42.67	18.32	-14.54	23.39	85.35	6.61	27.43
28.96	18.32	-7.93	19.96	57.91	11.45	30.48
13.72	12.59	1.98	12.75	27.43	12.75	27.43
0.00	0.00	0.00	0.00	0.00		

NOTE: Clause 11.3.2 of CAN/CSA-S37-01 stipulates that the out-of-plumbness between any two elevations on the structure shall not exceed 1 in 500.

Table 2 Tower Twist

Reference Elevation	Twist w.r.t Base	Allowable Twist w.r.t Base	Relative Twist between Reference Elevations	Allowable Twist between Reference Elevations
m	degrees	+/- degrees	degrees	+/- degrees
56.39	1.40	5.00	0.22	2.29
42.67	1.18	5.00	0.54	2.29
28.96	0.65	4.83	0.11	2.54
13.72	0.75	2.29	0.75	2.29
0.00	0.00	0.00		

NOTE: Clause 11.3.3 of CAN/CSA-S37-01 stipulates that the twist (angular rotation in the horizontal plane) between any two elevations on the structure shall not exceed 0.5° in 10 ft. (approx. 3 m) and that the maximum twist over the structure height shall not exceed 5°.

2.2 Structural Members

- Structural members appeared to be in a good condition.

2.3 Connections

- Structural connections appeared to be in good condition.

2.4 Antennas and Attachments

- Table 3 lists the antennas and transmission lines;
- Antennas and mounts appeared to be in good condition.

Table 3 Antenna list

Elevation (m)	Antenna	Azimuth (deg.)	Transmission Lines
61.0	Dipole antenna	omni	LDF4
61.0	Double obstruction lights	-	Teck90
58.7	SRL480	omni	LDF7
57.9	Yagi antenna	200	LDF4
56.4	SRL210-C2	240	LDF4
52.4	SRL210-C4	0	LDF4
47.2	SRL210-C4	0	LDF4
35.0	SRL210-C4	0	LDF4
32.0	Corner reflector	260	LDF4/LDF5
30.0	(2) Double obstruction lights	-	Teck90
29.9	Coast guard antenna	120	LDF2

2.5 Transmission Lines and Conduit

- Transmission lines appeared to be in good condition.

2.6 Ladders and Platforms

- There are no climbing facilities on this tower.

2.7 Painting

- The tower is painted in alternating bands of orange and white;
- The paint is in fair condition.

2.8 Galvanizing and Anti-Corrosion Treatment

- Galvanizing appeared to be in good condition.
- There is no cathodic protection for the anchor shafts.
- There are some signs of corrosion on the guy cable hardware, antenna mounts, junction boxes and splice bolts.

2.9 Guys and Guy Hardware

- All of the measured guy tensions are outside the allowable range (see Table 4);
- Some turnbuckle gaps are outside the desirable range (see Table 5);

Table 4 Measured Guy Tensions

Anchor Location	Guy Elevation at Tower	Guy Size and Type	Measured Tension at -2°C	Measured Tension adjusted to 10°C	Design Initial Tension at 10°C	Range of Tensions Allowable
	m		kN	kN	kN	kN
N	13.72	5/16" GS	4.17	3.36*	4.89	4.40 - 5.38
	28.96	5/16" GS	3.91	3.42*	4.89	4.40 - 5.38
	42.67	1/2" GS	9.21	8.49*	11.11	10.00 - 12.22
	56.39	1/2" GS	6.14	5.68*	11.11	10.00 - 12.22
SE	13.72	5/16" GS	4.21	3.39*	4.89	4.40 - 5.38
	28.96	5/16" GS	3.47	2.96*	4.89	4.40 - 5.38
	42.67	1/2" GS	8.60	7.86*	11.11	10.00 - 12.22
	56.39	1/2" GS	6.94	6.46*	11.11	10.00 - 12.22
SW	13.72	5/16" GS	4.29	3.45*	4.89	4.40 - 5.38
	28.96	5/16" GS	4.31	3.78*	4.89	4.40 - 5.38
	42.67	1/2" GS	8.32	7.53*	11.11	10.00 - 12.22
	56.39	1/2" GS	7.31	6.78*	11.11	10.00 - 12.22

* outside allowable range

Notes:

1. Clause 11.3.1 of CAN/CSA-S37-01 recommends that the tolerance on guy tensions for new structures be +15% and -5% of the temperature corrected specified initial tension and those for existing structures be $\pm 10\%$ of the temperature corrected specified initial tension.

Table 5 Measured Turnbuckle Gaps

Anchor Location	Guy Elevation at Tower	Shackle Size	Turnbuckle Size	Gap Measured	Desirable Range	Suggested Adjustment
	m	mm	mm	mm	mm	mm
N	13.7	12.7	15.9 x 305	244.3*	102 - 203	8.36
	29.0	12.7	15.9 x 305	120.6	102 - 203	7.76
	42.7	19	22.2 x 305	107.9	102 - 203	5.00
	56.4	19	22.2 x 305	101.5	102 - 203	-7.63
SE	13.7	12.7	15.9 x 305	247.5*	102 - 203	-7.27
	29.0	12.7	15.9 x 305	209.4*	102 - 203	-19.85
	42.7	19	22.2 x 305	136.4	102 - 203	-20.13
	56.4	19	22.2 x 305	177.7	102 - 203	-28.17
SW	13.7	12.7	15.9 x 305	241.1*	102 - 203	-10.25
	29.0	12.7	15.9 x 305	82.5*	102 - 203	-5.11
	42.7	19	22.2 x 305	171.3	102 - 203	-6.31
	56.4	19	22.2 x 305	196.7	102 - 203	-11.08

* outside desirable range

2.10 Foundations and Anchors

- The visible portions of the tower foundation appeared to be in good condition.

2.11 Grounding

- The tower base is grounded.
- All guy cables are grounded at the anchor end.
- Some transmission lines are not grounded on the tower.
- The transmission lines are not grounded at the shelter entry ports.

2.12 Waveguide Bridge

- The cable tray appeared to be in good condition.

3. RECOMMENDATIONS

We recommend the following remedial work to bring the tower into compliance with CAN/CSA-S37-01.

1. Adjust the guy tensions to the new guys to bring them within acceptable limits. The verticality and straightness of the tower should be monitored during the process to ensure that they remain within the acceptable range at all times. Provide for adequate adjustment in the turnbuckles.
2. Wire brush all the parts showing signs of rust and paint them with two coats of zinc rich paint.
3. Ground all the transmissionlines along the tower and before entering the shelter.
4. Install cathodic protection or other means of corrosion protection on the anchor shafts.

Prepared by



Mircea Teodorescu, P.Eng.



APPENDIX A
PHOTOGRAPHS



Photo 1

View of the 61 m guyed tower from the north.



Photo 2

View of the Canadian Coast Guard equipment shelter from the north.

Photo 3

View of the waveguide bridge from the east.



Photo 4

View of the north anchor from the east.



Photo 5

View of the southeast anchor from the south.

Photo 6

View of the southwest anchor from the south.



Photo 7

Close-up of a typical guy attachment point.

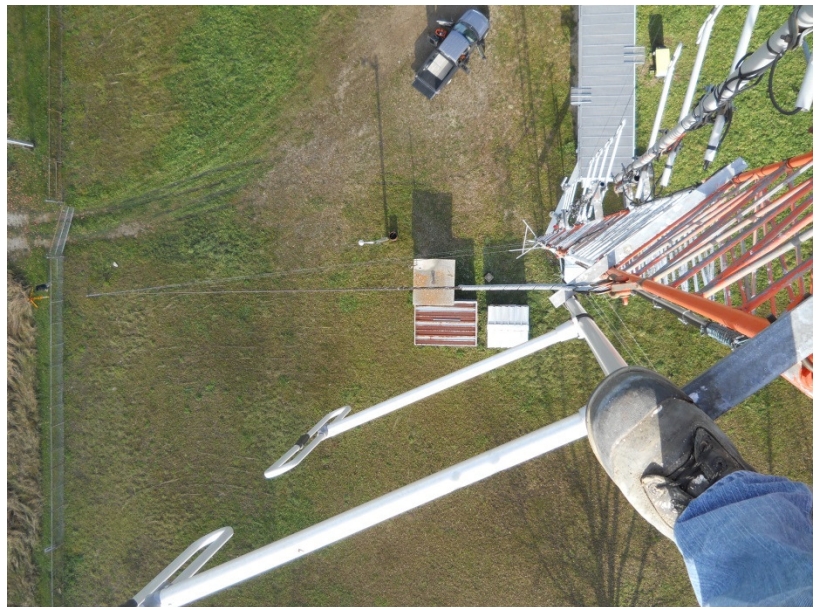


Photo 8

Close-up of the antenna and attachments at the top of the tower.

Photo 9

View of the compound from the top of the tower.



APPENDIX B

WORK PERFORMED

1. Overall Tower
 - (a) Recorded tower height, azimuth, face width, panel height, location of attachments (antennas, transmission lines etc.).
 - (b) Measured alignment of tower including plumb and twist.
2. Structural Members
 - (a) Checked for bent, missing, and damaged members.
3. Connections
 - (a) Randomly checked a sample of connections for loose and missing bolts, short bolts, cracked welds.
4. Antennas
 - (a) Recorded type, elevation, location on tower, azimuth and transmission line(s) of all antennas.
 - (b) Recorded mounting details of new antennas, including members, connections and hardware.
 - (c) Checked antennas and mounts for damaged and missing members, loose and missing bolts, cracked welds.
5. Transmission Lines and Conduit
 - (a) Recorded type, top elevation and location on tower of all transmission lines.
 - (b) Checked transmission lines for damaged, loose and missing support clamps and hangers, loose and missing grounding straps.
 - (c) Checked electrical conduit for damaged, loose or missing support clamps, loose and damaged junction boxes.
6. Lighting
 - (a) Check light fixtures for broken and loose globes and fittings, burnt out light bulbs.
7. Ladders, Safety Devices, Platforms and Rails
 - (a) Checked ladder and safety rail for continuity, obstructions, loose and missing connections.
8. Painting
 - (a) Checked for peeling, cuts, blisters, flaking, rust and fading.

9. Galvanizing and Anti-Corrosion Treatment
 - (a) Checked for signs of corrosion.
 - (b) Checked galvanizing for cuts, flaking, blistering, rusting.

10. Guys and Guy Hardware
 - (a) Recorded dimensions and installation of guys and guy hardware (shackles, thimbles, turnbuckles, bolts, guy grips and clips).
 - (b) Calculated guy tensions by the use of the pulse method.
 - (c) Checked guys for broken strands, slippage of guy grips and clips.
 - (d) Checked for damaged guy hardware.
 - (e) Verified that the guy hardware was able to articulate freely.
 - (f) Checked turnbuckles for adequate take-up.
 - (g) Checked that turnbuckles were adequately locked against rotation.

11. Foundations
 - (a) Checked for damaged anchor shafts.
 - (b) Checked visible portion of concrete and grout for spalling, cracking, deterioration.
 - (c) Checked for full bearing on base plate.
 - (d) Checked adjacent ground for evidence of movement, adequate drainage, backfill.

12. Grounding
 - (a) Checked grounding wires and straps for breaks, loose and missing connections, proper hardware, electrical path.
 - (b) Checked for installation of lightning rod.

13. Waveguide Bridge
 - (a) Checked for bent, damaged and missing members.
 - (b) Checked that adequate support had been provided for transmission lines.
 - (c) Checked seal at transmission line entrance to shelter.

14. Site Conditions
 - (a) Checked for security fences and gates.
 - (b) Checked that the road and parking lot offer a safe entrance to the site.
 - (c) Checked site for erosion and poor drainage, depressions due to inadequate compaction and poor backfill.
 - (d) Checked vegetation for interference with the roads, tower, shelter.
 - (e) Checked overall condition of the shelter.



APPENDIX E: SUMMARY OF SUBMITTALS

Submission Description	Section(s)	Required Date
Work Schedule	011100 – 1.3.1	5 days after award
As-Builts	013300 – 1.3.2	At project completion
Safety Policies	013530 – 1.2.1	With bid
Project Specific Safety Program (Can be merged with Project Construction Plan)	013530 – 1.3.1	5 days after award
Tower Demolition Plan	024116 – 2.1.1	Before site mobilization
Concrete Engineering Plans	033000 – 3.1.1	Before site mobilization
Tower Engineering Plans	133613.13 – 3.1.8	Before fabrication
Welding Certifications	133613.13 – 3.3.1	Before fabrication
Project Construction Program (Can be merged with Project Specific Safety Plan)	133613.13 – 3.11.1	Before site mobilization
Geotechnical Report	033000 – 3.2.7	Before Foundation Design



Fisheries and Oceans
Canada

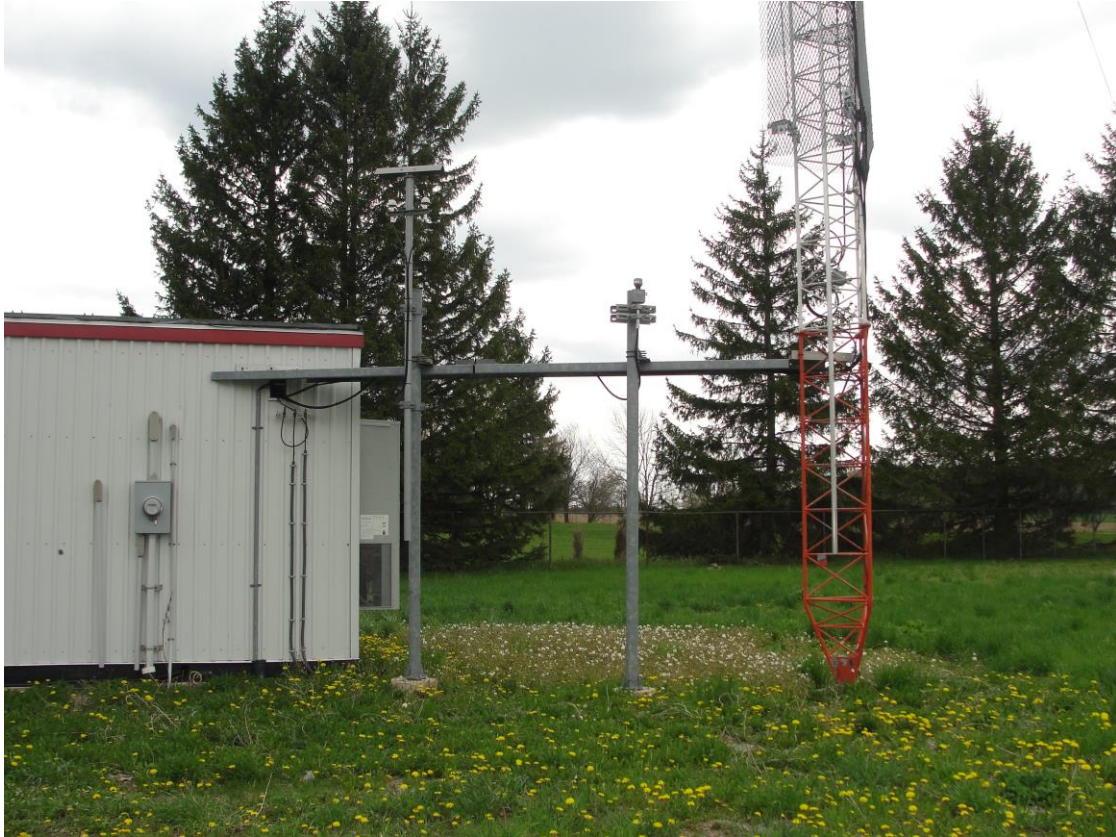
Pêches et Océans
Canada

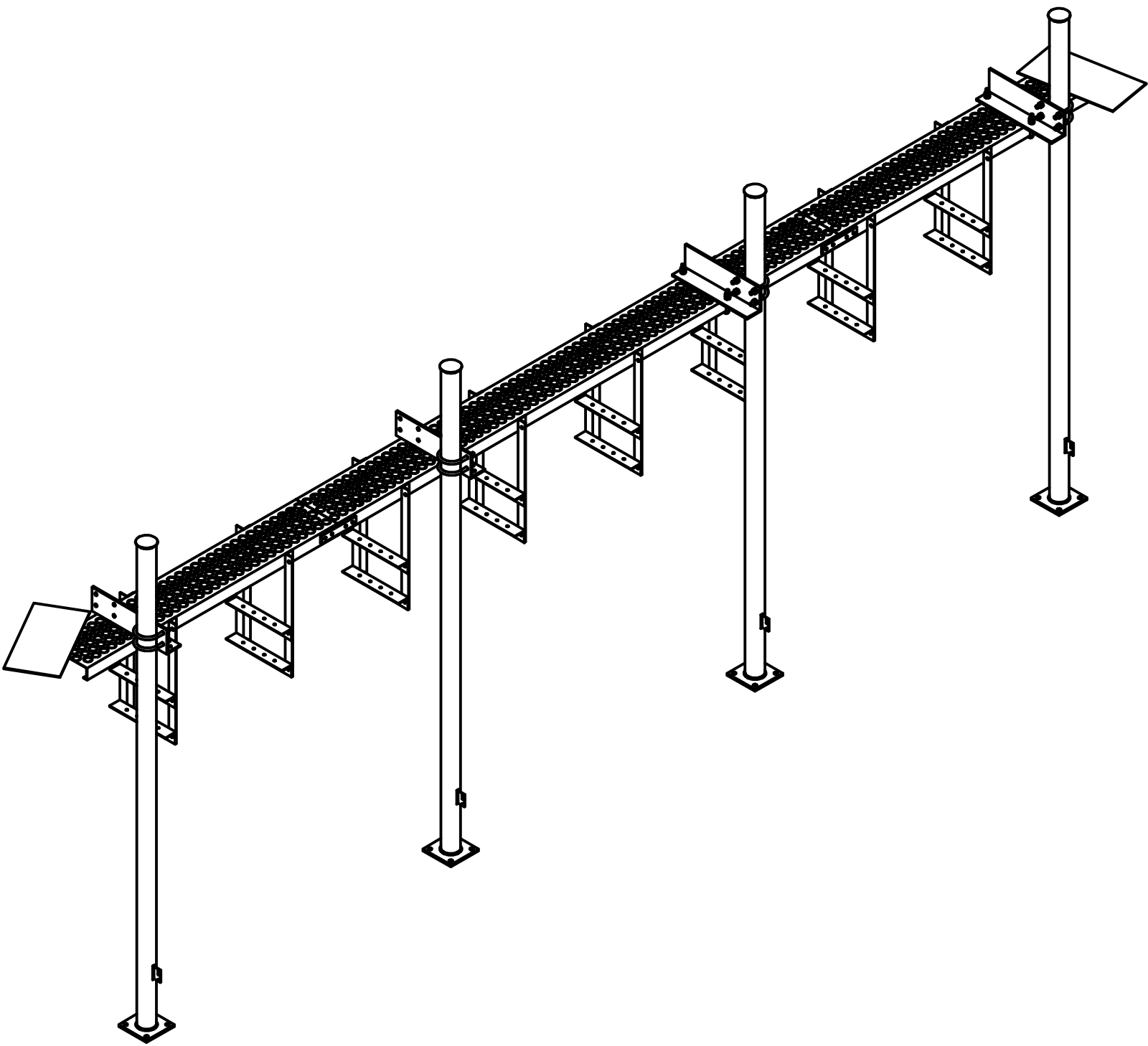
Canadian
Coast Guard

Garde côtière
canadienne



APPENDIX F: EXISTING WAVEGUIDE BRIDGE





STRUCTURAL STEEL NOTES

1. ALL WORKMANSHIP MUST BE IN ACCORDANCE WITH THE LATEST EDITION OF ALL APPLICABLE STANDARDS.
2. ALL STRUCTURAL STEEL TO CONFORM TO CAN3-G40.21, GRADE 300W, HSS TO MEET REQUIREMENTS OF G40.21, CLASS H, GRADE 350W.
3. ALL WELDING SHALL BE COMPLETED IN ACCORDANCE WITH APPLICABLE CSA STANDARDS AND PERFORMED BY A FABRICATOR CERTIFIED TO CSA W47.1 TO DIVISION 1 OR 2.1.
4. ALL BOLTS TO CONFORM TO ASTM SPECIFICATION A325, PROPERLY SIZED FOR THE APPLICATION, AND THE THREADS TO BE EXCLUDED FROM THE SHEAR PLANE.
5. HOLES ADDITIONAL TO THOSE SHOWN ON STRUCTURAL DRAWINGS ARE NOT PERMITTED IN ANY STRUCTURAL MEMBER.
6. ALL STRUCTURAL STEEL TO BE HOT DIP GALVANIZED UNLESS NOTED OTHERWISE.
7. ALL FASTENERS SHALL BE A325 STEEL HOT DIP GALVANIZED.
7. APPLY THREE (3) COATS OF ZINC RICH PAINT TO ALL DAMAGED GALVANIZED SURFACES.
8. FIELD MODIFICATIONS SUCH AS DRILLING OF HOLES AND WELDING TO BE AVOIDED, UNLESS SPECIFIED OTHERWISE .

GROUNDING NOTES

1. EACH WAVEGUIDE BRIDGE POST TO BE CONNECTED TO MAIN SITE GROUND SYSTEM VIA A 35 mm² (#2 AWG) OR COARSER, BARE, TINNED, COPPER CONDUCTOR.
2. CONDUCTOR BONDING TO POSTS SHALL BE MADE USING A GROUND LUG ALONG WITH A 3/8" BOLT, LOCKWASHER, AND NUT ASSEMBLY.
3. CONDUCTOR BONDING TO SITE GROUNDING SYSTEM SHALL BE MADE USING IRREVERSIBLE HIGH COMPRESSION FITTINGS.

GENERAL NOTES

1. ALL DIM IN MM UNLESS OTHERWISE SHOWN

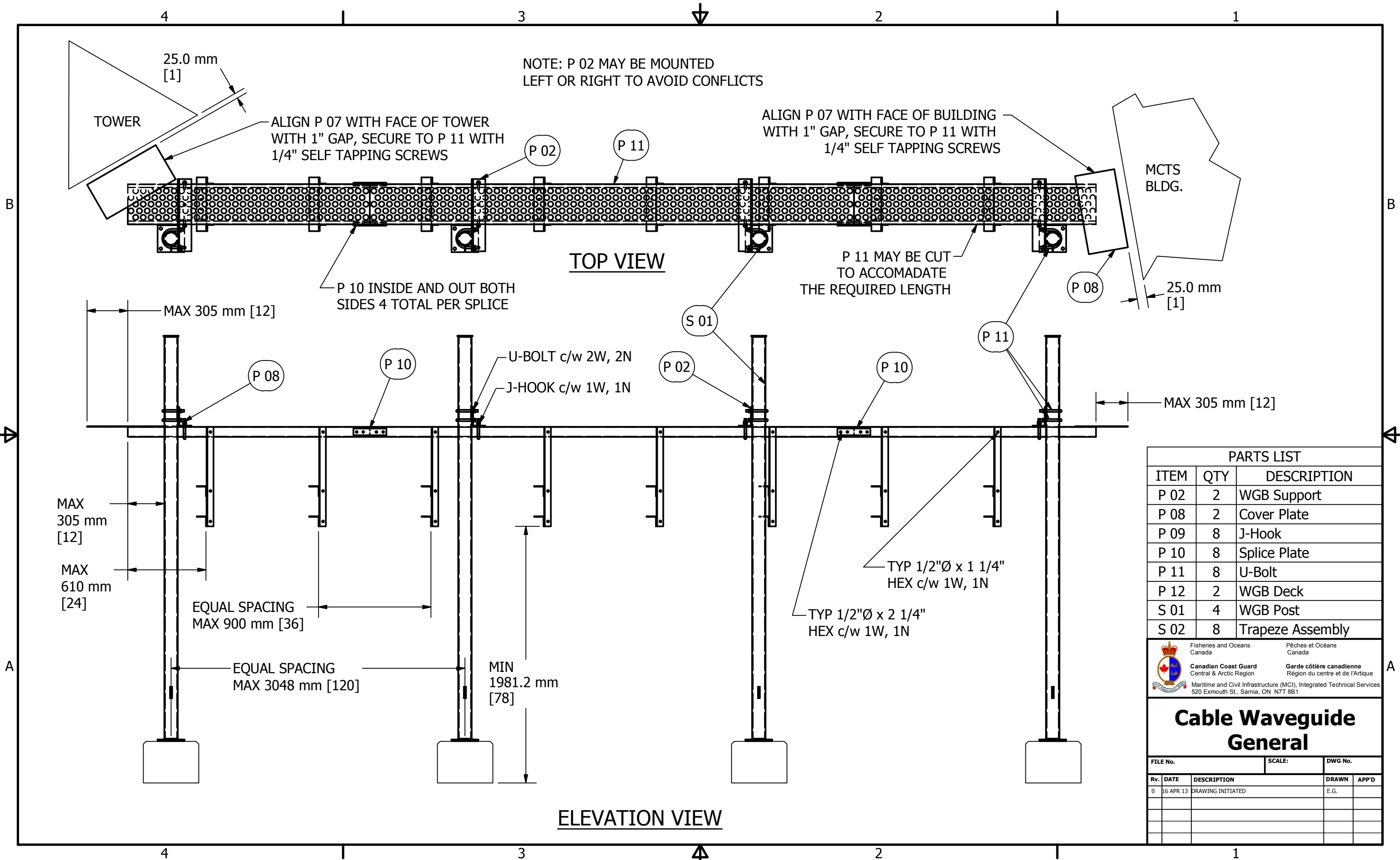
STANDARD MCTS WAVEGUIDE BRIDGE

General Waveguide Bridge Parts List

Part	Name	Quantity	L = required length of waveguide bridge in ft (building to tower)
S 01	Waveguide Post	(L-4)/10 + 1	
S 02	Trapeze Assembly	(L-6)/3 + 1	
P 01	Trapeze Hanger	2 * QTY S 02	*All Decimals Rounded up*
P 02	WGB Support	QTY S 01	
P 03	Trapeze Arm	2 * QTY S 02	
P 04	Support Post	QTY S 01	
P 05	Foot Plate	QTY S 01	
P 06	Ground Attachment	QTY S 01	
P 07	Top Plate	QTY S 01	
P 08	Cover Plate	2	
P 09	J-Hook c/w 1W, 1N	2 * QTY S 01	
P 10	Splice Plate	2 * QTY P 12	
P 11	U-Bolt c/w 2W, 2N	2 * QTY S 01	
P 12	WGB Deck	L/12	
	1/2"Ø x 1 1/4" Hex c/w 1W, 1N	6 * QTY S 02 + 10%	
	1/2"Ø x 2 1/4" Hex c/w 1W, 1N	2 * QTY P 10 + 10%	
	5/8"Ø Nut and Flat Washer	6 * QTY S 01 + 10%	

Sample Standard Parts List (10% Hardware Overage Included)

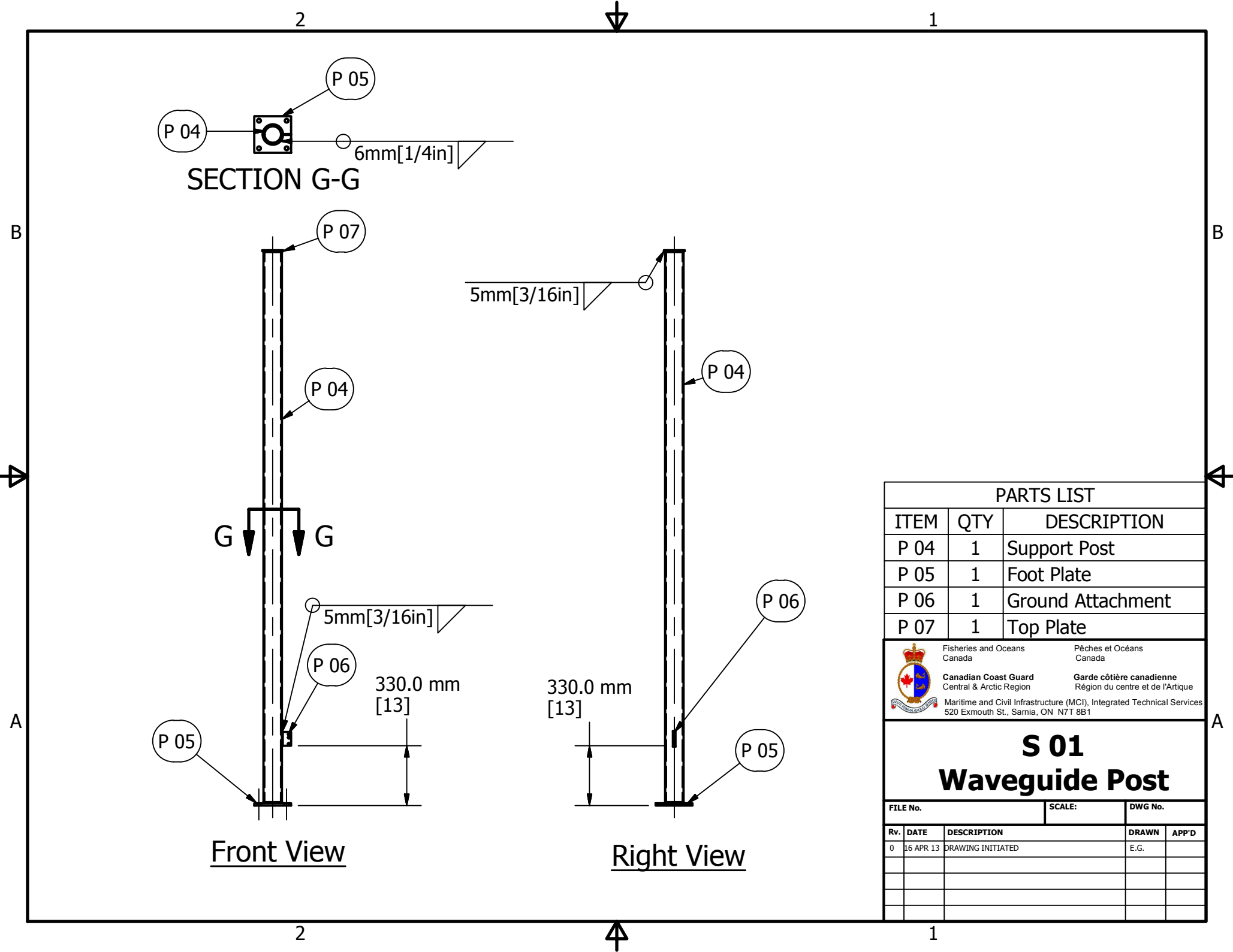
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Part	Quantity	Part	Quantity	Part	Quantity	Part	Quantity
S 01	2	S 01	3	S 01	4	S 01	5
S 02	3	S 02	5	S 02	8	S 02	11
P 01	6	P 01	10	P 01	16	P 01	22
P 02	2	P 02	3	P 02	4	P 02	5
P 03	6	P 03	10	P 03	16	P 03	22
P 04	2	P 04	3	P 04	4	P 04	5
P 05	2	P 05	3	P 05	4	P 05	5
P 06	2	P 06	3	P 06	4	P 06	5
P 07	2	P 07	3	P 07	4	P 07	5
P 08	2	P 08	3	P 08	4	P 08	5
P 09	4	P 09	6	P 09	8	P 09	10
P 10	0	P 10	4	P 10	8	P 10	8
P 11	4	P 11	6	P 11	8	P 11	10
P 12	1	P 12	2	P 12	3	P 12	3
Hex 1 1/4	20	Hex 1 1/5	33	Hex 1 1/6	53	Hex 1 1/7	73
Hex 2 1/4	0	Hex 2 1/5	9	Hex 2 1/6	18	Hex 2 1/7	18
5/8 N&W	14	5/8 N&W	20	5/8 N&W	27	5/8 N&W	33




PARTS LIST		
ITEM	QTY	DESCRIPTION
P 02	2	WGB Support
P 08	2	Cover Plate
P 09	8	J-Hook
P 10	8	Splice Plate
P 11	8	U-Bolt
P 12	2	WGB Deck
S 01	4	WGB Post
S 02	8	Trapeze Assembly

Fisheries and Oceans Canada / Pêches et Océans Canada
 Canadian Coast Guard Central & Arctic Region / Garde côtière canadienne Région du centre et de l'Arctique
 Maritime and Civil Infrastructure (MCI), Integrated Technical Services
 520 Exmouth St., Sarnia, ON N7T 8B1

Cable Waveguide General		FILE No.	SCALE:	DWG No.
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

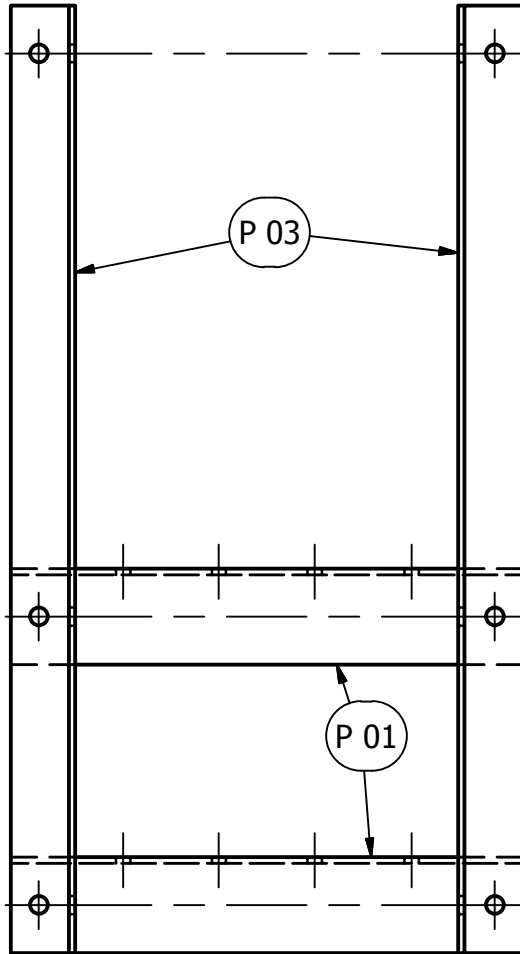


PARTS LIST		
ITEM	QTY	DESCRIPTION
P 04	1	Support Post
P 05	1	Foot Plate
P 06	1	Ground Attachment
P 07	1	Top Plate

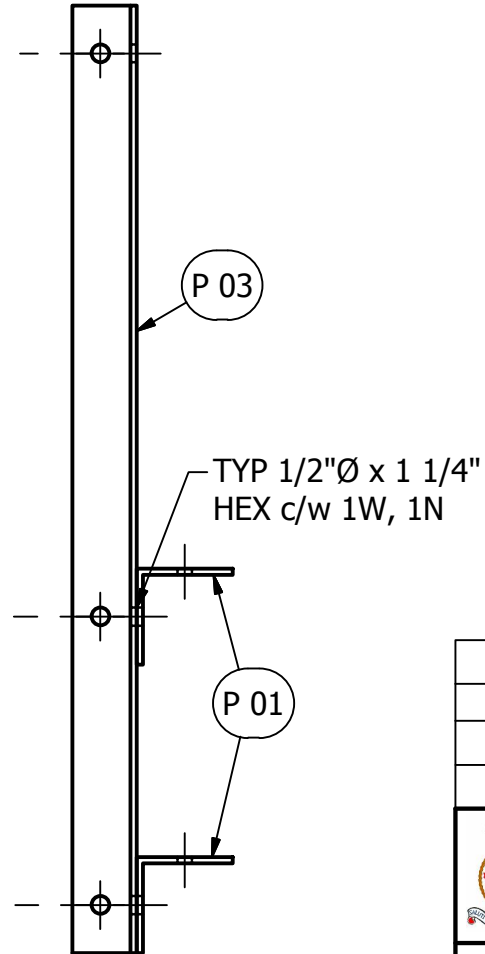

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S 01
Waveguide Post

FILE No.		SCALE:	DWG No.		
Rv.	DATE	DESCRIPTION		DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED		E.G.	




Front View



Right Side View

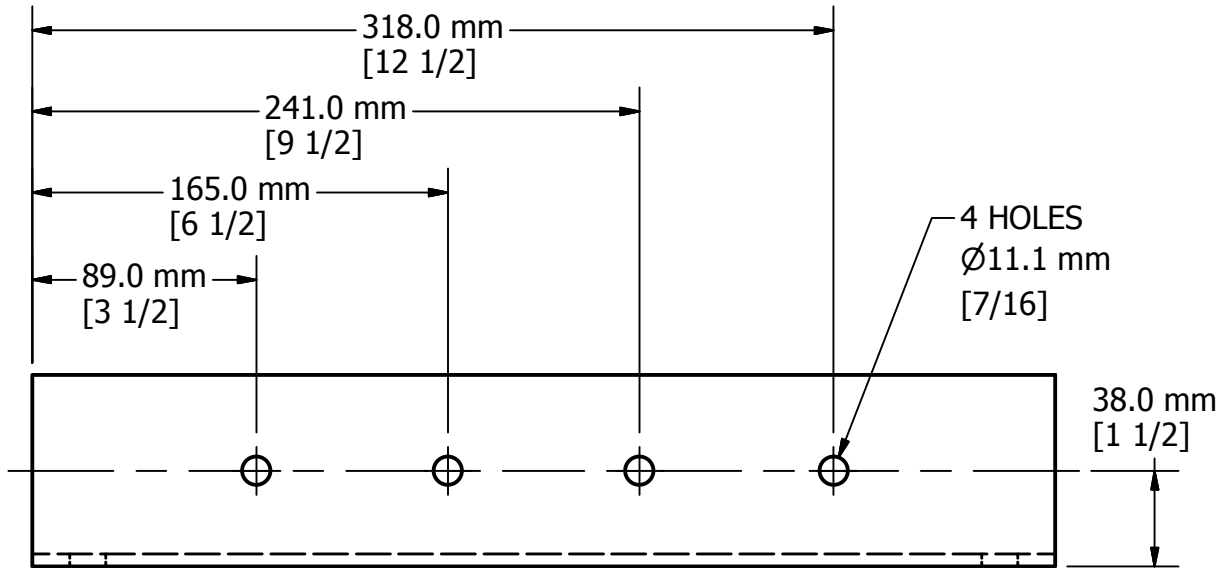
PARTS LIST				
ITEM	QTY	DESCRIPTION		
P 01	2	Trapeze Hanger		
P 03	2	Trapeze Arm		

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1		

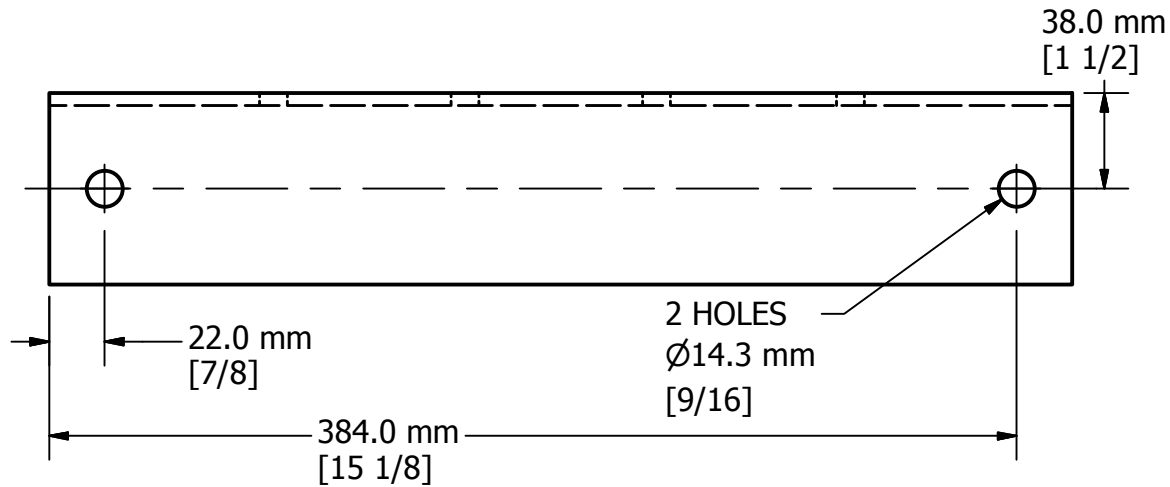
S 02	
Trapeze Assembly	

FILE No.		SCALE:	DWG No.		
Rv.	DATE	DESCRIPTION		DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED		E.G.	


L 76x76x5 x 406 lg
WEIGHT: 2.5kg



Top View



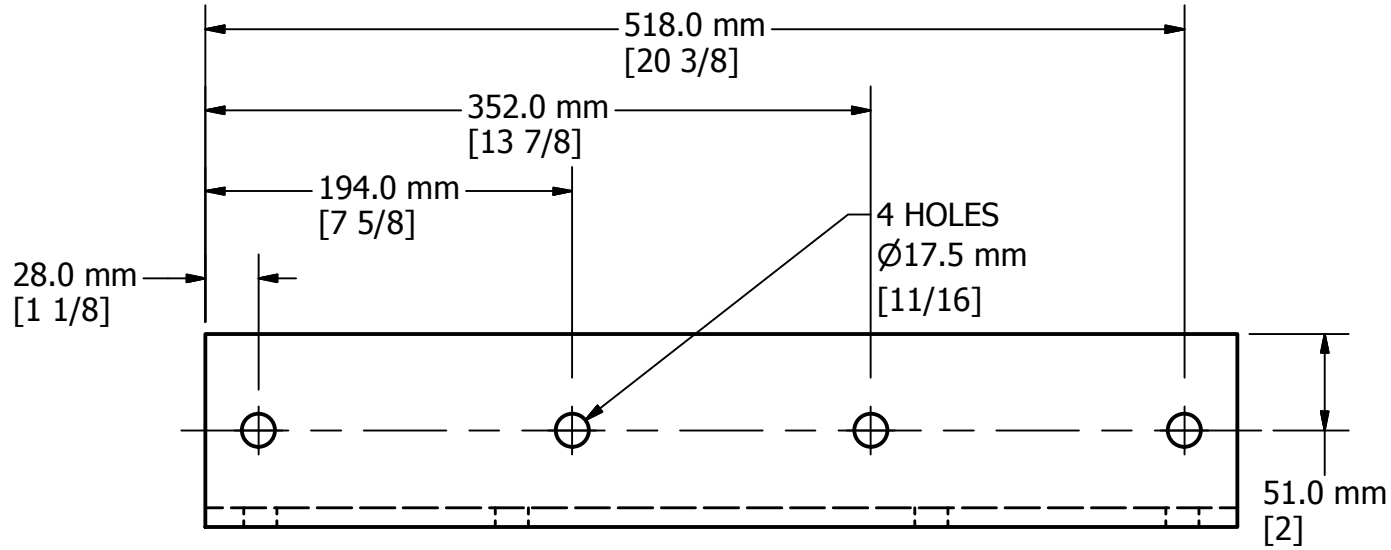
Front View

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1		

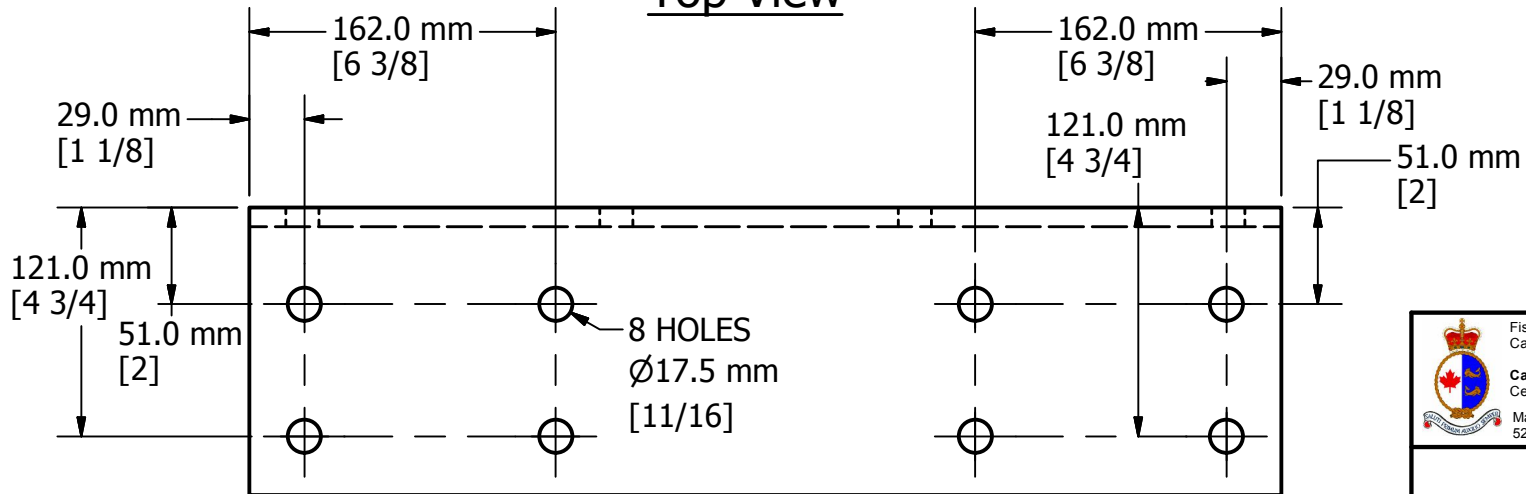
P 01
Trapeze Hanger

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	


L 152x102x10 x 546 lg
WEIGHT: 10kg



Top View



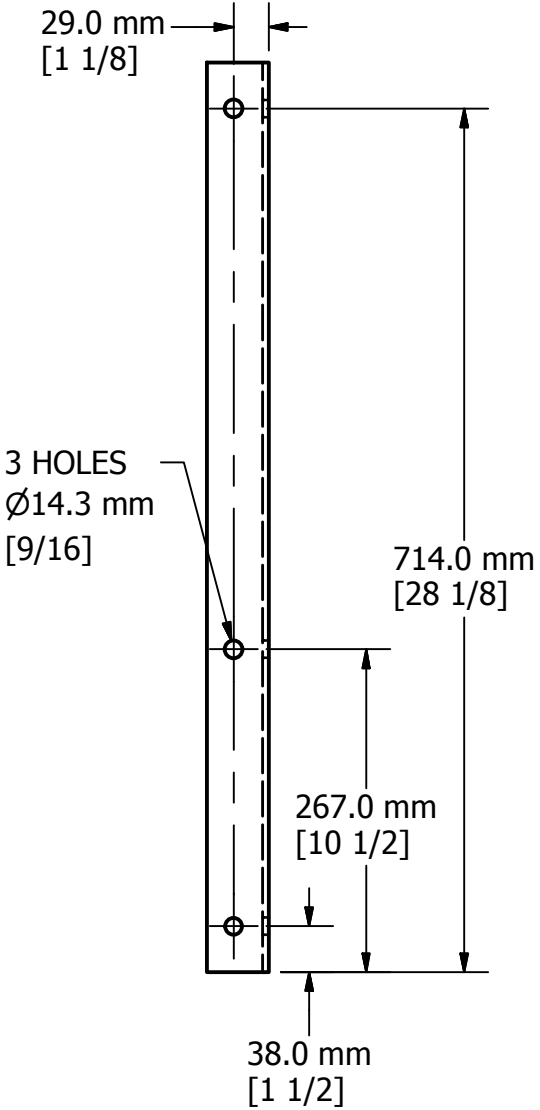
Front View

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1		

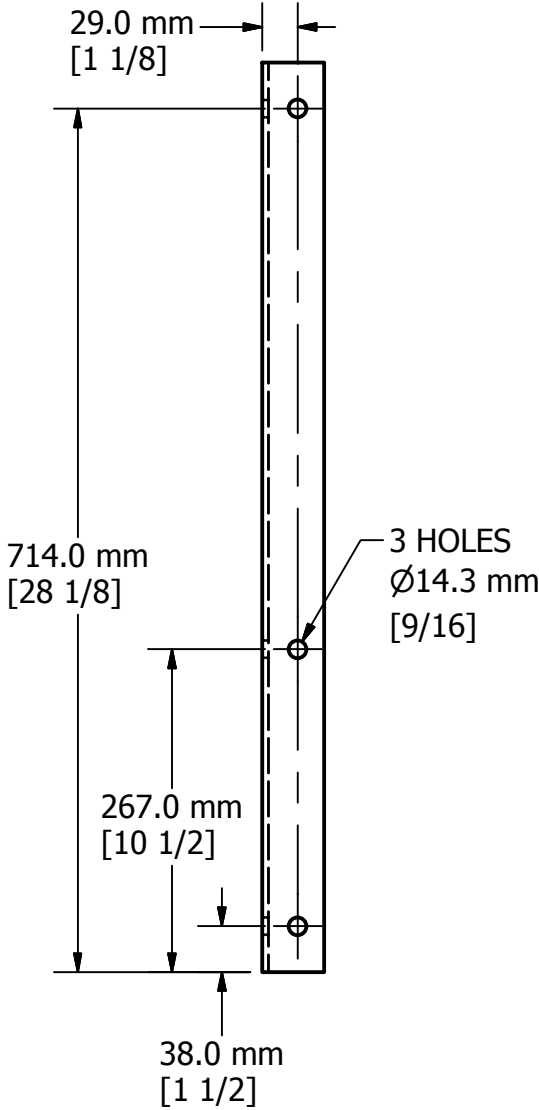
P 02
WGB Support

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Rv.	DATE	DESCRIPTION	DRAWN	APP'D
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L 51x51x5 x 752 lg
WEIGHT: 2.7kg



Front View



Right Side View

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1		

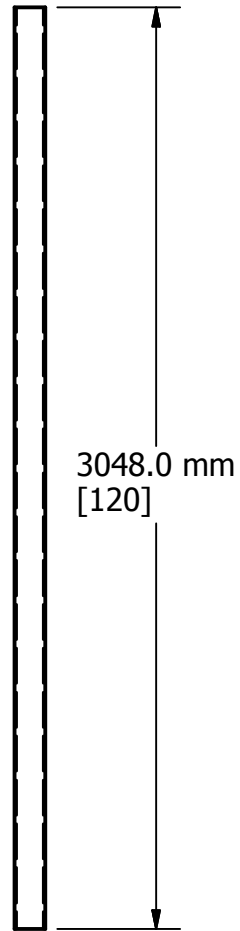
P 03
Trapeze Arm

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	


HSS 102x6.4 x 3658 lg
WEIGHT: 85kg

Ø102.0 mm
[4]

Top View



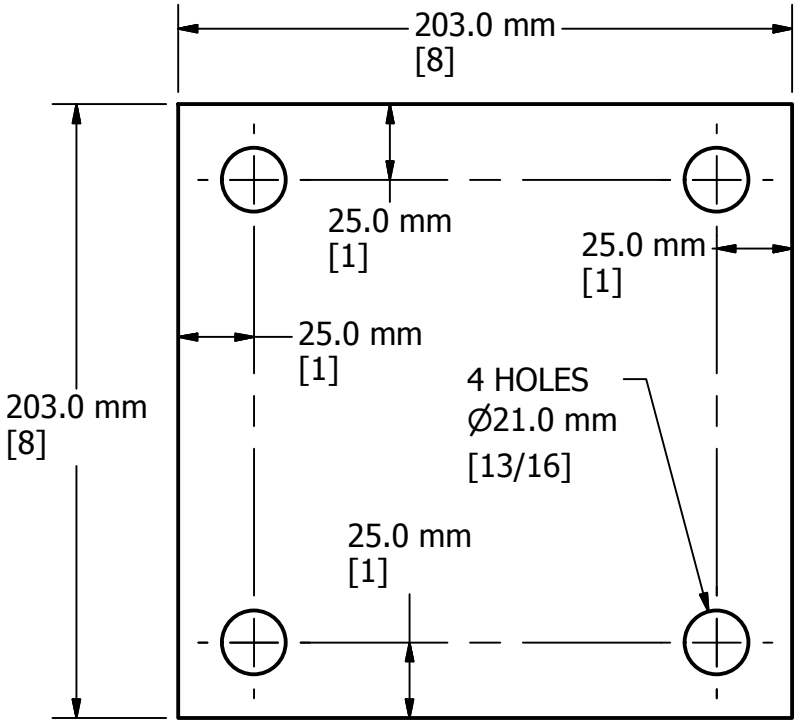
Front View

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
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P 04
Support Post

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

FB 203 x 13 x 203 lg
WEIGHT: 4kg



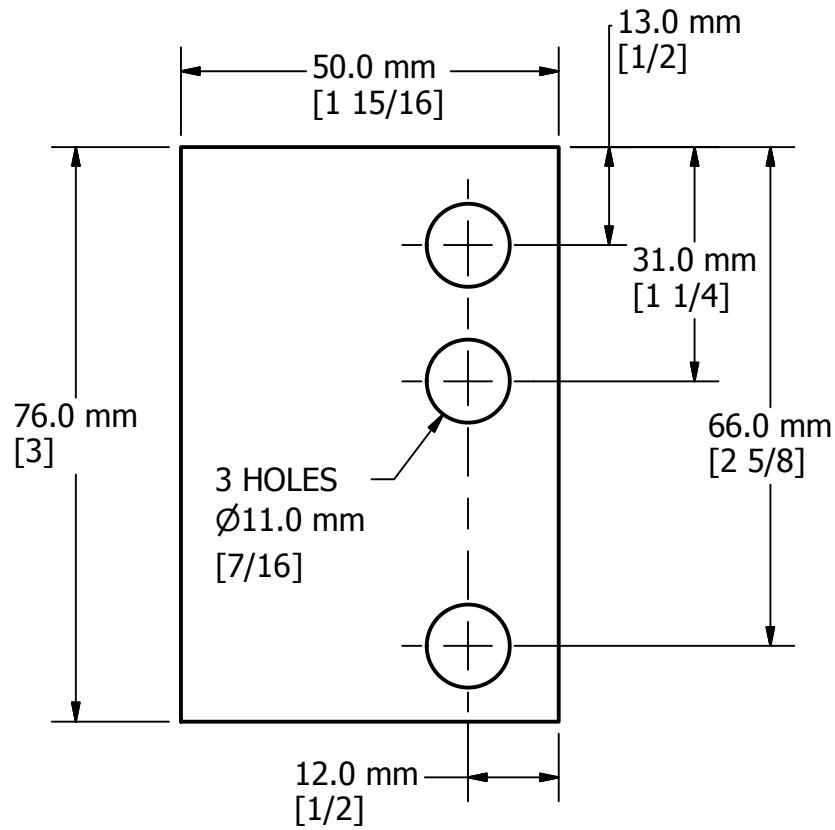
Top View

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1		


P 05 Foot Plate

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

FB 50 x 5 x 76 lg
 WEIGHT: 0.2kg



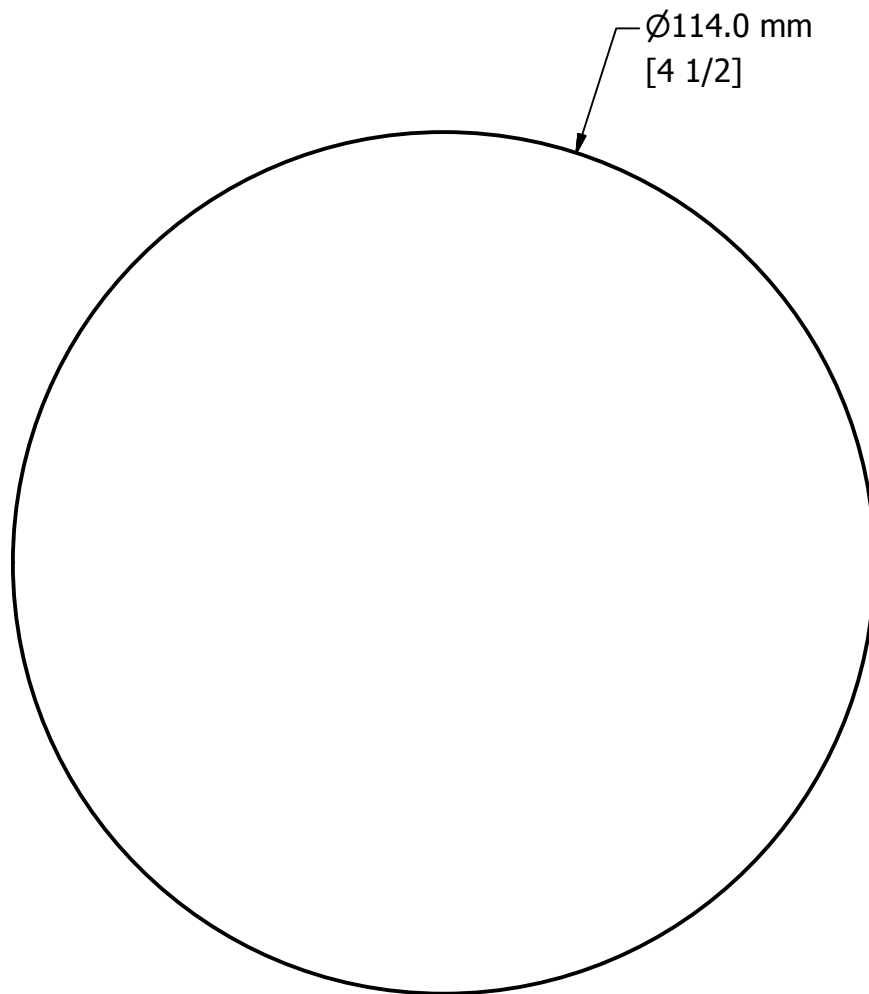
Left Side View

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
Maritime and Civil Infrastructure (MCI), Integrated Technical Services 520 Exmouth St., Sarnia, ON N7T 8B1		

P 06 Ground Attachment


FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

PL Ø114 x 5
WEIGHT: 0.4kg



Ø114.0 mm
[4 1/2]

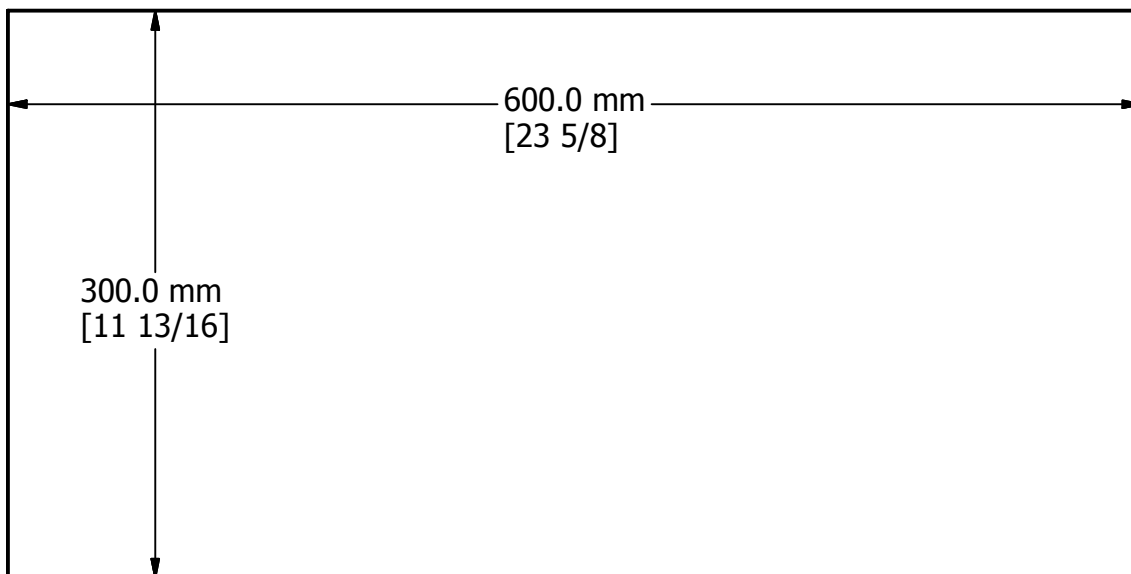
Top View

	Fisheries and Oceans Canada	Pêches et Océans Canada
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P 07 Top Plate

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

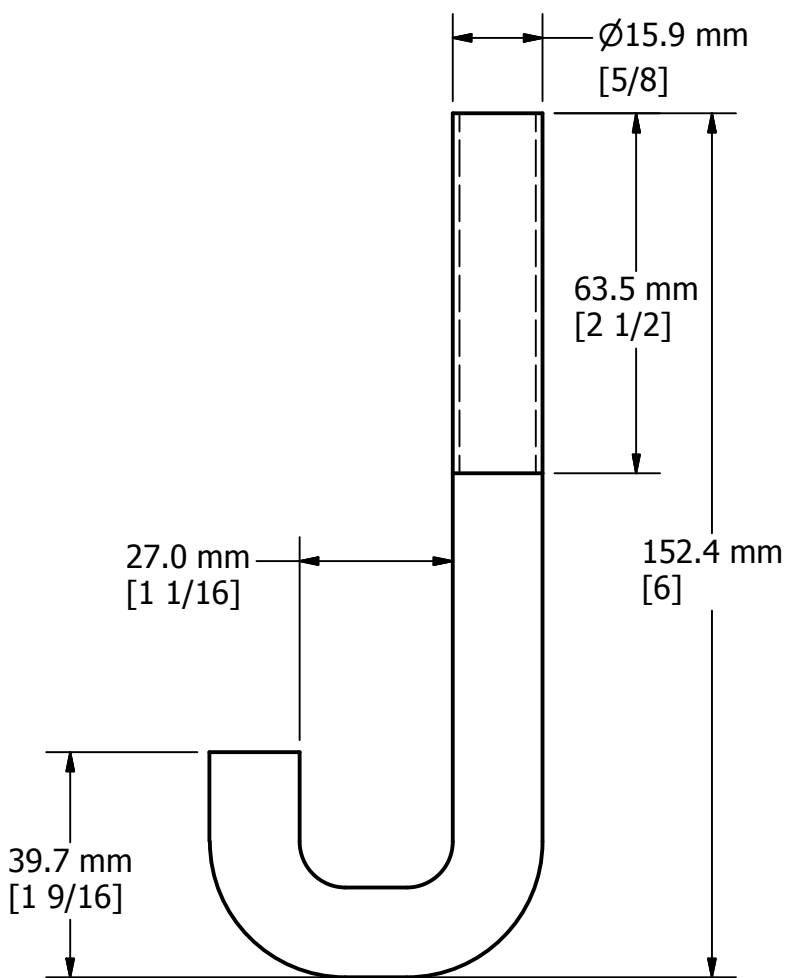
PL 600x300x5
WEIGHT: 7kg




Top View

 Fisheries and Oceans Canada		Pêches et Océans Canada		
Canadian Coast Guard Central & Arctic Region		Garde côtière canadienne Région du centre et de l'Arctique		
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<h2>P 08 Cover Plate</h2>				
FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

Ø5/8 J-HOOK
WEIGHT: 0.3kg



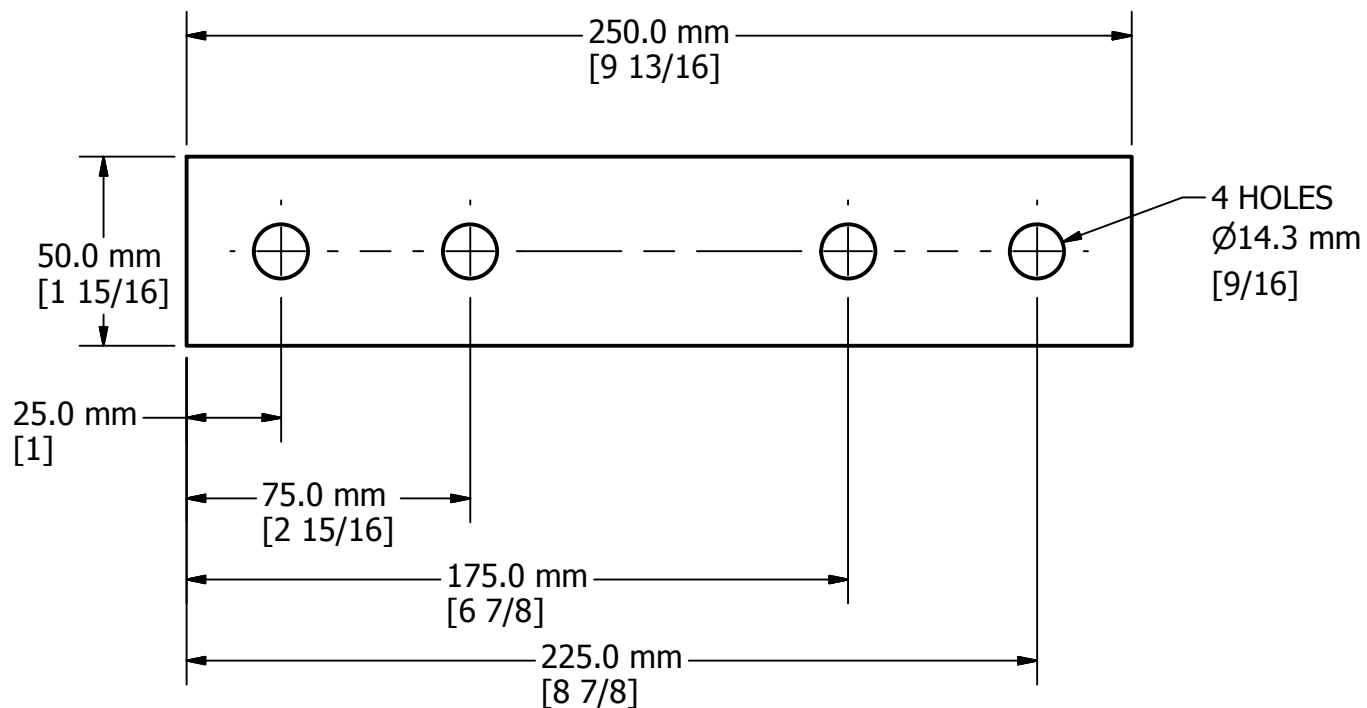
Front View

	Fisheries and Oceans Canada	Pêches et Océans Canada
	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
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P 09
J-Hook

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

PL 250x50x10
WEIGHT: 1kg



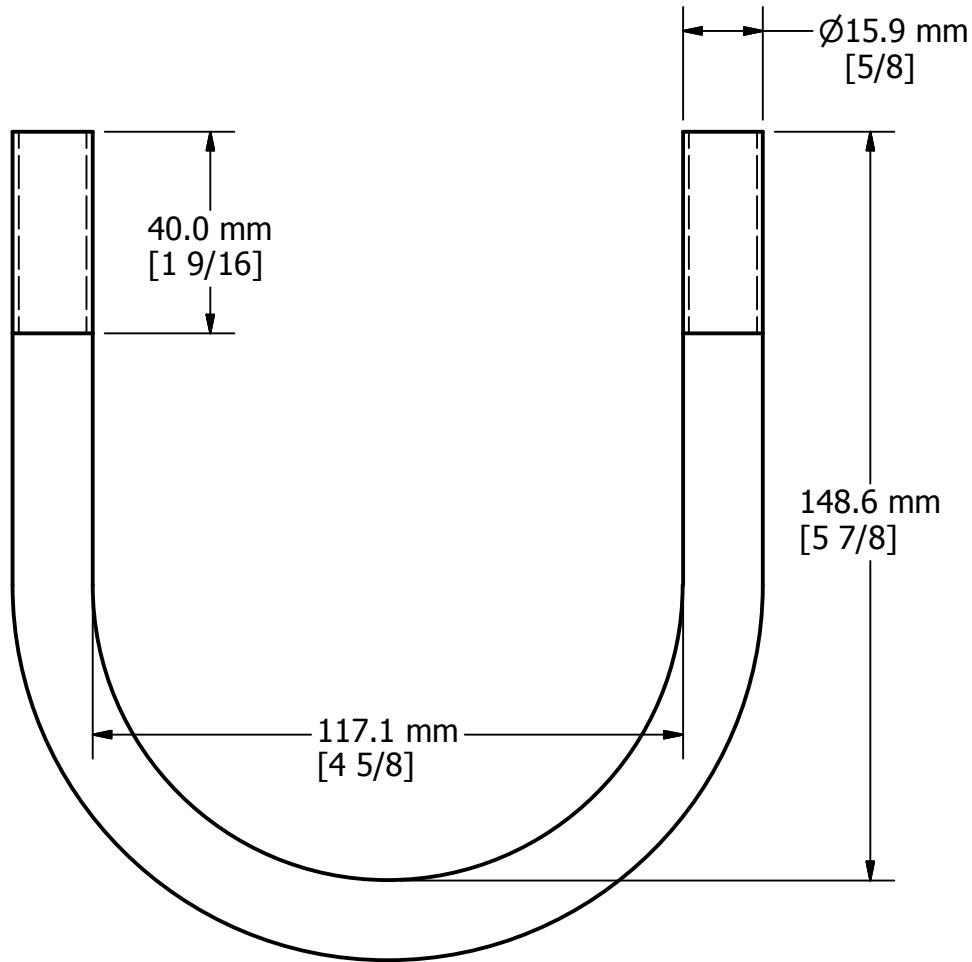
Front View

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	Canadian Coast Guard Central & Arctic Region	Garde côtière canadienne Région du centre et de l'Arctique
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P 10 Splice Plate

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

Ø5/8 U-BOLT
WEIGHT: 0.6kg



Front View

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P 11
Custom U-Bolt

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

2

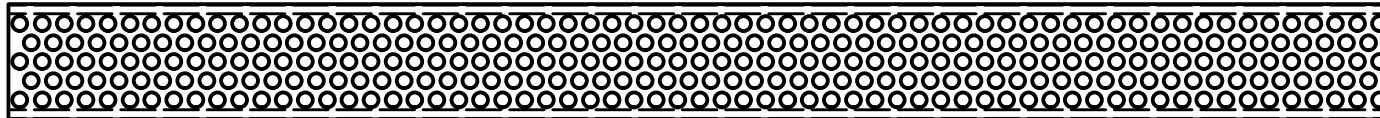
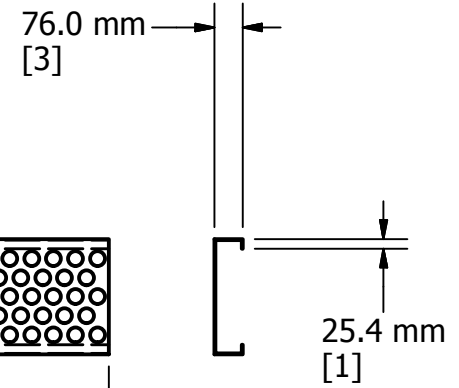


1

FISHER LUDLOW SHUR GRIP 11ga
 305(w)x76(h)x3658(lg)
 MAT'L: STEEL
 WEIGHT: 34kg
 FINISH: H.R.P.O.

B

B



STOCK
 LENGTH
 3658.0 mm
 [144]

Top View


A

A

2



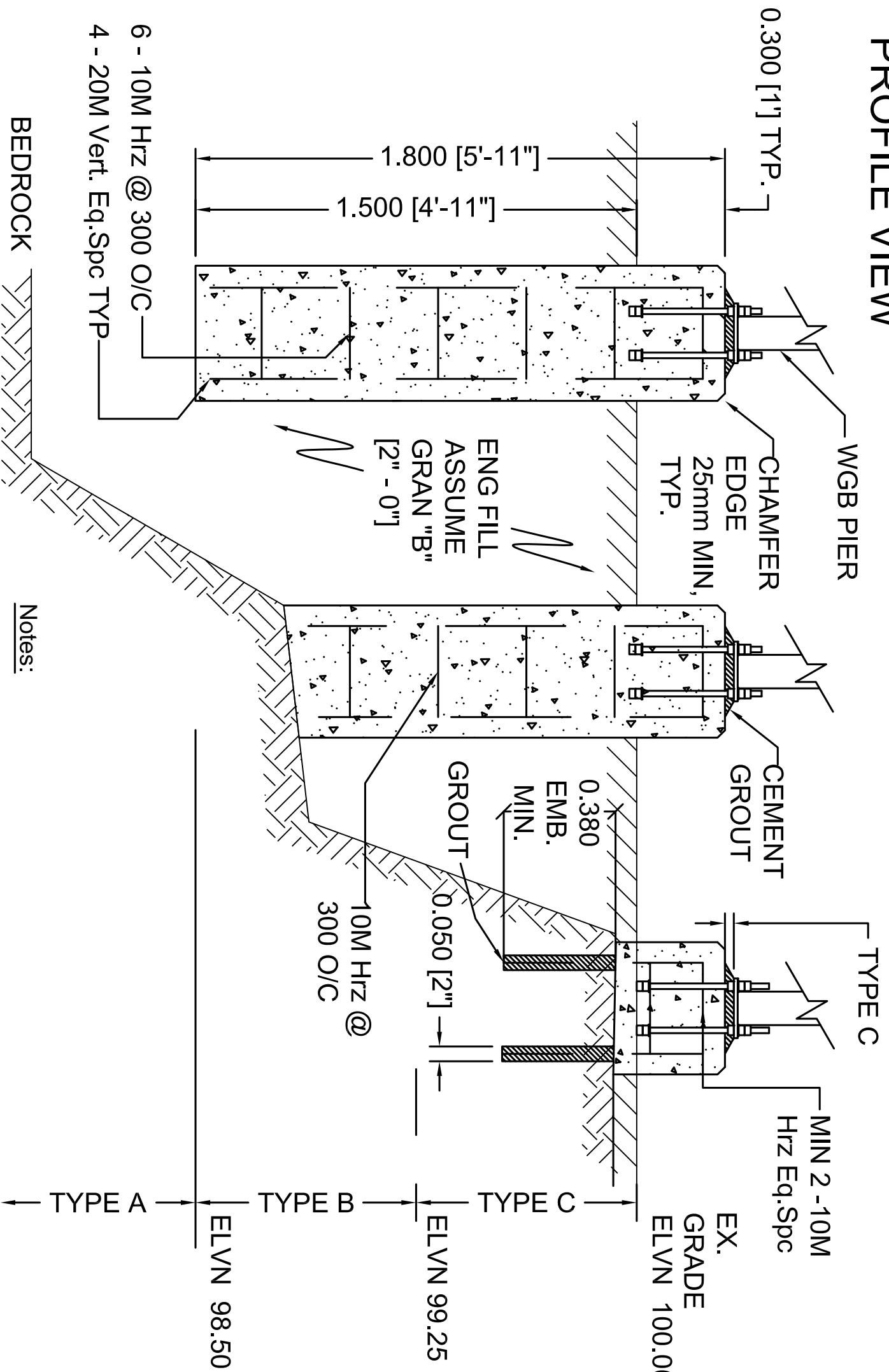
1


 Fisheries and Oceans
 Canada
 Pêches et Océans
 Canada
 Canadian Coast Guard
 Central & Arctic Region
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P 12
WGB DECK

FILE No.		SCALE:	DWG No.	
Rv.	DATE	DESCRIPTION	DRAWN	APP'D
0	16 APR 13	DRAWING INITIATED	E.G.	

PROFILE VIEW

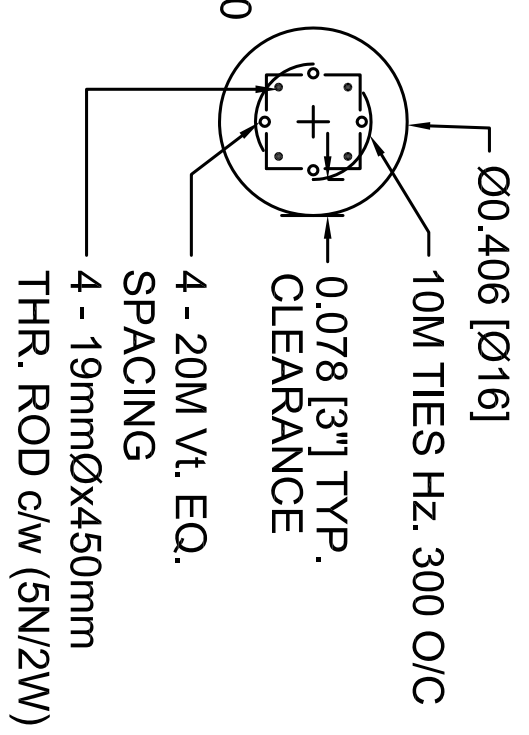



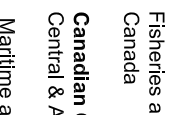
CABLEWAY GUIDE PIERS

Notes:

Piers shall be cast to a depth of 1.5m below ex. grade (Type A).
 Where bedrock is encountered at an elevation of less than 1.5m the configuration of the pier shall be amended to Type B or C depending upon the depth to bedrock.
 Reinforcement: Deformed bars as per CSA G30.18 M92, Fy 400 Mpa. Fabrication, placement, cover, and support as per CSA A23.1
 Grout: SIKAMBED or equal
 Concrete: Quikrete 5000 or equal HES

PLAN VIEW

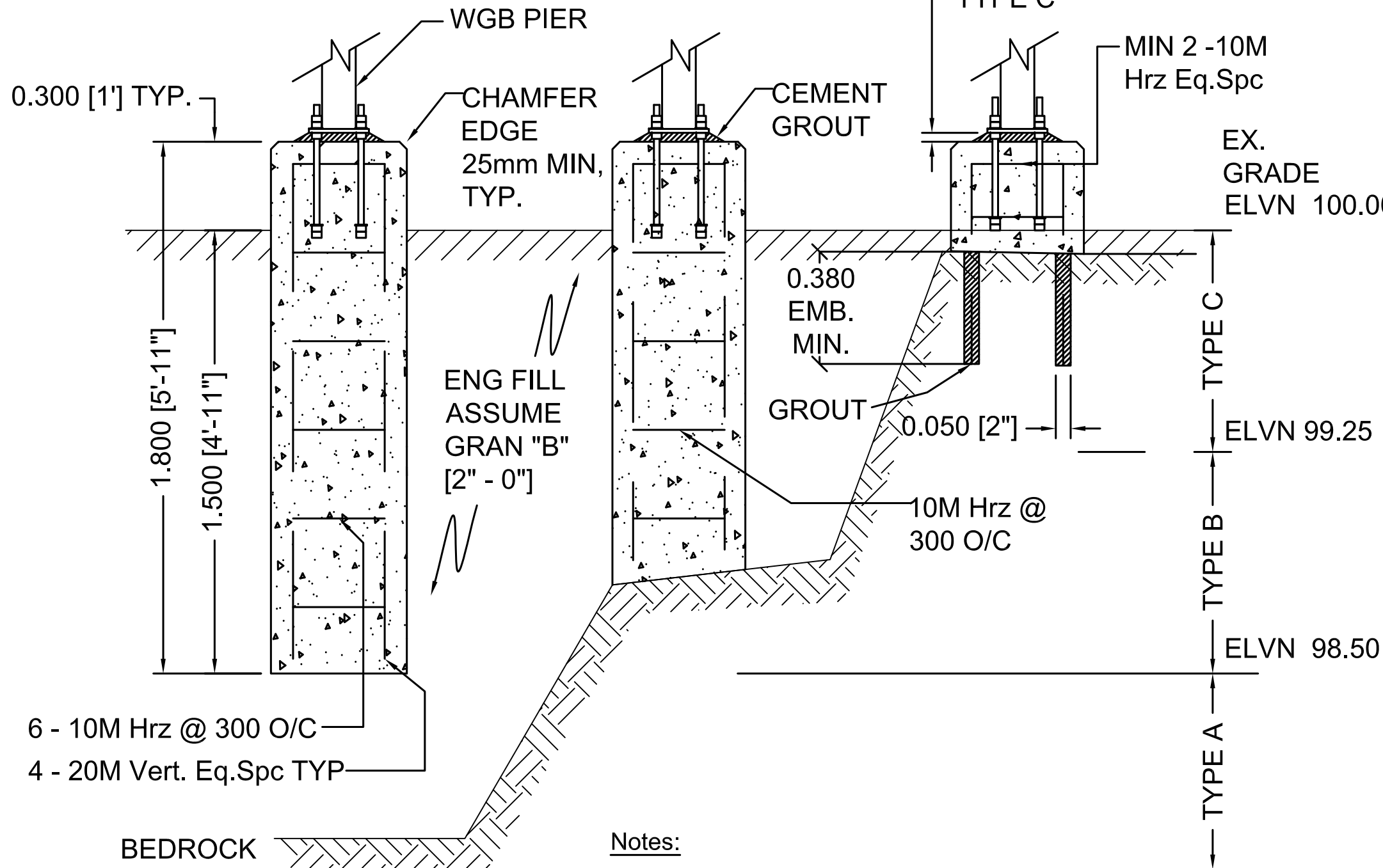


	
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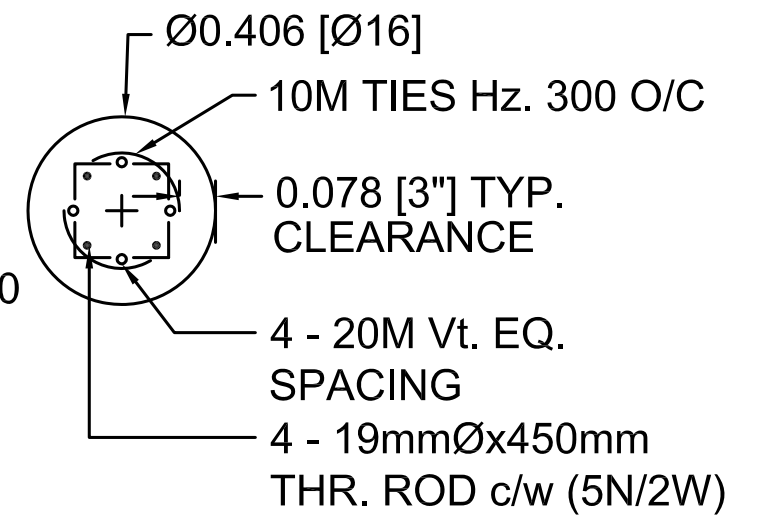
GENERAL WGB FOUNDATION PIER LAYOUT

FILE No.:	U/A	SCALE:	N.T.S.	DWG No.	13
Rv.	DATE	DESCRIPTION	DRAWN	APP'D	
O	03 APR 12	DRAWING INITIATED.	D.E.J.	R.M.	
1	17 APR 13	TITLE MODIFIED	E.G.		

PROFILE VIEW



PLAN VIEW



CABLEWAVE GUIDE PIERS


Notes:

Piers shall be cast to a depth of 1.5m below ex. grade (Type A). Where bedrock is encountered at an elevation of less than 1.5m the configuration of the pier shall be amended to Type B or C depending upon the depth to bedrock.

Reinforcement: Deformed bars as per CSA G30.18 M92, Fy 400 Mpa. Fabrication, placement, cover, and support as per CSA A23.

Grout: SIKA MBED or equal

Concrete: Quikrete 5000 or equal HES

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GENERAL WGB FOUNDATION PIER LAYOUT

FILE No.:	U/A	SCALE:	N.T.S.	DWG No.	13
Rv.	DATE	DESCRIPTION	DRAWN	APP'D	
0	03 APR 12	DRAWING INITIATED.	D.E.J.	R.M.	
1	17 APR 13	TITLE MODIFIED	E.G.		