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SOW –TOWER REPLACEMENT

LL 677

Livingston Channel Upper Entrance

**Detroit River
Amherstburg, ON**

Solicitation file number: FP802-170092

MARITIME AND CIVIL INFRASTRUCTURE

Prepared by: DJ

Approved by: BY

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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 Definitions

- .1 ATON: Aid to Navigation
- .2 CCG: Canadian Coast Guard, Central and Arctic Region
- .3 Engineer: Manager of Engineering, CCG MCI Central and Arctic Region or designate
- .4 MCI: Maritime Civil Infrastructure
- .5 PA: Project Authority, as indicated in the Contract Documents.

1.3 Description of Work

- .1 Work under this Contract includes but is not limited to the provision of all labour, materials, and equipment required to:
 - .1 Mobilize to site with a work barge of appropriate size and certification;
 - .2 Salvage:
 - .1 Existing ATON appurtenances (lantern, solar panels, batteries and battery box); and,
 - .2 Existing ATON tower.
 - .3 Remove and dispose of existing hand rails (building and pier cap);
 - .4 Remove and dispose surplus abandoned utilities;
 - .5 Demolish and remove existing building;
 - .6 Complete pier repairs as detailed, including:
 - .1 Partial depth removal of existing concrete;



- .2 Concrete patching; and,
- .3 Concrete crack sealing.
- .7 Install new reinforced concrete foundation above existing pier cap.
- .8 Install new 9.75m ATON tower
 - .1 Tower has been fabricated with a splice ring and may be installed in two sections.
- .9 Install salvaged ATON equipment (Lantern/Solar Panels/Batteries).
- .10 Demobilize.
- .2 The following work will be undertaken by others and is hereby excluded:
 - .1 Application of hand rail coating;
 - .2 Supply of the new ATON tower; and,
 - .3 Connection and commissioning of ATON equipment.

1.4 Submittals

- .1 Mandatory submittals and schedule for submission are detailed below and in Appendix B2. The following identifies general requirements only. The relevant sections must be consulted for a complete listing of mandatory content.
- .2 Detailed Schedule:
 - .1 Deadline: No later than ten (10) 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 Project Participants Listing:
 - .1 Deadline: With schedule.
 - .2 Deliverables:
 - .1 Contractor shall furnish listing of all core project team members and all relevant subcontractors. Listing must include; but, is not limited to the following:
 - .1 Project Manager, prime point of contact
 - .2 Contractor's Engineer responsible for the design of formwork and falsework
 - .3 Fabrication facility undertaking the construction of those components identified in Section 055000.



- .4 Marine access provider (if subcontracted); and,
- .5 Concrete Supplier.
- .2 Document must include satisfactory evidence that project team members are compliant with mandatory qualifications indicated below, as listed in the following sections, and as contained in appendicies.
- .4 Fabrication Plan
 - .1 Deadline: As indicated in the submitted schedule.
 - .2 Deliverables:
 - .1 Fabrication package Section 055000.
 - .5 Contract Construction Plan:
 - .1 Deadline:
 - .1 As indicated in submitted schedule; and,
 - .2 No less than ten [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 Project specific safety program (Section 013530);
 - .2 Project environmental protection plan (Section 013543);
 - .3 Detailed demolition plan (Section 024116);
 - .4 Detailed construction plan (Section 055000); and,
 - .5 Erection plan (Section 133613).
- .6 Contract Maintenance Package
 - .1 Deadline: No more than 30 working days following substantial completions of the works.
 - .2 Deliverables:
 - .1 Waste disposal receipts or records of disposal (Section 024116)
 - .2 Quality assurance test results (Section 033000)
 - .3 Fabrication maintenance package (Section 055000)



1.5 Contractor's Qualifications

- .1 The work shall be carried out under the supervision and responsibility of a sole specialized Contractor with experience in the erection of equivalent facilities offshore by barge.
- .2 The Contractor may retain subcontractor's in accordance with their need provided such subcontractors meet the requirements indicated below:
 - .1 Engineers retained by the Contractor must be licensed by the Professional Engineers of Ontario in the appropriate discipline.
 - .2 Fabrication facilities must be accredited by the Canadian Welding Bureau to complete work in accordance with the requirements indicated in Section 055000.
 - .3 Marine access provider and plant must comply with the requirements indicated in Appendix B5, Marine Access Requirements.
 - .4 Concrete supplier is expected to be a ready-mix Facility accredited by Concrete Ontario / Ready Mixed Concrete Association of Ontario (RMCAO).

1.6 Site Location

- .1 The location of the site is as follows:
 - .1 Lat./Long.: 42° 8'8.90"N 83° 7'20.80"W
 - .2 The closest settlement is Amherstburg, Ontario.
- .2 The site is located on an offshore pier in the Detroit River adjacent to the main commercial channel.

1.7 Existing Conditions

- .1 Bidders must make their own estimate of the difficulties associated with all phases of the works.
- .2 The contractor must include in their costs all expenses related to the difficulties of working at the sites.
- .3 Photographs of the existing site are included in Appendix B1.
- .4 Engineers Review (Exp, 2016) has been included in Appendix B4.
- .5 A geotechnical investigation has not been completed for this location.

1.8 Contractor's Access to Site

- .1 Contractor is responsible for transportation of all labour, materials, and equipment to and from the sites, including any and all material furnished or itemized for salvage by CCG.
- .2 The Site is accessible by water only.



- .3 The Contractor is responsible for sourcing appropriate marine access to support all construction work. Contractors are also responsible for ensuring that all the requirements of Appendix B5 – Marine Access Requirements are met.

1.9 Completion, Scheduling and Planning of the Works

- .1 Work may commence as early as practical following CCGs acceptance and approval of mandatory submissions.
- .2 Site work shall not commence without written authorization of CCG PA.
- .3 Work shall be completed no later than 31 OCT 2017 unless otherwise negotiated and approved in writing.

1.10 Canadian Coast Guard Staging Location

- .1 Items itemized as supplied by, or salvaged to CCG shall be collected or delivered by the Contractor to the following staging locations as noted. The Contractor shall be responsible for all transportation costs between the project site and the identified staging location. Material drop off or access to stored goods outside of regular operating hours shall be at the discretion of CCG PA and may be subject to cost recovery:

- .1 Staging locations

- .1 For tower pick up (new) /delivery (salvaged) and coating application:

- .1 CCG Base – Prescott, 401 King St. W, Prescott ON K0E 1T0

- .2 For all other requirements noted herein:

- .1 CCG Base – Amherstburg, 370 Dalhousie St., Amherstburg ON N9V 1X3

- .2 Advise CCG at least three (3) working days prior to pick-up/delivery

- .1 Shipping/Receiving hours: Monday through Friday, 9:00AM to 3:00PM.

1.11 Temporary Facilities

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Arrange, pay for, and maintain temporary electrical power supply as required for construction, and water supply as required, in accordance with governing regulations and ordinances.
- .3 Maintain emergency spills kit on-site at all times.

1.12 Fees, Permits, Certificates and Information

- .1 Contractor shall provide authorities having jurisdiction with all information requested.
- .1 Contractor shall provide copies to CCG PA of any documentation submitted to other authorities related to the work described in this document.



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.2 Contractor shall pay fees and obtain certificates and permits required.

.3 Contractor shall furnish certificates and permits when requested.

1.13 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.

1.14 Required Submissions

.1 A summary of the minimum mandatory submissions required can be found in Appendix B2. This summary is not an exhaustive list of all submissions required for the duration of the project. Additional submissions may be required after award.

PART 2 - PRODUCTS

2.1 Not Used

PART 3 - EXECUTION

3.1 Not Used



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 CCG for review.
- .2 Do not proceed with the work until submitted documents or samples have been reviewed by CCG PA.
- .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 CCG PA's review of the submitted documents.
- .5 Notify CCG PA 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 CCG PA's review of submission, unless CCG gives written acceptance of specific deviations.
- .7 Make any changes to submissions that CCG may require consistent with Contract Documents and resubmit as directed by CCG.
- .8 Provide CCG with a written notice, when resubmitting, of any revisions other than those requested CCG.

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 Documents may be forwarded via email to the CCG PA. Documents are expected to be provided in .pdf or standard microsoft office format (.doc, .xls).
- .3 Allow three (3) working days, or as stipulated in the specifications, for CCG to review the submission.
- .4 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.



SECTION: 013530 HEALTH AND SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 Scope

- .1 The Contractor shall be responsible to develop, implement and enforce a safety program which addresses all elements of the work.

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
- .3 Ontario Occupational Health and Safety Act and Regulations, 2009.
- .4 Any and all other Provincial/Territorial Regulations and Policies; Worker's Compensation Board Policies; Local municipal regulations; pertaining to safety of the contractors workers

1.3 Submittals

- .1 Project Specific Safety Program

- .1 Deadline:

- .1 With Construction Plan

- .2 Deliverables:

- .1 Safety Program Document, include:

- .1 A listing of all activities specific to this phase of 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.
- .4 Material Safety Data Sheets for all products to be utilized in the execution of the works.



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 Related Sections

- .1 Not used.

1.4 Submittals

- .1 Contractor shall submit and environmental protection plan

- .1 Deadline: With Construction Plan

- .2 Deliverables:

- .1 A written 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;

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 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



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- .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 CCG. 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



SECTION: 014500 QUALITY CONTROL

PART 1 - GENERAL

1.1 Inspection

- .1 CCG 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 CCG in these specifications or provided for in work-site regulations, the request for inspection must be made without unreasonable delay.

1.2 Procedures

- .1 Provide CCG 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 CCG 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 CCG will make acceptance visits of work executed by the Contractor at critical milestones identified in the following sections.
- .2 The Contractor shall inform CCG 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: 016100 COMMON PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 General

- .1 Secure CCG approval of all products to be incorporated into the works. Work shall not commence until product data and/or samples have received CCG approval.
- .2 Supply and/or fabricate material and equipment of prescribed quality, with performance conforming to established standards.
- .3 Use new material and equipment unless otherwise specified.
- .4 Ensure replacements parts may be readily procured.
- .5 Use products from one manufacturer for material and equipment of same type or classification, unless otherwise specified.

1.2 Manufacturer's Instructions

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
- .2 Notify CCG in writing of any conflict between these specifications and manufacturer's instructions; CCG will designate which document is to be followed.

1.3 Compliance

- .1 When material or equipment is specified by standard or performance specifications, upon request of CCG, obtain an independent testing laboratory report from the manufacturer, stating that material or equipment meets or exceeds specified requirements.

1.4 Substitution

- .1 Where specific products have been specified, proposals for substitution may only be submitted after award of contract. Such requests must include statements of respective costs of items originally specified and the proposed substitution.
- .2 No substitutions will be permitted without prior written approval of CCG. Substitutions will be considered by CCG only when:
 - .1 Materials specified in Contract Documents, are not available; or,
 - .2 Delivery date of materials selected from those materials specified would unduly delay completion of contract; or,
 - .3 Alternative materials to those specified which are brought to the attention of and considered by CCG as equivalent to the material specified will result in a credit to the Contract amount.



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- .3 Should the proposed substitution be accepted either in whole or in part, the Contractor must assume full responsibility and costs when such substitution affects other work on the project including any and all design or drawing changes required as a result of substitution.

1.5 Submittals

- .1 Provide product specifications and/or samples upon request from CCG.



SECTION: 024116 DEMOLITION OF STRUCTURES

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 Salvage existing ATON equipment (lantern, solar panel, batteries/battery box);
 - .2 Salvage the existing ATON tower (including delivery to CCG Base – Prescott);
 - .3 Removal and disposal of existing handrails and ladders;
 - .4 Removal and disposal of surplus abandoned utilities;
 - .5 Demolish and remove existing building; and,
 - .6 Partial depth removal of existing concrete (patch repairs, pier cap, assume 3.0m² at average depth of 0.100m).

1.2 Related Sections

- .1 Concrete Work, Section 033000
- .2 Metal Fabrications, Section 055000
- .3 Metal Towers, Section 133613

1.3 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
 - .2 NRC-CNRC National Building Code of Canada.
 - .3 Ontario Occupational Health and Safety Act and Regulations.
 - .4 CSA S350-[M1980(R1998)], Code of Practice for Safety in Demolition of Structures.

1.4 Submittals

- .1 Contractor to provide demolition plan.
 - .1 Deadline: With Construction Plan.
 - .2 Deliverables:



- .1 Method of demolition including all associated tasks and schedule;
- .2 Methods for protecting the site from demolition debris.
- .3 The ultimate disposal location of all waste materials and debris.
 - .1 Include documentation detailing regulatory approval for waste disposal facility and transporter.
- .2 Work under this section shall not proceed until written approval of the demolition plan has been received from the CCG.
- .3 Waste disposal receipts or records of disposal
 - .1 Deadline:
 - .1 with Contract Maintenance Package
 - .2 Deliverables:
 - .1 Copies of certified receipts from the disposal sites for all material removed from the work site upon request.

1.5 Existing Conditions

- .1 Contractor must insure facilities are dismantled and demolished in a safe manner.
- .2 Photos of the existing facilities are included in Appendix B1.
- .3 Engineer's Review (Exp, 2016) is included in Appendix B4
- .4 No hazardous material has survey has been completed. CCG is aware of no hazardous materials; however, existing paint/coatings are of an age where lead based coatings are to be anticipated. Contractor must assume and estimate for appropriate mitigation measures.

PART 2 - PART 2 - PRODUCTS

2.1 Not used.

PART 3 - PART 3 - EXECUTION

3.1 General

- .1 Work under this section shall be continuous and proceed without interruption unless otherwise approved by CCG.

3.2 Protection

- .1 Implement effective controls to catch/collect all tower debris during demolition, specifically paint.
- .2 Implement effective controls to prevent injury to workers, and mariners.



3.3 Preparation

- .1 Erect warning signs and barricades.
- .2 Ensure all environmental protection/mitigation measures are in place.
- .3 Ensure all items identified for salvage have been removed and stored.

3.4 Demolition

- .1 Remove and dispose of handrails and associated access facilities.
- .2 Remove and dispose of existing building.
 - .1 Removal of this element must in no case damage the integrity of existing pier cap. Any and all damage to the pier cap not otherwise identified as existing at the time of the Engineer's Review (EXP, 2016, Appendix B4) will be remedied to the satisfaction of the CCG PA at the sole expense of the Contractor. Such expenses will include; but, are not limited to:
 - .1 Investigation and recommendation of a suitable third party Consulting Engineer; and,
 - .2 Construction of same.
 - .2 Vertical dowels incased in the existing building footing (connecting the building to the pier cap) are to be preserved.
- .3 Remove existing deteriorated concrete where identified by CCG PA to the depths indicated in the contract drawings.
 - .1 Work is to be completed utilizing saw and chipping hammer(s) to avoid damage to the existing pier armouring, unless otherwise approved in writing.
 - .1 Chipping hammers shall have a maximum weight of 9 kg prior to any handle modification
 - .2 Existing keyway is to be exposed.
 - .3 Debris is to be removed from the removal area on an ongoing basis to ensure that removals do not exceed the boundaries and depths specified for removal.
 - .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 CCG.

3.5 Disposal

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



SECTION: 033000 CONCRETE WORK

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work of this section includes the supply of all labour, material, and equipment, necessary to complete the:
 - .1 Installation of new reinforced concrete footing (above existing pier cap) as detailed in Contract Drawings, Appendix B3; including, but, not necessarily limited to:
 - .1 Concrete patch work (deteriorated concrete, existing pier cap, estimate 0.3 m³);
 - .2 Sealing of existing cracks (pier cap, estimate 20m)
 - .3 Scarification of existing pier cap (interior of existing building)
 - .4 Installation of anchor dowels (if existing bars are inadequate),
 - .5 Installation of concrete bonding agent; and,
 - .6 Installation of curing compound.
 - .2 Work includes any and all provisions necessary to ensure that the anticipated performance of the placed concrete will be obtained if work is undertaken in cold weather.
 - .3 Work under this section excludes:
 - .1 Partial depth removals (see, Section 024116 Demolition of Structures)
 - .2 Concrete armouring (see, Section 055000 Metal Fabrications)
 - .3 Grouting (see, Section 133613, Metal Towers)

1.2 Related Sections

- .1 Demolition, Section 024116
- .2 Metal Fabrications, Section 055000
- .3 Metal Towers, Section 133613

1.3 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-G30.18 Billet Steel Bars for Concrete Reinforcement
- .7 CAN/CSA S269.3 Concrete Formwork
- .8 ACI Specification 306 Cold Weather Concreting

1.4 Submittals

- .1 Submittals shall be forwarded to CCG in accordance with the provisions of section 013530.
- .2 Concrete Mix Parameters:
 - .1 Deadline: with Construction Plan (Section 011100)
 - .2 Deliverables:
 - .1 Provide high level summary of mix properties and admixtures to demonstrate compliance with CCG criteria.
 - .2 Provide MSDS, (pre-mixed products only).
- .3 Concrete placement methods and curing procedures.
 - .1 Deadline: with Construction Plan (Section 011100)
 - .2 Deliverables:
 - .1 Detailed written description of concrete placement, including:
 - .1 Anticipated haul routes and distances;
 - .2 Shop drawings for falsework and formwork;
 - .3 Placement methods and procedures to control consolidation/segregation;
 - .4 Location of necessary cold joints;
 - .5 Finishing procedures;
 - .6 Curing methods and schedule;
 - .7 Strength requirements for structural stability (removal of forms);
 - .8 Clean-up procedures; and,



- .9 Mitigation measures to account for hot or cold temperatures where reasonably anticipated during the construction period.
- .10 MSDS and Manufacturers instructions for secondary products incorporated into the works including; but not limited to:
 - .1 Dowel adhesive;
 - .2 Crack sealing materials;
 - .3 Concrete bonding agent; and,
 - .4 Curing compound.
- .4 Quality Assurance Test Results
 - .1 Deadline: With Contract Maintenance Package (Section 011100)
 - .2 Deliverables
 - .1 Records of all plastic property testing completed on the date of placement.
 - .2 Records of all strength development testing completed following initial placement.

1.5 Quality Assurance

- .1 CCG's minimum inspection requirements are detailed below. The Contractor shall be responsible to notify CCG of the date and time that the works may be inspected.
 - .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 Testing is to be completed by a third party independent Consultant and is to be completed by a certified technician in accordance with CAN CSA A23.2.

PART 2 - PRODUCTS

2.1 General

- .1 Incorporated products (reinforcement, concrete, anchors, adhesives, bonding agents) must comply with the Contract Drawings provided in Appendix B3, unless otherwise negotiated and approved in writing.



2.2 Formwork / Falsework

- .1 Formwork and falsework must be designed and constructed in accordance with the requirements of CAN CSA A23.1.

2.3 Curing Compound

- .1 White pigmented, Type 2 – Class B or approved alternative.

2.4 Crack Sealant

- .1 Material as approved by CCG PA.

PART 3 - EXECUTION

3.1 General

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

3.2 Falsework and Formwork

- .1 Formwork and Falsework are to be designed and installed the Contractor.
 - .1 Shop drawings of the proposed falsework are to be provided to CCG PA with Contractor's Construction Plan.
 - .2 Contractor must ensure exposed corners are chamfered in accordance with Contract Drawings, Appendix B3.

3.3 Preparation

- .1 Preparation shall not commence until bearing surfaces have been inspected by CCG PA.
- .2 Remove all loose and deleterious material.
- .3 Complete all smaller patch repairs in existing pier cap.
- .4 Place reinforcement in accordance with Contract Drawings.
 - .1 Dowels are to be installed to the embedment depth indicated in the Contract Drawings
- .5 Surface is to be clean and free of deleterious material. Bonding agent is to be applied in accordance with Manufacturer's Instructions.
- .6 Contractor must take all necessary action required to account for climatic conditions reasonably anticipated at the time of the concrete placement.



3.4 Placement

- .1 Concrete placement shall not commence until formwork, reinforcement, and bonding surface have been inspected by CCG PA.
- .2 Patch repairs are to be completed prior to placement of the concrete footing.
- .3 Contractor shall place, finish and cure concrete as per CAN CSA A23.1 making all adjustment necessary to account for climatic conditions anticipated during the curing period.
- .4 Concrete shall be placed in one continuous pour.
 - .1 The development of cold joints must be previously approved in writing.
- .5 Finish exposed concrete surfaces to provide a lightly brushed non-skid surface.
- .6 Contractor shall provide samples as required during placement operation for the performance of quality assurance testing.

3.5 Curing

- .1 Concrete curing must be undertaken in accordance with CAN CSA A23.1 and the Contractor's approved Construction Plan. Curing compound is preferred given mobilization requirements.
 - .1 Curing regiment employed must take into account local climatic conditions reasonably anticipated to occur during the curing period.
- .2 Contractor is to apply curing compound 2-4 min. following finishing operation, completely covering the surface of the concrete. A second application of curing compound shall be applied within 30 to 60 minutes after the first application.

3.6 Clean up

- .1 Contractor must remove all forms and falsework not designated to be left in place.
- .2 Forms and falsework shall not be removed until the concrete has achieved suitable strength and temporary support and/or insulation against freezing is no longer required.
 - .1 Curing compound must be placed following the removal of formwork.
- .3 All means used to anchor the falsework to the existing pier cap are to be removed and restored to the satisfaction of the CCG PA. For clarity, fasteners and waste concrete are to be removed; all resulting voids shall be filled.
- .4 Cavities, depressions, and other defects observed in the placed concrete must be restored by the Contractor to the satisfaction of the CCG PA.



SECTION: 055000 METAL FABRICATIONS

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work of this section includes the supply of all labour, material, and equipment, necessary to complete the following activities:
 - .1 Fabricate and install new access facilities (ladder, platform, and handrails); and,
 - .2 Transportation of access facilities to and from the identified CCG staging location for final coating application.
- .2 The following work is to be completed by others and is excluded from the requirements of this section:
 - .1 Coating application

1.2 Related Sections

- .1 Demolition, Section 024116
- .2 Concrete Work, Section 033000
- .3 Metal Towers, Section 133613

1.3 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
 - .2 NRC-CNRC National Building Code of Canada
 - .3 Ontario Occupational Health and Safety Act and Regulations
 - .4 CAN/CSA G40.20-13 & G40.21-13– General Requirements for Rolled or Welded Structural Quality Steel
 - .5 CAN/CSA G164 - Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .6 CAN/CSA G401-14 – Corrugated Steel Pipe Products
 - .7 ASTM A36-14 - Standard Specification for Carbon Structural Steel
 - .8 ASTM A513-15 – Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing



1.4 Submittals

- .1 Submittals shall be forwarded to CCG PA in accordance with the provisions of section 013530.
- .2 Fabrication Package
 - .1 Deadline: As indicated in Contractor's submitted schedule
 - .2 Deliverables
 - .1 Fabrication drawings for concrete armouring and access facilities
- .3 Fabrication Maintenance Package:
 - .1 Deadline: Furnish with Contract Maintenance Package (Section 011100)
 - .2 Deliverables:
 - .1 Material cut sheets for all incorporated products
 - .2 Amended fabrication drawings detailing any and all approved modifications to the Contract Drawings
 - .3 Amended Contract Drawings detailing:
 - .1 Installed orientation of the access facilities;
 - .2 Height of platform above water elevation (date of installation); and,
 - .3 Height of lowest rung relative to water elevation (date of installation).

1.5 Quality Assurance

- .1 CCGs minimum inspection requirements are detailed below. The Contractor shall be responsible to notify CCG of the date and time that the works may be inspected.
 - .1 Upon completion of fabricated facilities prior to galvanizing
 - .2 Upon installation of fabricated facilities at the project site.

PART 2 - PRODUCTS

2.1 General

- .1 Incorporated products must comply with the Contract Drawings provided in Appendix B3, unless otherwise negotiated and approved in writing.



PART 3 - EXECUTION

3.1 Fabrication

- .1 All members shall be fabricated in accordance with the Contract Drawings and as per the specified references.
- .1 In any bending or reworking of any material, methods employed shall ensure that the physical properties of the material are not impaired.

3.2 Galvanizing

- .1 All materials are to be hot dipped galvanized unless otherwise indicated.

3.3 Coating

- .1 CCG will complete the application of the final coating system to the fabricated access facilities.
- .2 The Contractor is responsible for the transporting the access facilities to and from the designated staging location (see Section 011000).
 - .1 The Contractor's schedule must allow for at least seven (7) days for CCG to complete the application of the coating system.

3.4 Installation

- .1 The Contractor must take all reasonable precautions to avoid damage to the fabricated elements during transport, unloading and installation. All components or damaged members must be repaired or replaced to the satisfaction of the CCG PA at the Contractor's expense.
- .2 Access facilities are to be installed as detailed in the Contract Drawings.
 - .1 Access facilities are to be aligned with the tower door as indicated and must be positioned on the downstream face of the pier.
 - .2 All damage to the coating system is to be repaired to the satisfaction of the CCG PA.



SECTION: 133613 METAL TOWERS

PART 1 - GENERAL

1.1 Scope of Work

- .1 Work under this section includes the supply of all labour, material, and equipment required to complete:
 - .1 Transportation of the tower and all associated hardware to site from the designated staging area;
 - .2 The installation of the tower detailed in the appended Contract Drawings; and,
 - .3 Transportation and installation of all salvaged ATON appurtenances.
- .2 Work of this section excludes:
 - .1 Supply of the new ATON tower; and,
 - .2 Commissioning of ATON equipment.

1.2 Related Sections

- .1 Demolition, Section 024116
- .2 Concrete Work, Section 033000
- .3 Metal Fabrications, Section 133613

1.3 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.
 - .2 NRC-CNRC National Building Code of Canada.
 - .3 CSA S37-01 - Antenna Towers and Antenna Supporting Structures.
 - .4 CAN/CSA S16.1 - Limit States Design of Steel Structures.
 - .5 CAN/CSA G164 - Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 Submittals

- .1 Erection Package
 - .1 Deadline: with Construction Plan



.2 Deliverables

- .1 Written plan detailing proposed labour, equipment and timings to complete the installation of the new ATON tower. Plan must clearly demonstrate procedures and methods to be employed to hoist the tower into position.
- .2 CCG 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; but is not limited to:
 - .1 Crane/helicopter lift capacity; and/or,
 - .2 Vessel stability.

.2 Tower maintenance package

- .1 Deadline: with Contract Maintenance Package.
- .2 Deliverables:
 - .1 As-built drawings detailing any and all amendments or revisions not indicated elsewhere
 - .2 Site photographs

1.5 Quality Assurance

- .1 CCGs minimum inspection requirements are detailed below. The Contractor shall be responsible to notify CCG of the date and time that the works may be inspected.
 - .1 Upon completion of the work to ensure tower is plumb and that light is operating correctly;

PART 2 - PRODUCTS

2.1 ATON Tower

- .1 Tower is supplied by CCG. Details of the tower being supplied are provided in Appendix B3.

PART 3 - EXECUTION

3.1 Handling of Material and Transportation

- .1 The Contractor shall take all reasonable precautions to avoid damage to the tower members or to tower coating during transport, unloading and erection. All components or damaged members shall be replaced to the satisfaction of CCG at the expense of the Contractor.
- .2 It is the responsibility of the Contractor to ensure that the towers are protected from bending and alignment damage.

3.2 Site preparation

- .1 Complete installation of all foundation elements prior to tower erection.



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- .2 Adjust supporting/leveling nuts to uniform elevation.

3.3 Erection

- .1 Ensure that each tower is plumb and level
 - .2 Tighten the first nut using turn of nut method associated to the length of bolt provided. The second nuts shall be snug tight.
 - .3 Install grout as indicated in the attached drawings.
 - .4 Install or suitably secure salvaged ATON appurtenances
-
- .1 Lantern is to be installed on the provided mount. Solar panel and batteries and housing are to be secured in the base of the tower unless alternative arrangements are approved by CCG PA.



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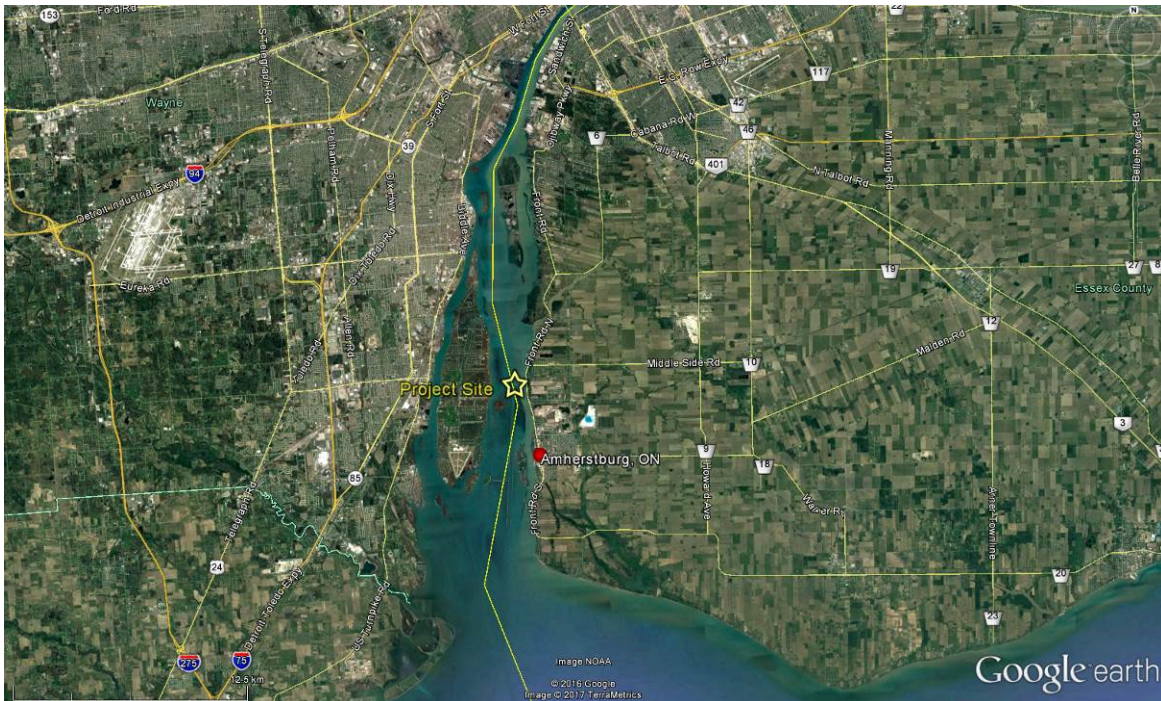
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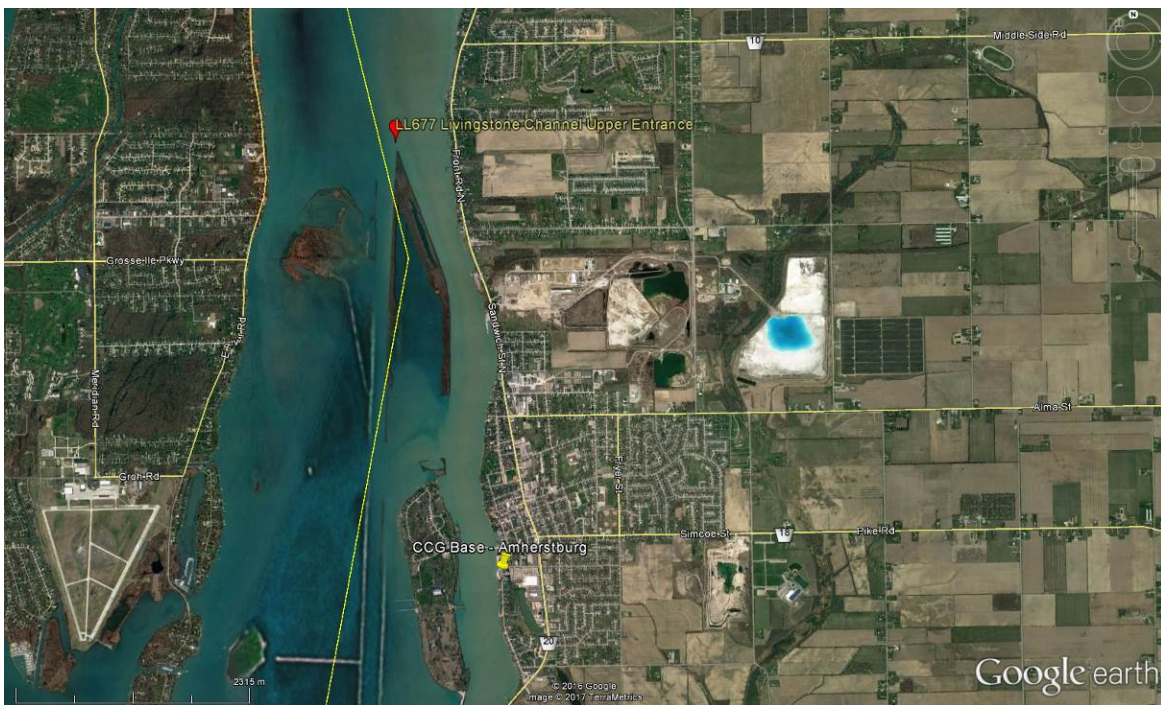
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APPENDIX B1: SITE LOCATION AND PHOTOGRAPHS



LL 677, Livingston Channel Upper Entrance (42° 8'8.90"N 83° 7'20.80"W)



Project Site



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Existing conditions and expected action
Additional photos are provided in Appendix B4



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APPENDIX B2 – SUMMARY OF CONTRACT SUBMITTALS (a)

Sect 011100 General Requirements		Sect 013530 Health and Safety Requirements	Sect 013543 Environmental Procedures	Sect 024116 Demolition	Sect 033000 Concrete Work	Sect 055000 Metal Fabrications	Sect 133613 Metal Towers
Deliverable	Deadline						
Detailed Schedule	<i>10 working days following award</i>						
Project Participants Listing	<i>With schedule</i>						
Fabrication Package	As detailed in Contractor's submitted schedule					<i>Fabrication Package</i>	
Contract Construction Plan	As detailed in Contractor's submitted schedule	<i>Project specific safety program</i>	<i>Environmental protection plan</i>	<i>Demolition Plan</i>	<i>Concrete mix parameters Concrete placement methods</i>		<i>Erection package</i>
Contract Maintenance Package	<i>No more than 30 days following substantial completion</i>			<i>Waste disposal receipts or records of disposal</i>	<i>Quality assurance test results</i>	<i>Fabrication maintenance package</i>	<i>Tower maintenance package</i>



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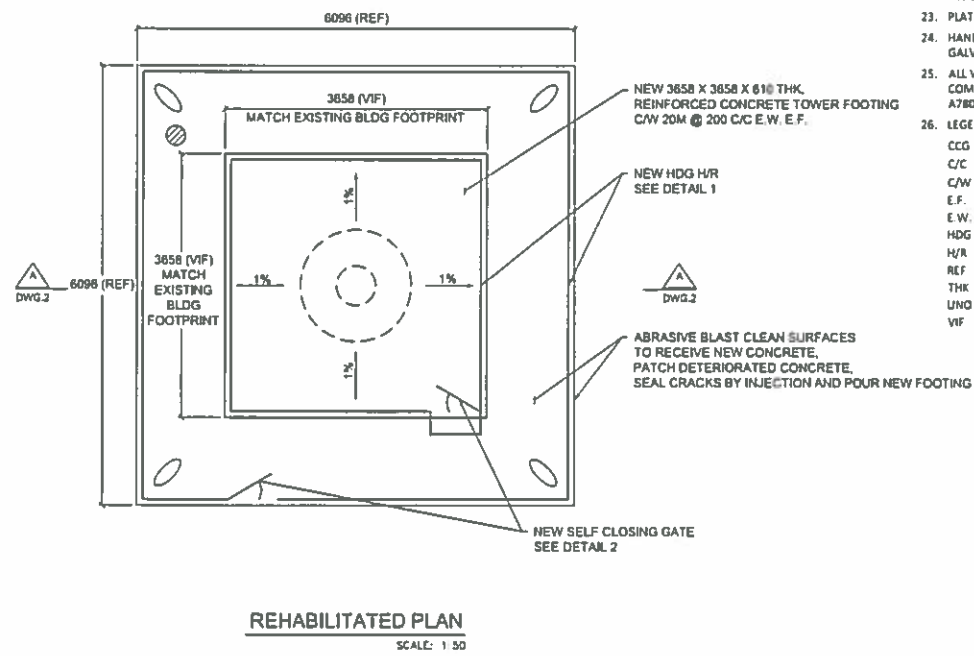
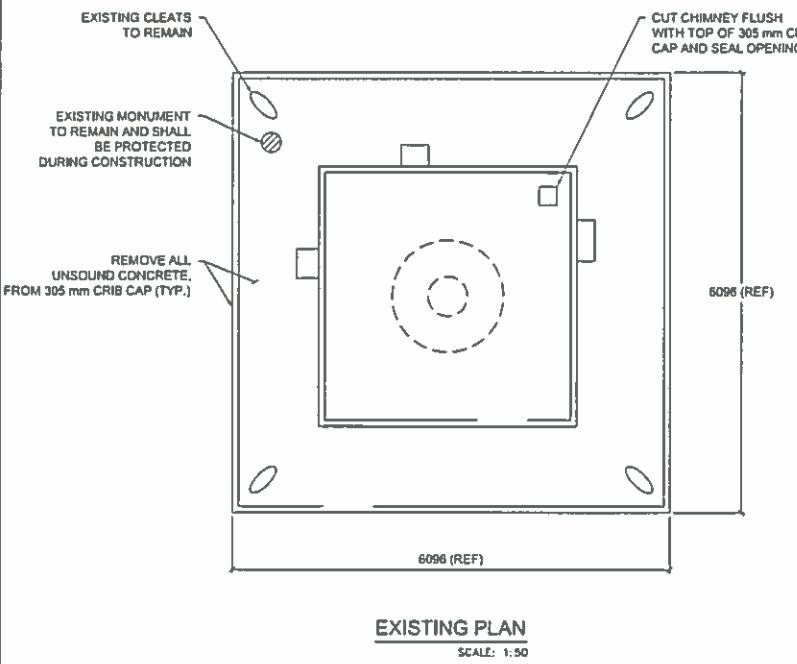
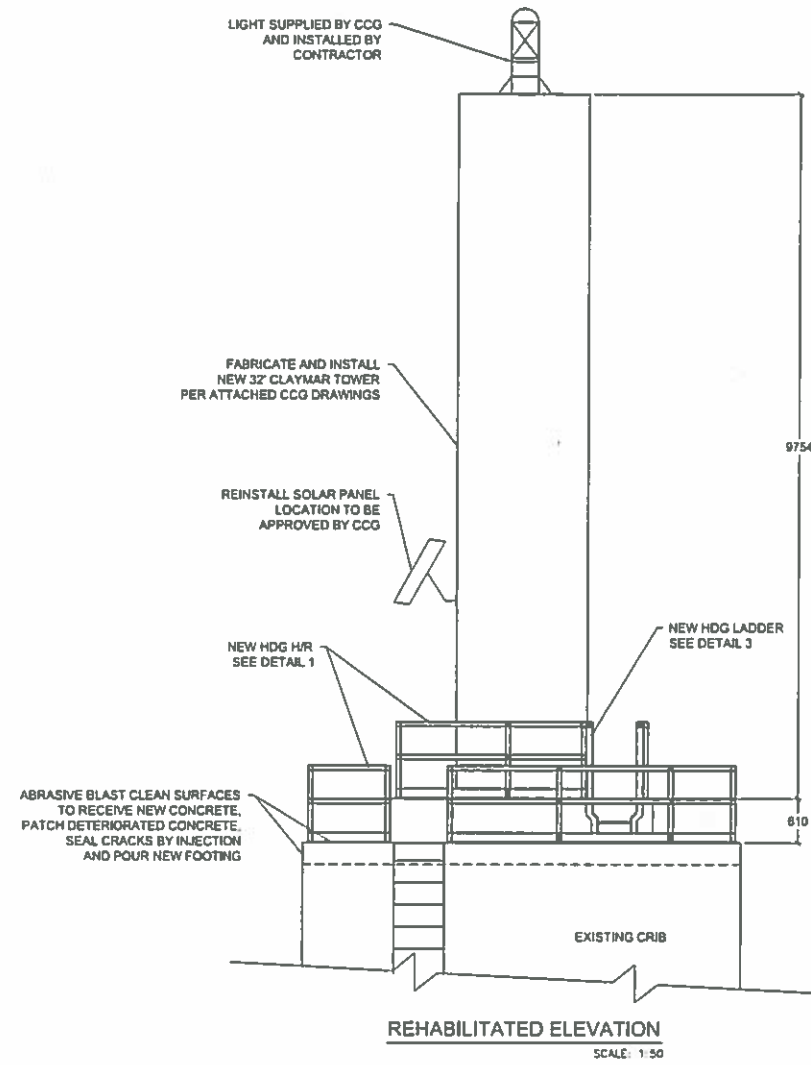
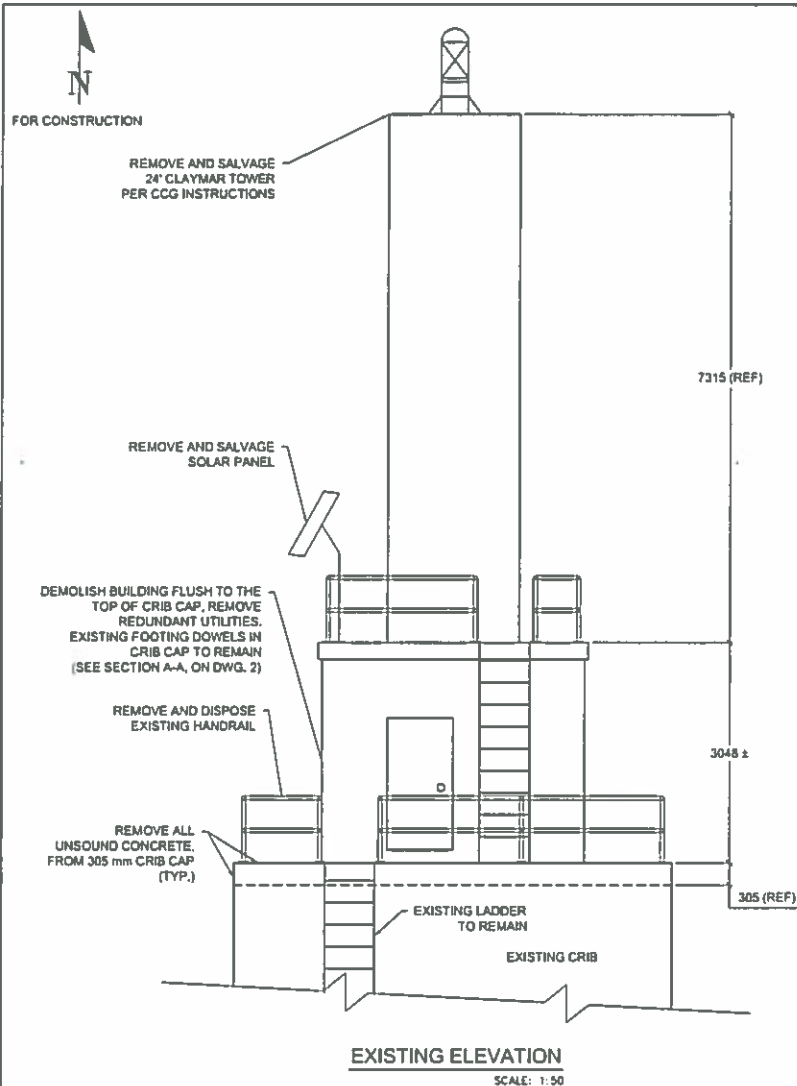
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APPENDIX B3 – DRAWINGS



NOTES:

- ALL DIMENSIONS SHOW IN MILLIMETERS UNO.
- ALL WORK SHALL CONFORM TO CONTRACT DRAWINGS AND SPECIFICATIONS.
- PERFORM ALL WORK IN ACCORDANCE WITH THE NATIONAL BUILDING CODE AS A MINIMUM STANDARD. REFER TO APPROPRIATE CSA STANDARDS FOR ADDITIONAL REQUIREMENTS CONCERNING WORKMANSHIP AND MATERIALS.
- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS ASSOCIATED WITH THE WORK TO BE DONE PRIOR TO COMMENCING WORK OR ORDERING MATERIALS. ALL DISCREPANCIES SHALL BE REPORTED TO THE OWNER IMMEDIATELY.
- CONTRACTOR SHALL CONFIRM ALL REDUNDANT UTILITIES WITH CCG PRIOR TO THEIR REMOVAL.
- IN CASE OF CONFLICTING INFORMATION GIVEN BETWEEN CONTRACT DRAWINGS AND SPECIFIED STANDARDS, THE MOST STRINGENT GOVERNS OR SEEK CLARIFICATION FROM THE ENGINEER OF RECORD.
- FIELD MODIFICATIONS, MATERIAL SUBSTITUTIONS AND ALTERNATES ARE SUBJECT TO THE APPROVAL OF THE ENGINEER OF RECORD.
- ANCHOR BOLTS AND FOOTING HAVE BEEN DESIGN FOR THE FOLLOWING LOAD AS SHOWN ON CLAYMAR TOWER DRAWING DATED 04/05/2006 FOUNDATION LOADS (UNFACTORED) - NORMAL OPEN EXPOSURE, EXP HAS NOT REVIEWED OR OTHERWISE ATTEMPTED TO VERIFY THESE LOADINGS:

DL	33.6 kN
LL	24.3 kN
BASE SHEAR	39.5 kN
BASE MOMENT	221.6 kN.m
MAXIMUM ANCHOR ROD LOAD	85.7 kN
- CAST-IN-PLACE CONCRETE:

EXPOSURE CLASS	F1
MINIMUM 28-DAY COMPRESSIVE STRENGTH	30 MPa
MAXIMUM NOMINAL AGGREGATE SIZE	20 mm
AIR CONTENT	5-8 %
MAXIMUM SLUMP	50 mm +/- 25 mm
REINFORCEMENT COVER	40 mm
- CONCRETE REINFORCING STEEL SHALL BE DEFORMED BARS TO CSA STANDARD G30 18M GRADE 400R.
- BONDING AGENT FOR ALL EXISTING CONCRETE FACES TO RECEIVE NEW CONCRETE SHALL BE "SIKADUR 32 HI-MOD" MANUFACTURED BY SIKA OR APPROVED EQUIVALENT.
- REINFORCING BAR DEVELOPMENT LENGTHS AND SPLICES TO CSA STANDARD A23.3 UNO. ALL SPLICES SHALL BE CLASS 'B' TENSION LAP UNO.
- CURING SHALL CONFORM TO THE LATEST EDITION OF CSA A23.1
- THE CONTRACTOR MUST OBTAIN AUTHORIZATION TO POUR FROM THE OWNER AFTER ALL THE REINFORCING STEEL, ANCHOR BOLTS, EMBEDDED PLATES AND SLEEVES HAVE BEEN ADEQUATELY INSTALLED AND INSPECTED.
- INSTALLATION DIAGRAMS, BAR LISTS, FORMWORK DRAWINGS, CONCRETE PLACEMENT / CURING PLAN, MIX DESIGN AND MATERIAL SUBSTITUTIONS TO BE SUBMITTED BY THE CONTRACTOR TO THE OWNER PRIOR TO FABRICATION AND INSTALLATION.
- EXPOSED CORNERS OF CONCRETE TO HAVE A 20 mm CHAMFER UNO.
- THE PERIMETER OF ALL CONCRETE PATCH WORK SHALL BE SAW CUT TO A DEPTH OF 25 mm OR TO THE DEPTH OF THE REINFORCEMENT WHICHEVER IS LESS. FEATHERED EDGES SHALL NOT BE PERMITTED.
- BEFORE PLACING CONCRETE, THE CONTRACTOR SHALL CLEAN THE FORMWORK AND REMOVE ALL FOREIGN MATERIAL AND STANDING WATER.
- THE CONTRACTOR SHALL SUPPLY AND INSTALL THE ANCHOR BOLTS AS SHOWN ON THE DRAWINGS.
- ALL BOLTS SHALL BE HIGH STRENGTH CARBON STEEL BOLTS TO ASTM A325.
- ALL NUTS SHALL BE HEAVY HEX NUTS TO ASTM A563.
- ALL STRUCTURAL STEEL SHALL BE NEW MATERIAL TO CSA G40 20/G40.21
- PLATES, ANGLES AND BARS: GRADE 300W
- HANDRAILS, LADDERS AND ASSOCIATED COMPONENTS SHALL BE HOT DIPPED GALVANIZED.
- ALL WELDED CONNECTIONS AND DAMAGED AREAS OF HOT DIPPED GALVANIZED COMPONENTS SHALL BE TOUCHED UP IN THE FIELD IN ACCORDANCE WITH ASTM A780.
- LEGEND:
 - CCG CANADIAN COAST GUARD
 - C/C CENTER TO CENTER
 - C/W COMES WITH
 - E.F. EACH FACE
 - E.W. EACH WAY
 - HDG HOT DIPPED GALVANIZED
 - H/R HANDRAIL
 - REF REFERENCE
 - THK THICKNESS
 - UNO UNLESS NOTED OTHERWISE
 - VIF CONTRACTOR TO VERIFY IN FIELD PRIOR TO FABRICATION

exp SERVICES INC.
 885 REGENT STREET
 SUDBURY ONTARIO
 P2E 3M4
 Phone: (705) 874-4401
 www.exp.com

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6 Nov. 2016

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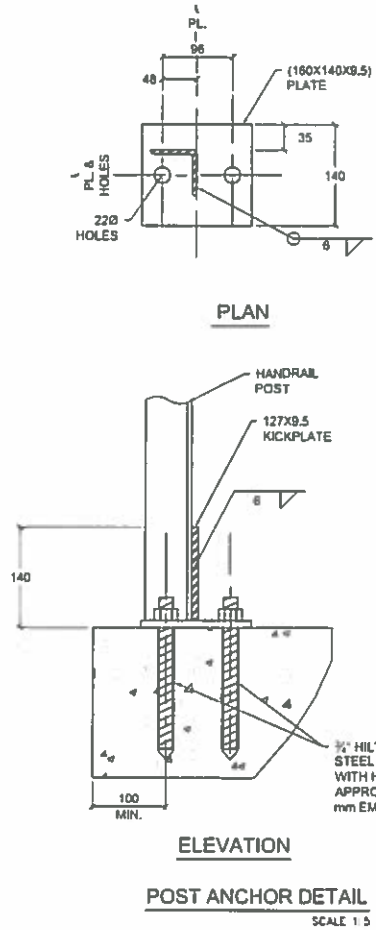
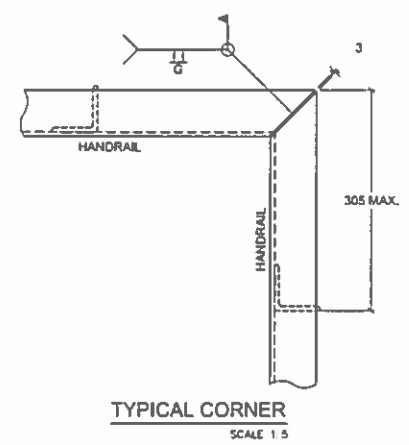
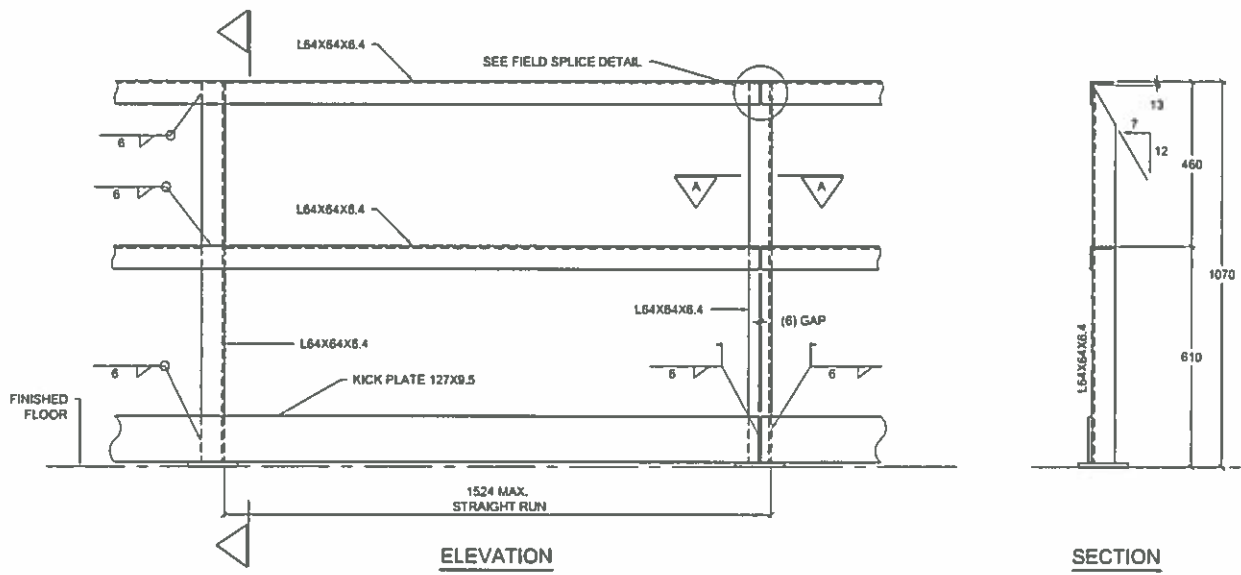
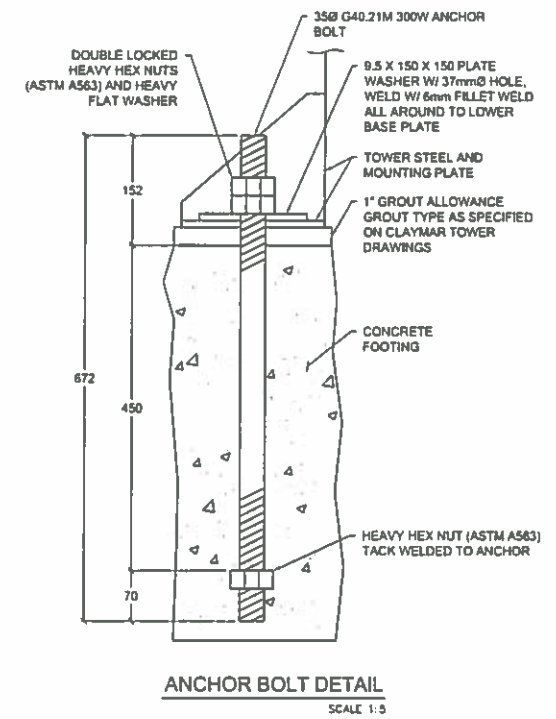
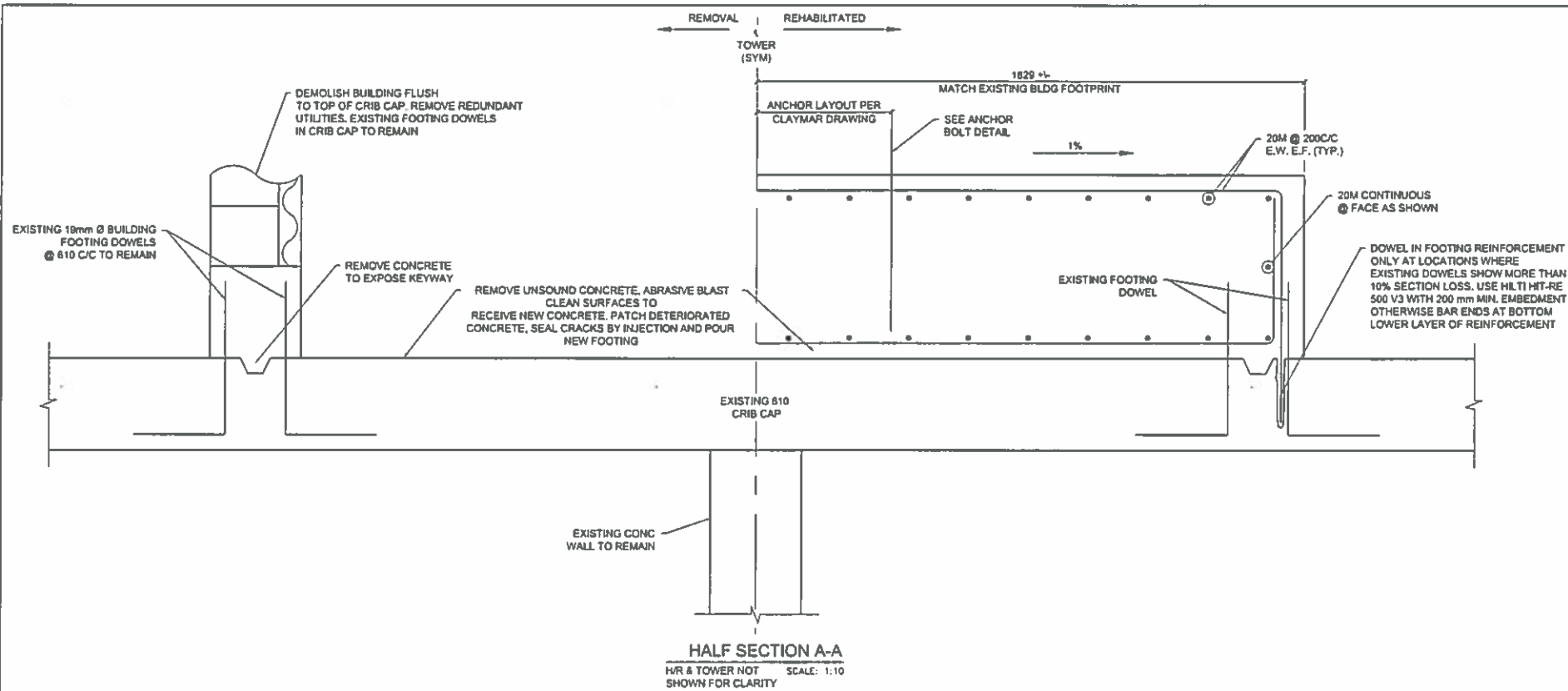
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 Checked By: S.M.C. Date: October 7, 2016
 Approved By: S.H.L. Date: October 7, 2016

Date Plotted: October 7, 2016

File Name: SUD-0016036-LivingstoneChannel
 Project Title: LL 677 LIVINGSTONE CHANNEL UPPER ENTRANCE TOWER BASE AMHERSTBURG, ONTARIO

Drawn Title: GENERAL ARRANGEMENT

Project No: SUD-0016036
 Draw No: 1 OF 3 Rev. No: 0



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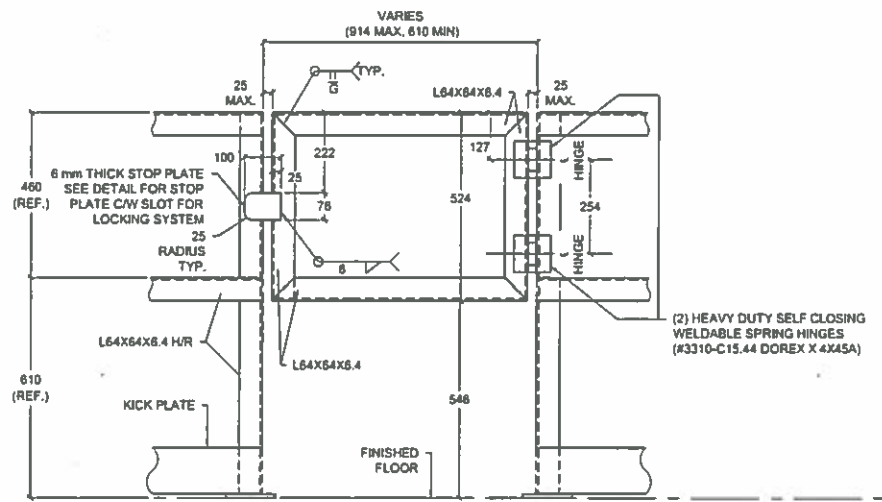
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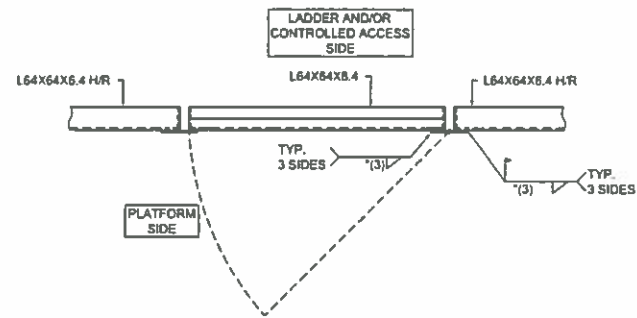
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 AMHERSTBURG, ONTARIO

Dwg. Title: **SECTIONS & DETAILS**

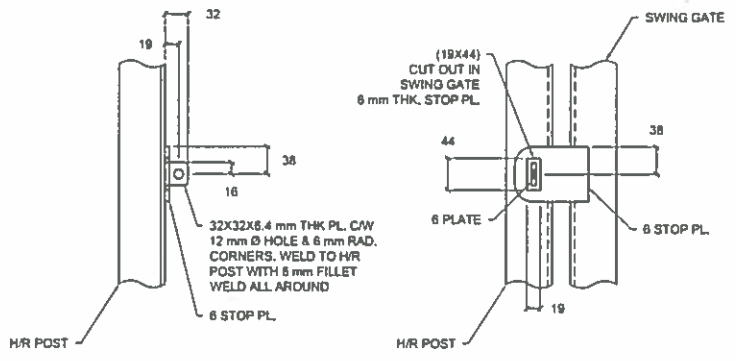
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SELF CLOSING GATE ELEVATION
VIEW FROM PLATFORM
GATES SHALL OPEN TOWARDS THE PLATFORM

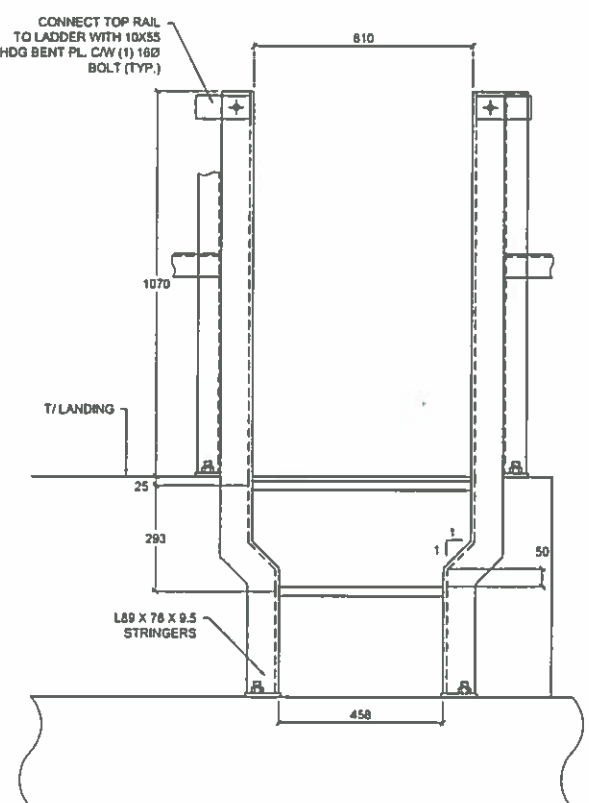


SELF CLOSING GATE PLAN
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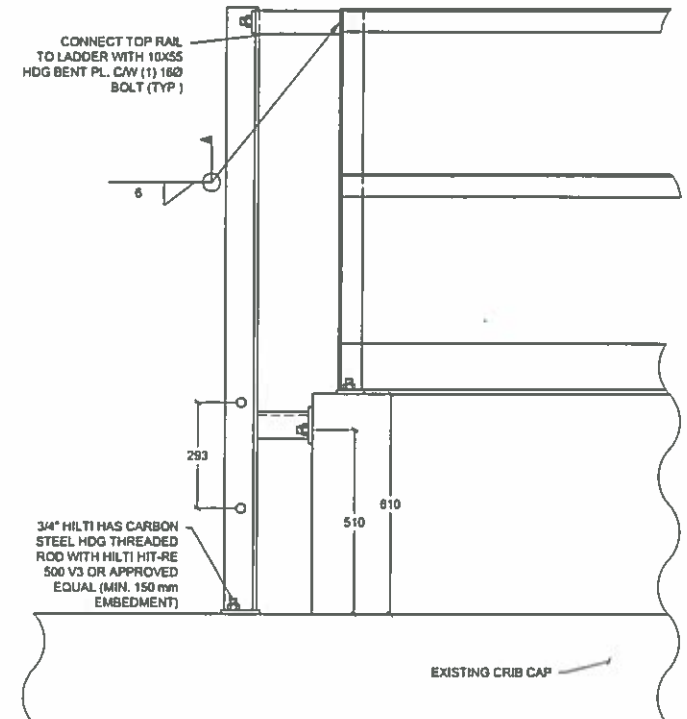


STOP PLATE FOR LOCKING SYSTEM DETAIL
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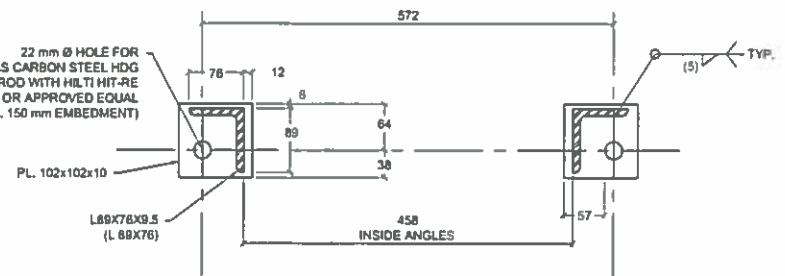
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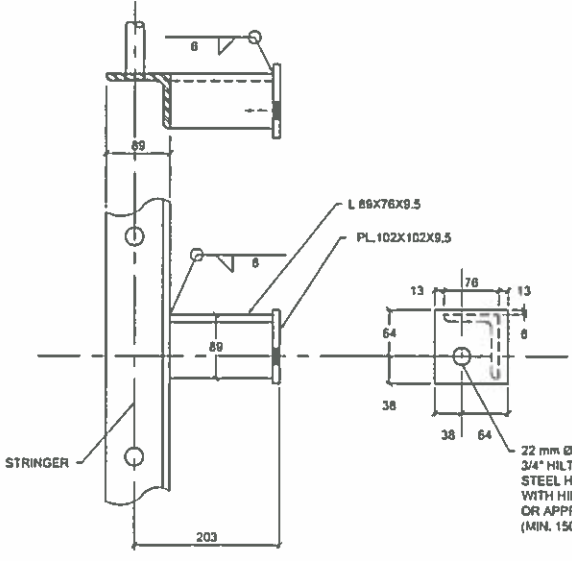
RAILING TO LADDER CONNECTION DETAIL
SCALE 1:10



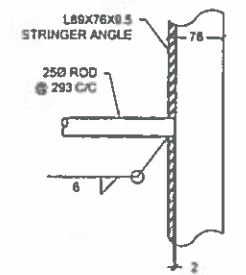
LADDER AND FOOTING DETAIL
SCALE 1:10



TYPICAL BASE DETAILS ON CONCRETE FLOOR
SCALE 1:5



INTERMEDIATE SUPPORT DETAIL
SCALE 1:5



TYPICAL RUNG DETAIL
SCALE 1:5

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100152662
P. Eng. P. E. O.
PROVINCE OF ONTARIO

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Checked By: S.M.C. Date: October 7, 2016
Approved By: S.M.L. Date: October 7, 2016

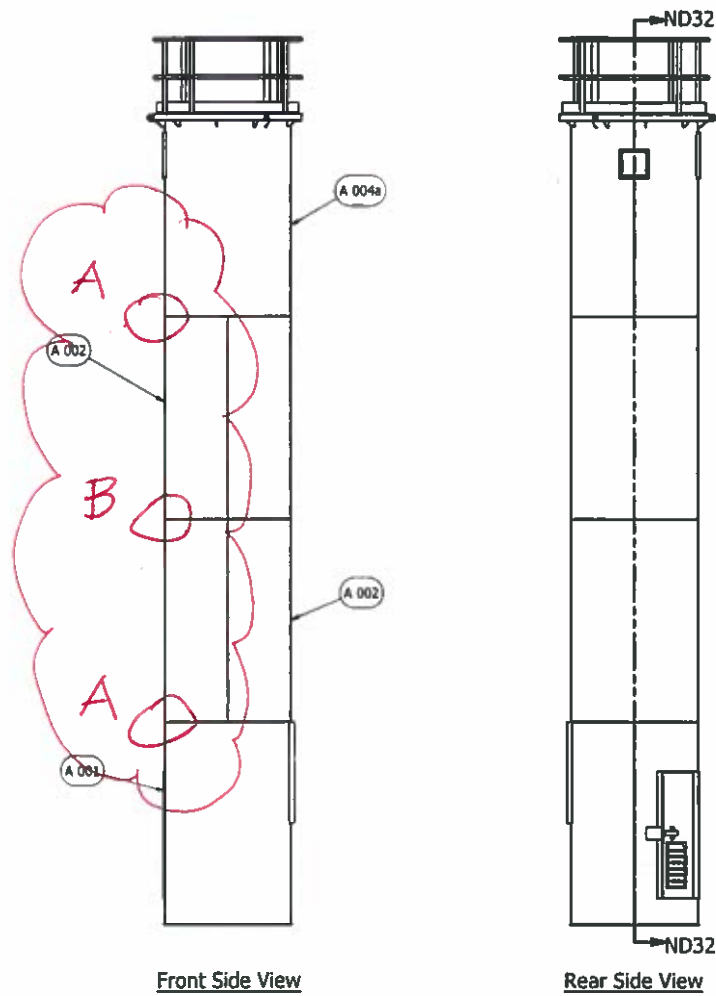
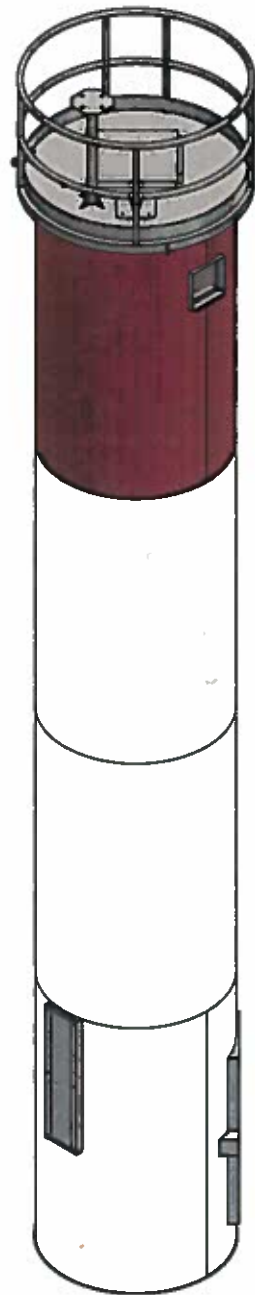
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File Name: SUD-00116036-LivingstoneChannel
Project Title:
LL 677 LIVINGSTONE CHANNEL UPPER ENTRANCE TOWER BASE
AMHERSTBURG, ONTARIO

Dwg. Title:
DETAILS

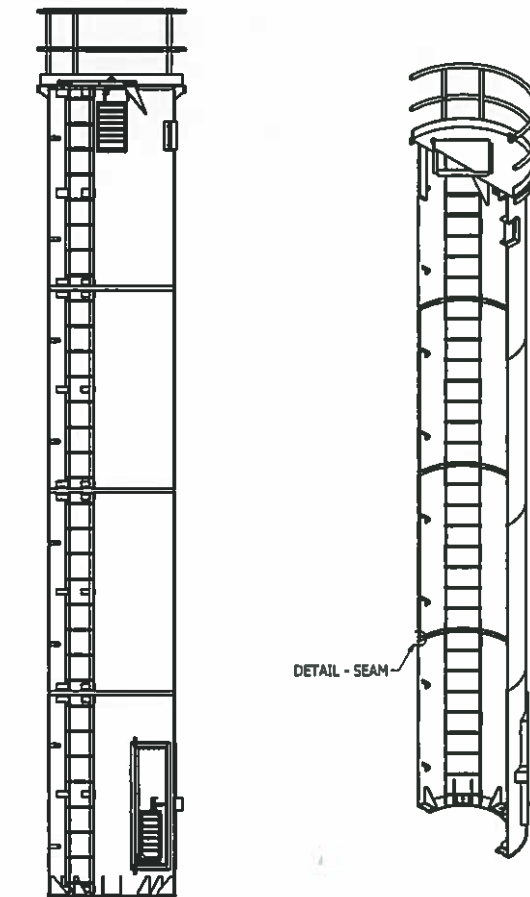
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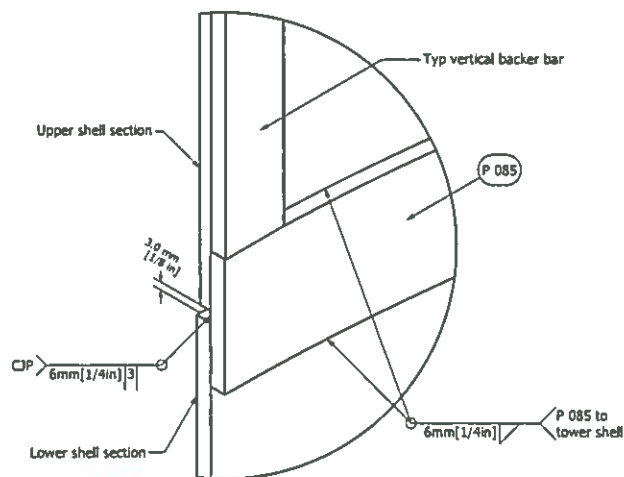
Front Side View

Rear Side View

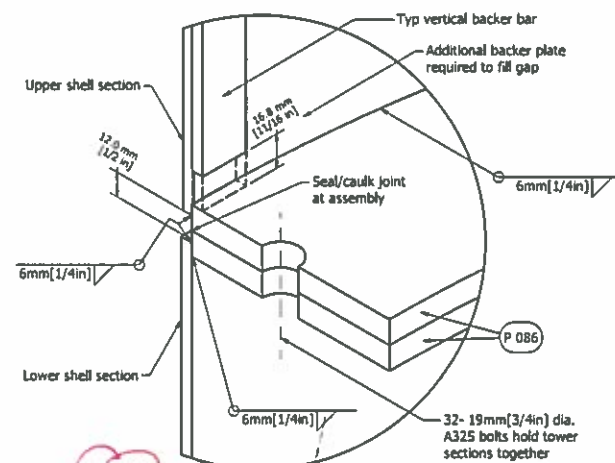


SECTION ND32-ND32

Isometric View of Section ND32-ND32



DETAIL - SEAM
Typ Section Seam Detail



Optional Splice Ring Detail

Note: Splice can be utilized in place of the usual backer bar. In situations where erecting the tower in multiple sections is advantageous and/or necessary

Notes:

- Design Location - Great Lakes, Ontario shore line, from Cornwall to Thunder Bay. Wind design loads include allowance for wind speed up on hill top location (Maximum hill height = 45m).
- Design shall be in accordance with the National Building Code of Canada. (NBC 2005), NBC 1995 Structural Commentaries (wind) and CSA S16-01.
- All work to comply with CSA S16-01, NBC 2005 & Canada Labour Code.
- Materials**
 - Structural Shapes - CSA G40.21M, Grade 300W.
 - HSS - CSA G40.21M, Grade 350W, CL. C.
 - Plates & Bar - CSA G40.21M Grade 300W.
- Welding**
 - Electrodes - E49XX (E70XX).
 - All connections shall be fully welded U.N.O.
 - Fabricator must be certified by CWB to CSA standard W47.1, division 1 or 2.1
 - Shall be in accordance with CSA S16-01, W47 & W59, latest version.
 - Remove all weld splatter, sharp edges & corners
 - Provide 6x50mm [1/4x2in] Backer Bar on all tower fabricated seams, weld 100% inside.
- Galvanization**
 - Tower to be hot dip galvanized
 - Hot dip galvanizing shall conform to CAN/CSA-G164
- Bolts**
 - Structural Bolts - ASTM A325 U.N.O.
- Paint**
 - Primer - CAN/CGSB-1.40 ALKYD Type.
 - Paint - CAN/CGSB-1.60 ALKYD Enamel or High Build Mastic Epoxy or Polyurethane.
 - Apply in accordance with CGSB 85-GP-14M.
- Fall Protection**
 - Supply and install DBI-SALA "LAD-SAF" system in accordance with manufacturer's instructions.
 - Installation must allow for simultaneous use by two personnel.
 - D-Ring Anchorage - DBI SALA D-Ring Anchorage Connector, Stainless Steel D-Ring, Stainless Steel Anchorage Plate with 9/16in Dia. mounting holes.
 - 9.5mm [3/8 in] doubler Plate to be installed as shown.
- Manufacturing Tolerance**
 - Maximum out of roundness of 1% on diameter, $D_{max} - D_{min} = 0.6in$.

Canadian Coast Guard 32' Claymar Tower

REVISED CCG PA
DJ - 30 MAY 17
TO REFLECT
FABRICATION
DETAIL

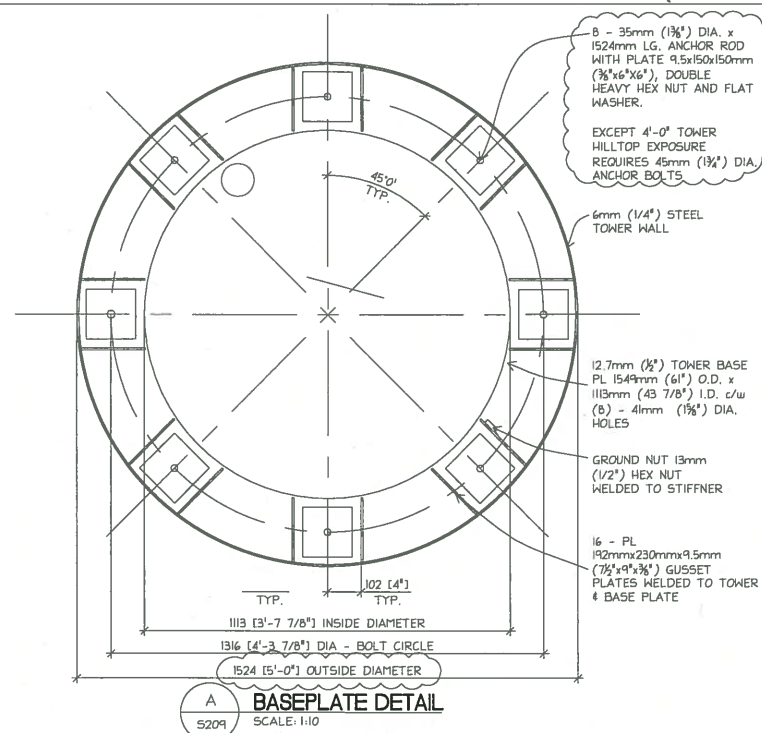
PARTS LIST	
ITEM	DESCRIPTION
A 001	1 Bottom Assembly
A 002	2 B' Middle Assembly
A 004a	1 Top Assembly
P 085	3 Backer Bar
P 086	6 Splice Ring (Optional)

Fisheries and Oceans Canada	Marine and Coastal Control & Arctic Region
Marine and Coastal Infrastructure (MCI), Integrated Technical Services 620 Esplanade St. Ste. 1177 887	

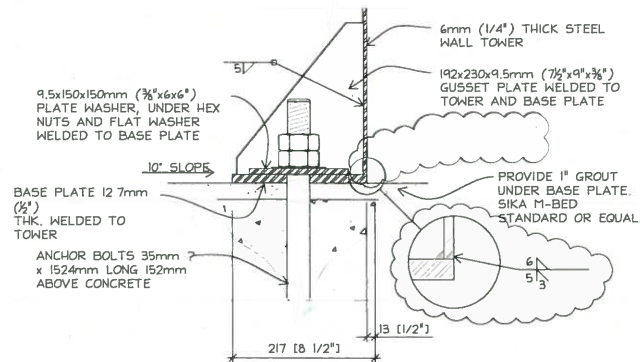
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1	0 Nov 13	UPDATED DRAWINGS BASED ON BLOS REVISIONS	E.G.	S.Y.	
2	26 Apr 15	TOWER DRAWINGS COMPLETED	E.G.	S.Y.	
3	3 Nov 15	REDESIGNED COVER PAGE AND SPICE DETAILS	G.L.	S.Y.	

Cover Page

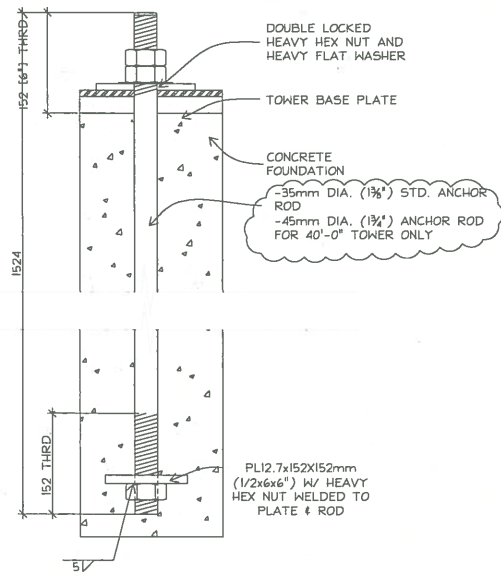
All Dimensions in mm unless otherwise noted.



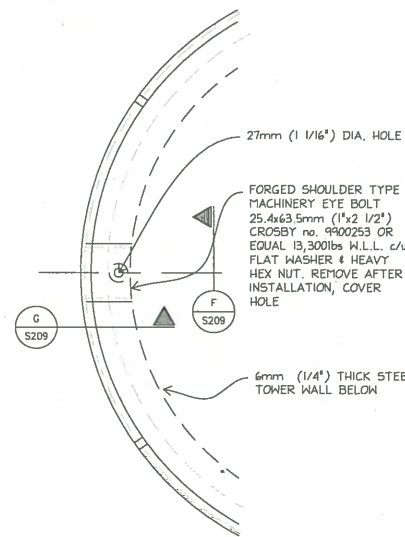
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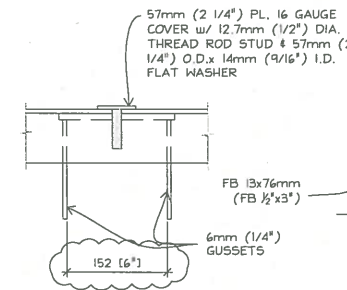
B ANCHOR BOLT DETAIL
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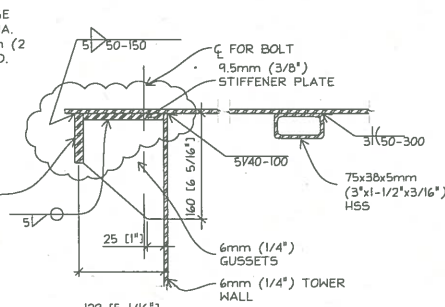
C ANCHOR BOLT DETAIL
SCALE: 1:5



D LIFTING LUG DETAIL
SCALE: 1:5



F LIFTING LUG DETAIL
SCALE: 1:5



G LIFTING LUG DETAIL
SCALE: 1:5

FOUNDATION LOADS (UNFACTORED) - NORMAL OPEN EXPOSURE

TOWER HEIGHT (m (ft.))	GRAVITY LOADS		BASE SHEAR (kN)	BASE MOMENT (kN-m)	MAXIMUM ANCHOR ROD LOAD (kN)
	DL (kN)	LL (kN)			
12.192m (40'-0")	39.9	25.4	49.7	346.0	133.8
10.973m (36'-0")	36.8	24.8	42.9	270.4	104.6
9.754m (32'-0")	33.6	24.1	39.5	221.6	85.7
8.534m (28'-0")	30.5	23.4	36.3	176.1	68.9
7.315m (24'-0")	27.4	22.7	31.8	152.5	51.3
6.096m (20'-0")	24.3	21.9	28.7	97.0	37.5
4.877m (16'-0")	21.2	21.3	25.7	64.7	25.0
3.658m (12'-0")	18.1	20.1	22.0	34.8	13.4

FOUNDATION LOADS (UNFACTORED) - HILLTOP EXPOSURE

TOWER HEIGHT (m (ft.))	GRAVITY LOADS		BASE SHEAR (kN)	BASE MOMENT (kN-m)	MAXIMUM ANCHOR ROD LOAD (kN)
	DL (kN)	LL (kN)			
12.192m (40'-0")	39.9	25.4	114.1	792.5	306.6**
10.973m (36'-0")	36.8	24.8	82.0	514.8	199.1
9.754m (32'-0")	33.6	24.1	70.4	393.8	152.4
8.534m (28'-0")	30.5	23.4	65.9	322.1	124.6
7.315m (24'-0")	27.4	22.7	63.5	262.6	101.6
6.096m (20'-0")	24.3	21.9	66.0	232.9	90.1
4.877m (16'-0")	21.2	21.3	53.3	133.1	51.5
3.658m (12'-0")	18.1	20.5	48.4	74.8	28.9

** REQUIRES 45mm (1 3/4") DIA. ANCHOR BOLTS

DESIGN LOADS

TOP DECK L.L. (SNOW) 2.4kPa (50psf)

WIND LOAD

MAXIMUM REFERENCE VELOCITY PRESSURE, $q=0.60$ kPa (12.5psf).
WIND LOADS CALCULATED PER NBC 1995.
BASE MOMENT INCLUDES ACROSS WIND LOADS DUE TO VORTEX SHEDDING.

ICE LOADS

1" THICK WINDWARD FACE TO TOWER,
1" THICK BOTH SIDES OF DAYMARK, LADDER & PLATFORM
0.25kPa (5.2psf) PER INCH OF THICKNESS



GLOS ASSOCIATES INC.

3535 North Service Road East
Windsor, Ontario
N8W 5R7

TEL: (519) 946-6750
FAX: (519) 946-6753

ISO 9001:2000 REGISTERED

PROJECT: 06044

Notes

1/ DESIGN LOCATION - GREAT LAKES, ONTARIO SHORE LINE, FROM CORNHALL TO THUNDER BAY. WIND DESIGN LOADS INCLUDE ALLOWANCE FOR WIND SPEED UP ON HILL TOP LOCATION (MAXIMUM HILL HEIGHT 45m.)

2/ DESIGN SHALL BE IN ACCORDANCE WITH THE NATIONAL BUILDING CODE OF CANADA (NBC 2005), NBC 1995 STRUCTURAL COMMENTARIES (WIND) AND CSA 516-01.

3/ ALL WORK TO COMPLY WITH CSA 516-01, NBC 2005 & CANADA LABOUR CODE

4/ MATERIALS

- STRUCTURAL SHAPES - CSA G40.21M GRADE 300H
- HSS - CSA G40.21M, GRADE 350H, CL. C.
- PLATES & BARS - CSA G40.21M, GRADE 300H
- GRATING - TYPE 1904, WELDED, 38mm X 5mm (1 1/4"x3/8")
- SERRATED BEARING BARS, BAND EDGES, HOT DIPPED GALVANIZED FINISH.
- PIPE - ASTM A53

5/ WELDING

- ELECTRODES: E490X (E70XX)
- ALL CONNECTIONS SHALL BE FULLY WELDED U.N.O.
- SHALL BE IN ACCORDANCE WITH CSA 516-01, W47 AND W59, LATEST EDITION
- REMOVE ALL WELD SPLATTER, SHARP EDGES & CORNERS.
- PROVIDE #50 (1/4"x2") BACKER BAR ON ALL TOWER FABRICATED PLATE SEAMS. WELD 100% INSIDE.

6/ BOLTS

- STRUCTURAL BOLTS - ASTM A325 U.N.O.
- SECONDARY CONNECTIONS - SAE J429, GRADE 5

7/ PAINT

- PRIMER: CAN/CGSB-140 ALKYL D TYPE
- PAINT: CAN/CGSB-160 ALKYL ENAMEL OR HIGH BUILD MASTIC EPOXY OR POLYURETHANE
- APPLY IN ACCORDANCE WITH CGSB 85-GP-14M.

8/ FALL PROTECTION

- PROVIDE FALL PROTECTION IN ACCORDANCE WITH CANADA OCCUPATIONAL HEALTH AND SAFETY REGULATIONS SECTION 12.10.
- SYSTEM HAS A MAXIMUM CAPACITY OF TWO USERS (1 USER + 1 RESCUER) WITH A MAXIMUM COMBINED HEIGHT OF 1.4 m (315 lbs) PER USER INCLUDING TOOLS AND EQUIPMENT.
- PROVIDE CAPACITY SIGNAGE AT BASE OF LADDER.

LADDER

- LADDER - DBI SALA "LAD-SAF" FLEXIBLE CABLE LADDER SAFETY SYSTEM.
- MINIMUM 4 RUNG ATTACHMENTS REQUIRED FOR TOP BRACKET INSTALLATION.
- LADDER RUNGS ARE SUITABLE FOR CENTER MOUNTING OF TOP & BOTTOM BRACKETS.
- INSTALL AND MAINTAIN IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
- D-RING ANCHORAGE - DBI SALA D-RING ANCHORAGE CONNECTOR, STAINLESS STEEL D-RING, STAINLESS STEEL ANCHORAGE PLATE WITH 3/8" DIA. MOUNTING HOLES.
- 9.5 mm (3/8") DOUBLER PLATE TO BE INSTALLED AS SHOWN.

9/ FOUNDATIONS

- PROVIDE DETAILED FOUNDATION DESIGN FOR INDIVIDUAL LOCATIONS.
- CONCRETE - 25 MPa MINIMUM.
- ANCHOR RODS - CSA G40.21M GR. 300H
- GROUT - SIKKA M-BED STANDARD OR EQUAL

10/ MANUFACTURING TOLERANCE

- MAXIMUM OUT OF ROUNDNESS OF IS ON DIAMETER, $D_w - D_m = 0.6"$

Revision	Date	By	Description
01	MAR 28/08	GLOS	MINOR REVISIONS AS NOTED

FACILITIES ENGINEERING AND CONSTRUCTION
FACILITES INGENIERIE ET CONSTRUCTION

project title
1524m (5'-0") DIA. CLAYMAR TOWER

drawing title
TOWER DETAILS

date - date	drawn - dessine	checked - verifie	approved
04/05/2006	AS/AG/DP	DL	
scale - echelle	reference - reference	drawing no. - no du dessin	sheet
AS NOTED		5209	1



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canadian
Coast Guard

Garde côtière
canadienne



APPENDIX B4 – Engineer’s Review (EXP, 2016)

SUD-00016036-IS

August 22, 2016



Fisheries and Oceans
Canada
Canadian
Coast Guard

Pêches et Océans
Canada
Garde côtière
canadienne

Canadian Coast Guard

**LL 677 Livingstone Channel
Upper Entrance
Aid to Navigation Tower Base
Engineering Review Report**

exp Services Inc.

885 Regent Street
Sudbury, Ontario P3E 5M4
Tel: (705) 674-9681
Fax: (705) 674-5583

Canadian Coast Guard

LL 677 Livingstone Channel Upper Entrance, Aid to Navigation Tower Base Engineering Review Report

Type of Document:
Report – Final

Project Name:
Livingstone Channel Upper Entrance, Aid to Navigation Tower Base

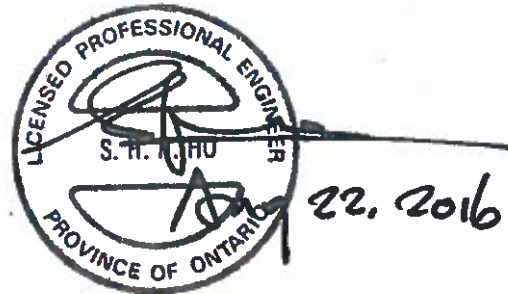
Project Number:
SUD-00016036-IS (Client No.: EWTM 8010-0677)

Prepared By:
Steve Cormier, P.Eng.

Reviewed By:
Stephen Ho, M.Eng., P.Eng.

exp Services Inc.
885 Regent St.
Sudbury, ON P3E 5M4
Canada
T: 705.674.9861
F: 705.507.8204
www.exp.com

For 
Steven M. J. Cormier, P.Eng.
Structural Engineer, Infrastructure
Professional License #: 100152662



Stephen H. Ho, M.Eng., P.Eng.
Project Manager, Infrastructure
Professional License #: 90221938

Date Submitted:
August 22, 2016

Legal Notification

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1 Introduction

This engineering review report was prepared for the Canadian Coast Guard (CCG) pursuant to the project of Livingstone Channel Upper Entrance, Aid to Navigation Tower Base Design. The subject structure is located in the Detroit River, near Amherstburg, Ontario with the coordinates 42° 8' 8.90" N, 83° 7' 20.80" W. It is our understanding that the existing structure is nearing the end of its service life and is in need of rehabilitation in order to remain in service.

This report examines the existing tower base along with the information available at the time this report was written in order to determine the most feasible rehabilitation design. A discussion of preliminary works completed in preparation for the detailed design as well as rehabilitation recommendations are presented in this report.



Figure 1.1 LL 677 Livingstone Channel Upper Entrance, Aid to Navigation Tower Location Plan

2 Existing Structure

The existing LL677 Livingstone Channel Aid to Navigation Tower Base was originally constructed in 1953. It consists of a reinforced concrete crib which is 24-ft in height, a 10-ft tall building with a 24-ft Claymar style tower mounted on top. The 20-ft by 20-ft crib has a 24-in thick base, 12-in thick exterior walls and two 10-in thick intermediate walls dividing the crib into four equal quadrants. The crib rests on a stone pad on the river bed with a sheet pile and concrete collar around the base (1956 addition). The crib cap is a 12-in thick reinforced concrete slab with a 10-in high by 14-in wide concrete curb which supports the above mentioned 10-ft tall block building. The building is 12-ft by 12-ft with a concrete roof which supports the 24-ft light tower.

The overall appearance of the building suggests that it is near the end of its service life. There is evidence of previous repairs and modifications noted throughout.

The following photos give a general overview of the structure in its current condition, see Appendix 3 for additional photos.



Photo 2.1 – Overview of Structure



Photo 2.2 – Deteriorated and Cracked Wall



Photo 2.3 – Crack in Building Wall to Foundation



Photo 2.4 – Typical Condition Inside of Building

2.1 Available Information

The following documents related to the subject tower base were made available to exp by the Canadian Coast Guard for reference purposes:

- Request for quotation issued June 16, 2016
- LL 677 Tower Construction Drawings, Dwg No. BR-14621-1 to BR-14621-4, dated 25/06/53.
- LL 677 Tower Repair Sketch SK-2, dated May 1987.
- Claymar Tower Vendor Drawings, Dwg No. S209 and S201, dated 04/05/2006
- LL701 Tower Repairs for Reference, Dwg No. 0116 1 of 1 dated Aug, 1983

3 Design Code and Standard

The preliminary design and subsequence rehabilitation of the LL677 Aid to Navigation Tower Base Design will be carried out in conformance to the requirements of the *2010 National Building Code of Canada (NBC 2010)* and the *Occupational Health and Safety Act, R.S.O 1990, c. O.1.*

4 Battery Limits

The battery limits of the agreed upon services are limited to the intermediate tower base defined as the area starting at the top of concrete crib cap to the underside of the bolting flange of the vendor provided Claymar Tower.

The CCG has indicated that the existing Claymar tower is a robust tower that they regularly use, and does not need to be included in the structural assessment. It should also be noted that the reinforced concrete crib was also not a part of the scope of services being rendered, and as such, its overall condition is not known and will be assumed to be generally in good condition and as shown in the available drawings.

5 Site Visit Observations

Steven M. J. Cormier P.Eng of exp performed a visual review on July 13, 2016. In attendance at the time of exp's site review were, Bailey Humphrey from the Canadian Coast Guard along with two additional CCG staff to provide input on functionality as well as provide access to the site via a coast guard vessel.

The visual assessment of the building walls was limited due to the exterior stucco façade and interior plywood which covered the walls and ceiling. No removal of material, exploratory probing, destructive or non-destructive, or any other performance testing were conducted as part of this review.

The following observations were made during the site visit;

- The stucco façade is delaminating and has spalled off in several locations.
- Where the block wall was exposed, cracks were noted throughout the building.

- All three windows were removed and covered with closure panels.
- Northeast wall – Crack noted through the roof slab extending past the window opening down to the foundation. Several areas of stucco have delaminated and spalled off.
- Northwest wall – Concrete spalled off window sill exposing steel reinforcement. Several areas of stucco have delaminated and spalled off.
- Southwest wall – Large areas of stucco have delaminated, some of which have spalled off. Significant cracking was noted near the foundation at the south corner.
- Southeast wall – Stucco has delaminated near the top right of the door. Cracks were noted in the foundation at the south corner.
- Inside the building – All the walls and ceiling were covered with plywood. Based on the original construction drawings, additional posts (2-L4x4x3/8") and tie-rods (1" diameter) have been installed at four locations sometime after the original construction which appear to reinforce the roof of the building. The roof also appears to have been replaced from a 2x8" timber joist construction to a reinforced concrete slab. Two heavy gauge cables entering the building in the south corner appear to be redundant.
- A survey monument was noted on the west corner of the crib cap.
- There is a solar panel located on the south corner of the building roof.
- A square stack was noted on the north corner of the building roof. CCG confirmed that the stack is redundant and is not required in the new design.
- Though not part of the scope, two localized areas on the crib cap have spots where the concrete has delaminated and spalled off.

6 Discussion

As outlined in the request for quotation, the Canadian Coast Guard is interested in evaluating the feasibility of either, repairing the existing 10-ft tall building which is currently supporting the existing tower, or the design of a new tower base on the existing crib cap which will support a new tower. The following discussion is based on the results of the site visit and review of the available information, and will evaluate the feasibility of the two options.

6.1 Option 1 – Rehabilitation of the Existing 10-ft Tall Building

Considering the results of the limited site inspection and review of the information available, exp is of the opinion that Option 1, repairing the existing 10-ft tall building currently supporting the light tower is not a feasible option due to the fact that the existing design concept requires above average maintenance and monitoring, and the fact that the building is near the end of its service life.

As mentioned in the previous section, the original structure was constructed in 1953. Since the original construction, the structure has undergone some significant modifications. Based on drawing BR-14621-1, there appears to have been foundation repairs in 1956 which consisted of a steel sheet pile and concrete collar installed at the riverbed. The site visit also revealed significant structural modifications to the 10-ft tall building currently supporting the 24-ft tower. The two major modifications to the building consisted of replacing the 2x8" timber joist roof with a reinforced concrete slab, and installing additional structural steel columns and tie-rods which appear to reinforce the existing roof beams (S10x25.4) which support the light tower.

Towers subjected to climatic forces are typically loaded with cyclical loading conditions as well as load reversal. For example, each gust of wind is one cycle throughout the structure's life span. Load reversal occurs when the force changes directions or, from a compression to tension force. In this case, a southerly wind would cause overturning of the tower which would be resisted by the tower base connections. The north portion of the connections would be in compression as the tower leans northerly and the south portion of the connection would be in tension. With a northerly wind, the loading on the connections changes direction and the tension areas from the southerly wind experience compression and the compression areas turn to tension. Cyclical loading and load reversals can cause many problems in structures, such as excessive deflections, cracking of materials and structural fatigue, and ultimately a structural failure if not dealt with accordingly in the design.

The request for quotation document states that in the past the CCG has had problems with similar style structures and as such wants this particular building be reviewed in detail. The original roof construction consisted of 2x8" timber roof joists flush framed to two (2) roof beams (S10x25.4) 4-ft apart running diagonally through the center of the building. The roof structure was supported by load bearing concrete block wall on all four sides. The 24-ft light tower was supported on the roof beams.

Based on the observations made during the site visit, the two major modifications implemented on the existing building appears to be directly related to the roof structure described above. Firstly, the 2x8" timber joist roof was replaced with a cast-in-place concrete slab. The existing steel roof beams appeared to remain in place and embedded in the concrete slab. This modification would improve the structural integrity of the system by increasing its stiffness and strength. Secondly, built-up (welded angles) steel posts and tie-rods were introduced to the structural system at four locations apparently directly under the original steel roof beams. The entire implementation may have been installed to introduce post-stressing into the structural system. This could possibly eliminate the undesirable load reversal condition from occurring in the structural system by introducing downward force to the roof beams with the tie-rod. Built-up steel post are provided to support the roof beams and prevent them from being overstressed by the intentionally induced downward force. If the downward force in the system is greater than the upward force caused by wind actions on the tower, then the roof would no longer experience the uplift, thus eliminating the load reversal.

Using the post-stressing system as observed during the site visit is a great method to repair a problematic issue in an existing structure but is not the most ideal design for new applications. The post-stressing system introduces more failure points, additional maintenance and continuous monitoring to ensure the tie-rods are tightened to the specified force. Based on the limited assessment of the post-stressing system and the lack of construction drawings, exp is of the opinion that it would not be feasible to carry out the destructive testing and investigation to obtain the information required to carry out a detailed evaluation of the 10-ft tall building. Moreover, it is not clear if the building along with its modifications is behaving adequately. The cracks observed during the site visit may have been a pre-existing condition to the installation of the post-stressing system, or they are a result of a system that is not performing adequately.

Furthermore, as noted during the site visit the building appears to be near the end of its design life. There are several large cracks noted throughout the structure. Some of the cracks may be attributed to the serviceability capacity of the design as described above, while some are likely a result of normal deterioration and degradation. As stated in the request for quotation document, one of the requirements for this option is that the structure must be rehabilitated to allow for a 25 year design life. Given the existing condition and the age of the structure, the structural design concept and the areas that were not able to be properly assessed, it is likely that the rate of deterioration will increase requiring more frequent repairs and monitoring.

6.2 Option 2 – New Tower Base on Existing Crib Cap

The design of a new tower base on the existing crib cap ensures that the supporting structure is adequately designed for the climatic loads that tower will be exposed to and that cyclical loads and load reversal are properly accounted for in both the serviceability and ultimate limit states design. The new tower base will also require much less maintenance and have a 25 year longer design life when compared to option 1.

Considering the results of the limited site inspection, review of the information available and the condition of the existing building, exp is of the opinion that Option 2 is the most feasible and cost effective option to proceed to detailed engineering. As indicated in the request for quotation document, this option has two sub-options to account for either, a new 2-ft high tower base with a 32-ft tower or, a new 6-ft high tower base with a 28-ft tower. Ultimately the end result is to maintain the existing 34-ft tower height.

7 Preliminary Design

Based on the discussion above, review of the existing information and preliminary design calculations performed, the following design scheme is proposed.

Conceptual general arrangement drawings for both sub-options (2-ft base and 6-ft base) to Option 2 – New Tower Base on Existing Crib Cap – are included in Appendix 1.

7.1.1 Plan Dimensions

In order to maintain similar clearances currently observed at the existing tower base, it is recommended that the new tower support base also be 12-ft long and 12-ft wide to match the foot print of the existing 10-ft tall building. This will also allow for the existing dowels, which extend from the crib cap into the existing build foundation, to remain in place and become part of the reinforcement of the new tower base.

7.1.2 Anchor Bolt Design

The baseplate and anchor details provided on the tower vendor drawing S209 were reviewed. The 35mm diameter anchor as shown in the vendor details will be maintained which will accommodate the baseplate details provided. However, based on the preliminary calculations performed for the proposed concrete base, the embedment depth of 1524mm specified on drawing S209 is not practical for the proposed slab 12-ft wide by 12-ft long slab base. As a result, the embedment depth will be revised to suit the new concrete strength and edge distances. Preliminary calculations indicate that the effective embedment depth will be approximately 375mm.

7.1.3 Top Slab Thickness

For the 2-ft base option, the most practical slab thickness is to provide a 2-ft thick base slab on the existing crib cap. Should the 6-ft base option be preferred the slab thickness will be governed by the anchor bolt embedment, reinforcing steel requirements and cover requirements. In this case, preliminary calculations indicate that the slab would likely be 500mm thick and be supported on 250mm thick walls along the perimeter as well as two intermediate 250mm thick wall matching the plan layout of the intermediate crib walls. Both options will require dowels into the existing crib cap.

7.1.4 2-ft Base vs 6-ft Base

Since the design concept of both options are relatively similar, the deciding factor would come down to the cost of materials and cost of construction. Providing a 2-ft base would require approximately 40% less concrete, a much simpler construction of formwork and a shorter duration of construction over the 6-ft base. The trade-off for providing the 2-ft base is an extra 4-ft section of tower, however, it is anticipated that the cost savings in the foundation construction would likely exceed the additional tower costs.

8 Recommendation

Having considered the information presented in this report, we recommend the Canadian Coast Guard to move forward with the detailed engineering of Option 2 – New Tower Base on Existing Crib Cap with the 2-ft tall base and 32-ft tall tower. The proposed works will address the concerns the Canadian Coast Guard has with the 10-ft tall building style of tower base as well as provide a 50-yr design life expectancy. The overall rehabilitation scheme is summarized as follows:

- Remove the existing 24-ft tower.
- Remove the existing 10-ft tall building to top of 10-in high foundation curb.
- Remove redundant utilities as required to install new foundation works.
- Pour 2-ft high reinforced concrete foundation slab on top of existing crib cap.
- Install new 32-ft Claymar tower.
- Relocate existing solar panel to new tower.
- Support existing batteries and remaining utilities from new tower.

9 Limitations

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The observations and comments are based on limited observations during **exp's** one (1) site visit and drawings (attached) which were available at the time this report was written. Should additional information become available that may affect the comments and conclusions included herein, **exp** should be retained to review the additional information and allow reassessment of our comments and conclusions.

10 Closure

We trust that this report provides you with sufficient information to select the preferred alternative to proceed with the detailed design. However, should you have any further questions, please do not hesitate to contact this office.

Best regards,

exp Services Inc.

Appendix 1 – Conceptual General Arrangement



EXP. INC.
 10000 N. 10th Street
 Suite 100
 Phoenix, AZ 85020
 Phone: 602.998.1000
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CONCEPTUAL

DATE: 06/24/2014

PROJECT: LL 677 LIVINGSTONE CHANNEL UPPER ENTRANCE TOWER BASE

SCALE: 1/8" = 1'-0"

DATE: 06/24/2014

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DATE: 06/24/2014

PROJECT: LL 677 LIVINGSTONE CHANNEL UPPER ENTRANCE TOWER BASE

SCALE: 1/8" = 1'-0"

DATE: 06/24/2014

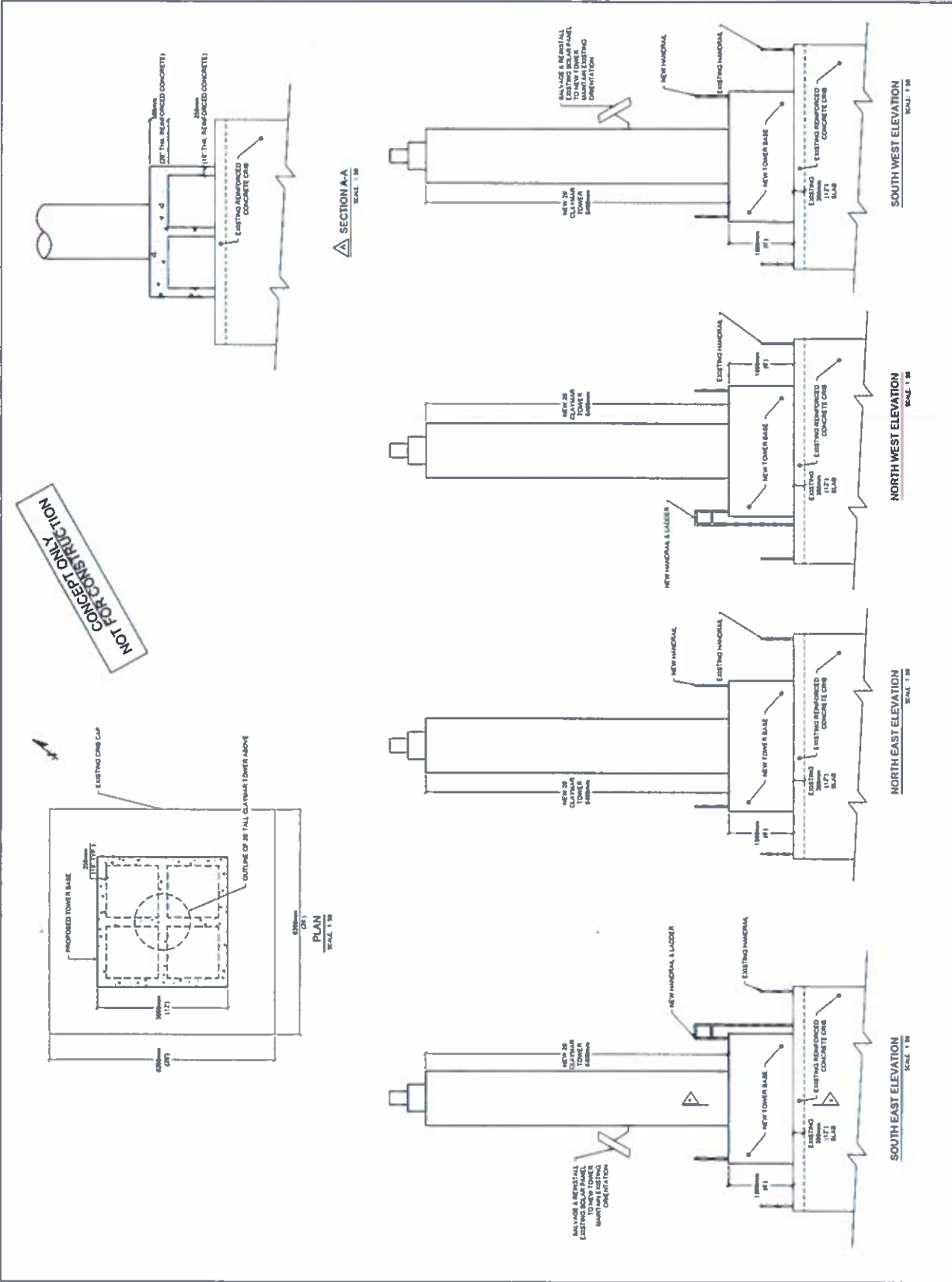
PROJECT: LL 677 LIVINGSTONE CHANNEL UPPER ENTRANCE TOWER BASE

SCALE: 1/8" = 1'-0"

DATE: 06/24/2014

PROJECT: LL 677 LIVINGSTONE CHANNEL UPPER ENTRANCE TOWER BASE

SCALE: 1/8" = 1'-0"



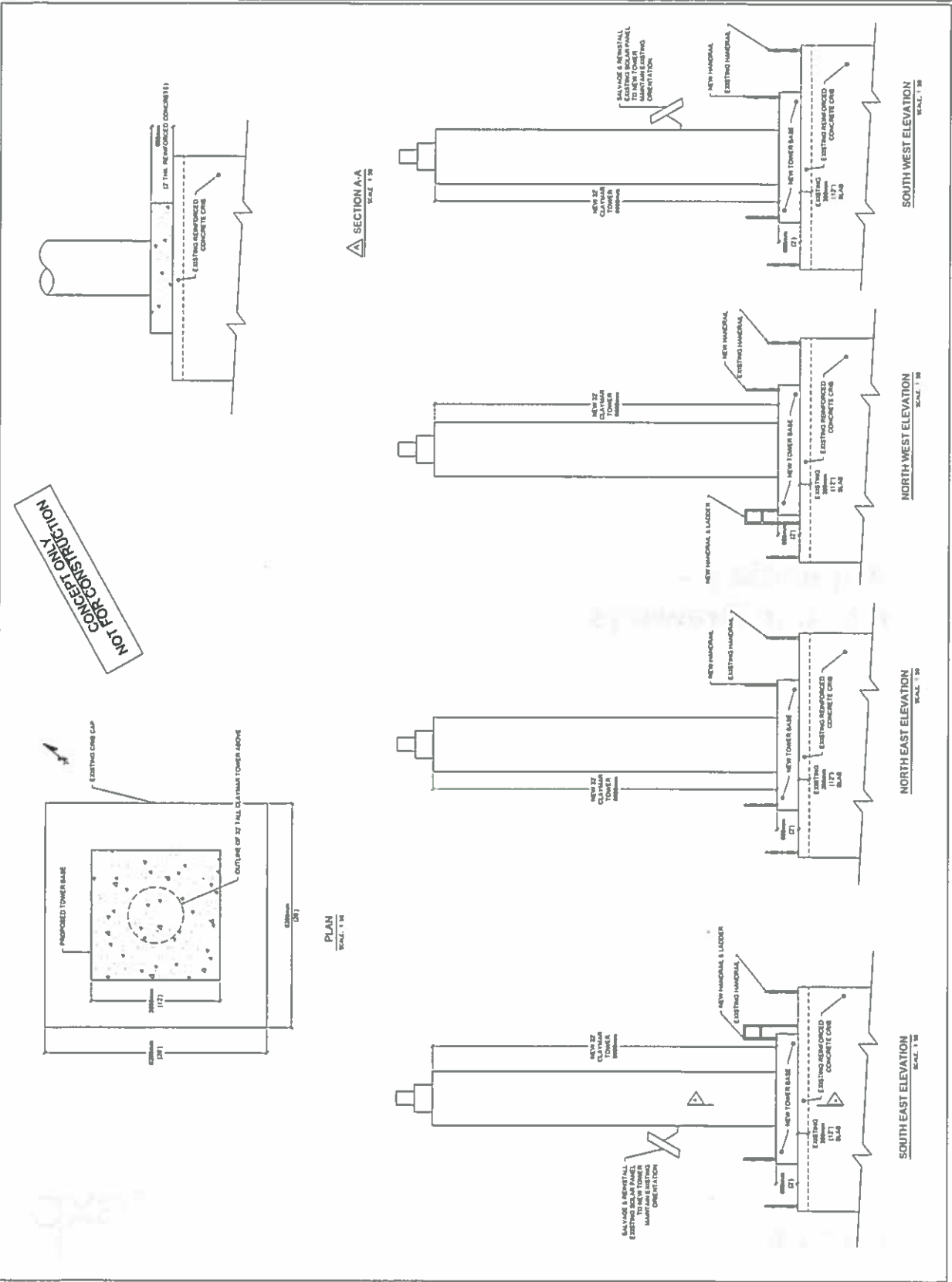
No.	Description	Rev.	Date
1	CONCEPTUAL	0	2023.07.27

CONCEPTUAL

PROJECT NO: [REDACTED]
 SHEET NO: [REDACTED]
 DRAWING TITLE: [REDACTED]

LL 677 LIVINGSTONE CHANNEL UPPER ENTRANCE TOWER BASE
 ALBERTA, CANADA
CONCEPTUAL GENERAL ARRANGEMENT 2-FT BASE OPTION

PROJECT NO: SUD-00016036
 SHEET NO: SK-002
 REV: 0



NOT FOR CONSTRUCTION

SECTION A-A
SCALE: 1/8"

PLAN
SCALE: 1/8"

SOUTH WEST ELEVATION
SCALE: 1/8"

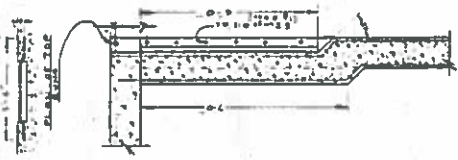
NORTH WEST ELEVATION
SCALE: 1/8"

NORTH EAST ELEVATION
SCALE: 1/8"

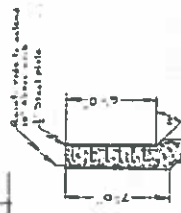
SOUTH EAST ELEVATION
SCALE: 1/8"

Appendix 2 – Existing Drawings

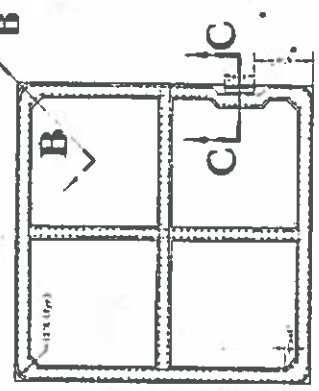
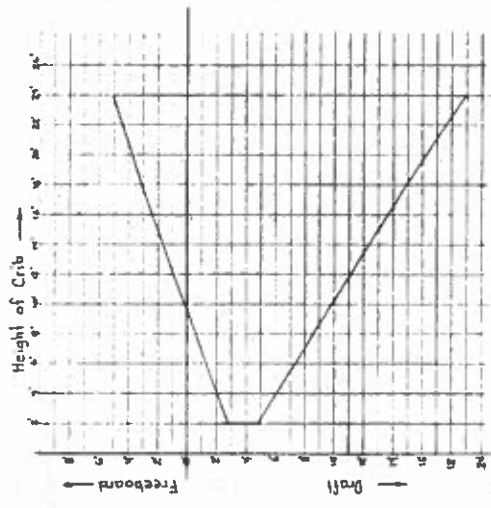
SR-1421-1



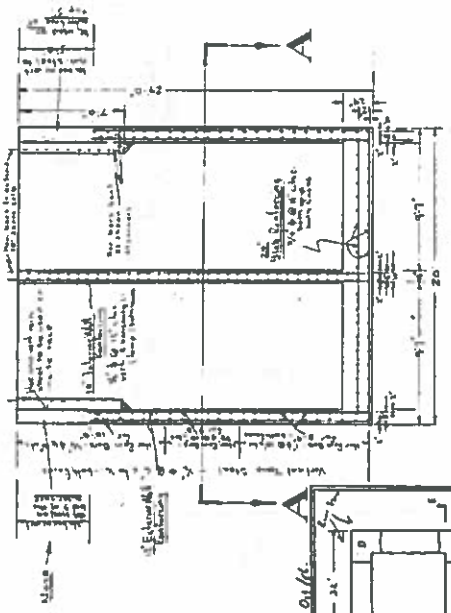
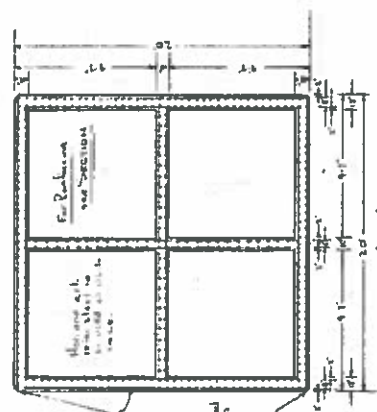
SEC. AT C-C
SCALE 1/4" = 1'-0"



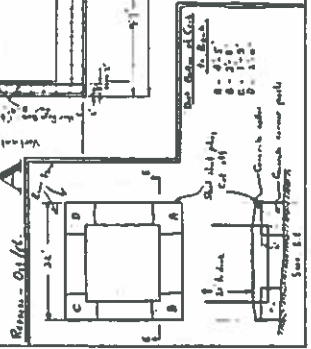
DEPARTMENT OF TRANSPORTATION
MARINE ENGINEERING BRANCH
REINFORCED CONCRETE CRIB
LIVINGSTONE CHANNEL
Scale as shown
Drawn by G.L.
Checked by G.L.
Approved by G.L.



Revised July
Checked by G.L.
Approved by G.L.



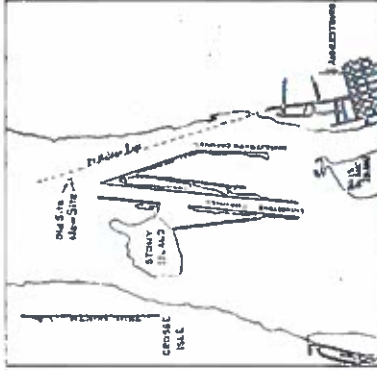
SECTION
Scale 1/4" = 1'-0"



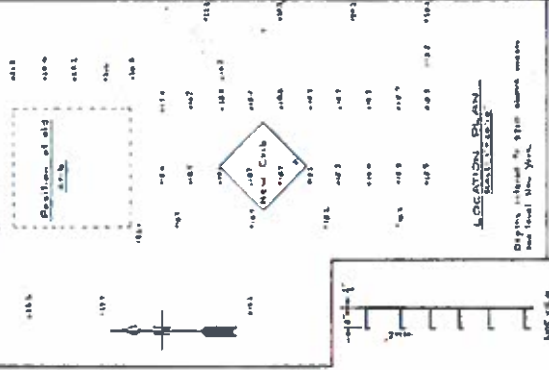
Revised - 8/1/16
Checked by G.L.
Approved by G.L.

J

J

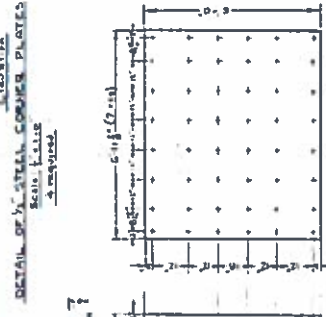
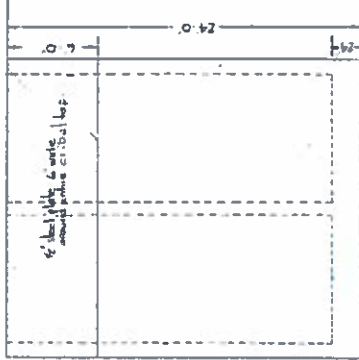
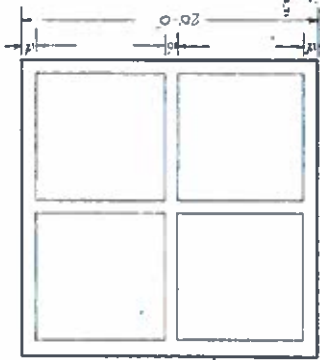
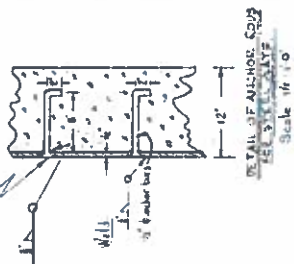


SITE PLAN OF PIER CONSTRUCTION SITE
Scale 1" = 200'

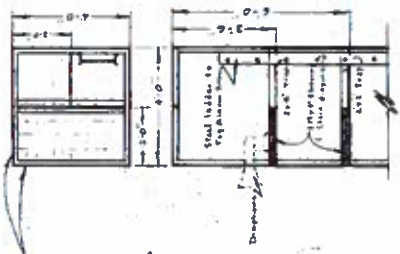


Consent of the Engineer
MARINE SERVICES DIVISION
Engineered Concrete Club
Livingstone Channel, Ont.
Scale as shown.
BR-14621-2

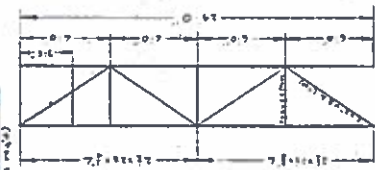
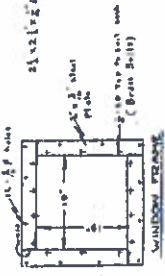
Plates to be welded to pier
to steel plate of anchor box



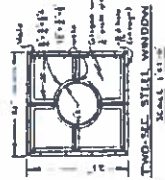
DETAIL OF 1/2" STEEL PLATE AND ANCHORS
Scale 1/4" = 1'-0"
Ø required



DETAIL OF TOP S.E.C. OF TOWER.



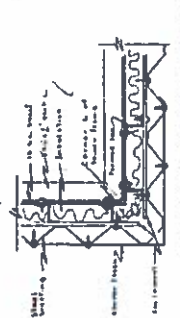
TOWER FRAME



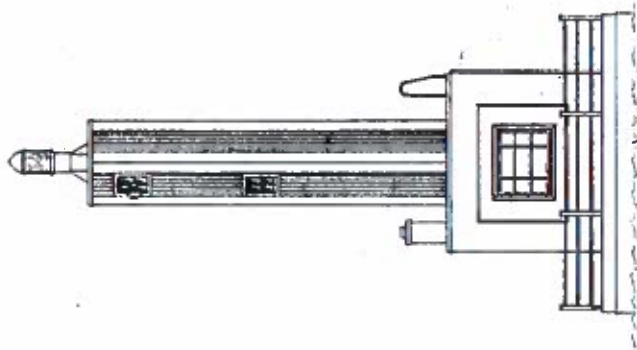
TWO-SE. STEEL WINDOW



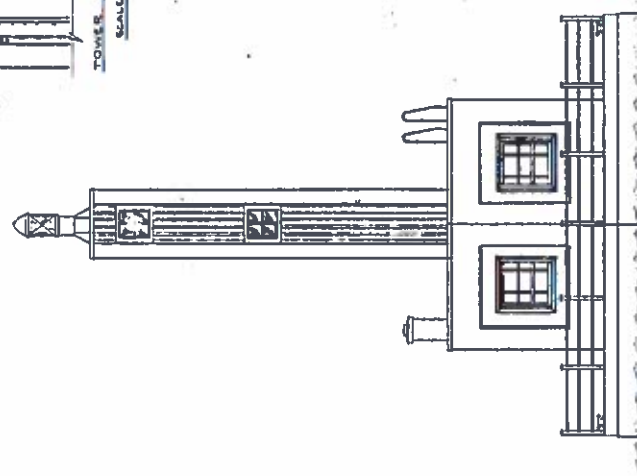
TOWER EDGE DETAIL
SCALE: 1/2\"/>



TYP. ARRANGEMENT FOR ENCLLOSING TOWER.



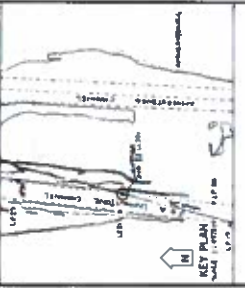
SIDE ELEVATION



FRONT ELEVATION

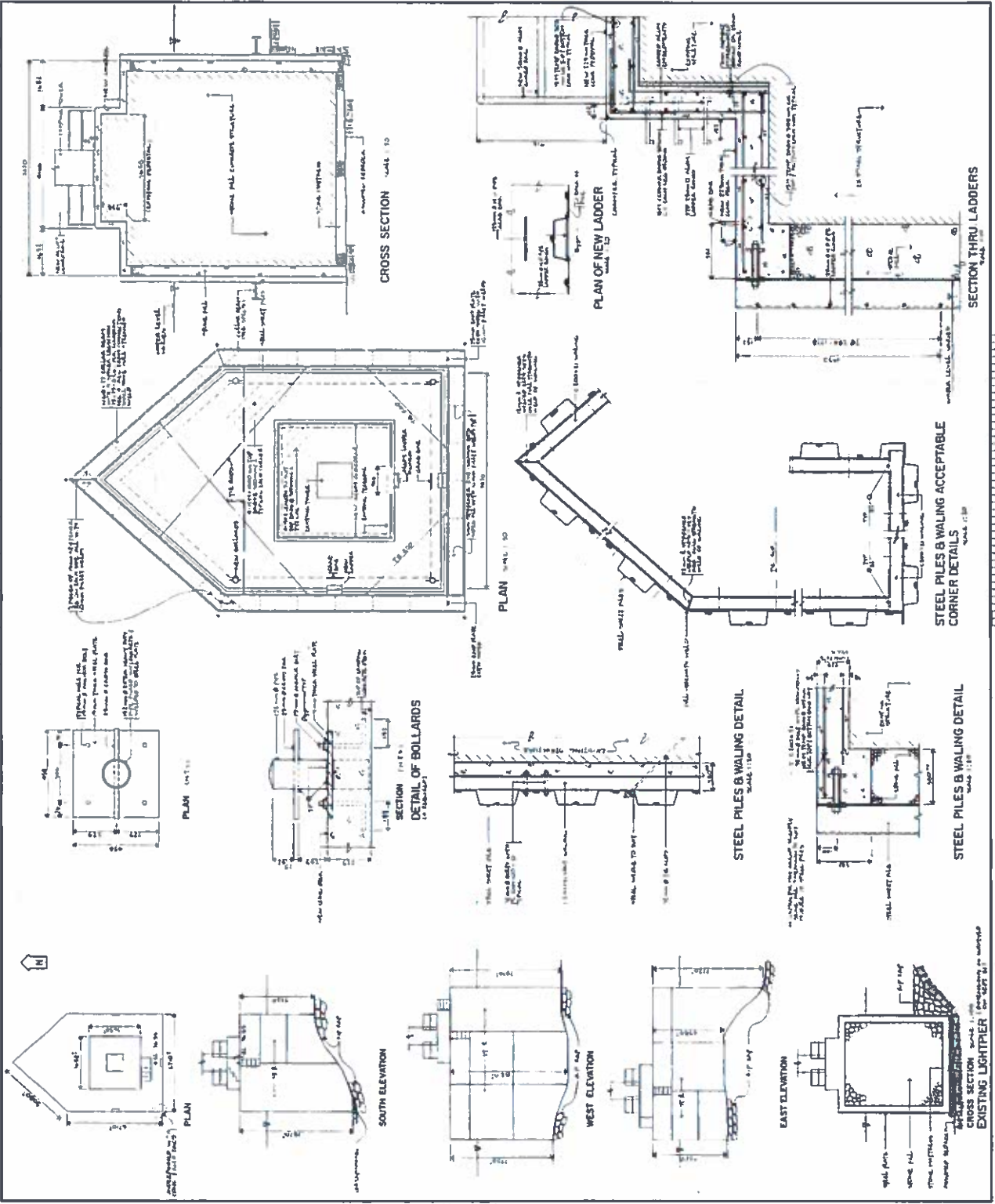
DEPARTMENT OF TRANSPORT
MARINE SERVICES BRANCH
LIGHT & FOG ALARM
LIVINGSTONE CHANNEL ONT

BR-14621
Scale: 1/2\"/>



NOTES
 ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
 CONSTRUCTION TO BE IN ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS.
 THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AUTHORITIES.

CANADIAN COAST GUARD CENTRAL REGION	
DATE	ISSUED BY
DESIGNED BY	APPROVED BY
DRAWN BY	CHECKED BY
PROJECT NO.	PROJECT NAME
SCALE	PROJECT LOCATION
PLANS, ELEVATIONS & SECTIONS	
DATE	PROJECT NO.
SCALE	PROJECT NAME
PROJECT LOCATION	PROJECT LOCATION



Appendix 3 – exp Photographs – July 13, 2016



Photo 1 – LL 677 Livingstone Channel Aid Tower



Photo 2 – Southeast Elevation



Photo 3 – Southwest Elevation



Photo 4 – Northwest Elevation



Photo 5 – Northeast Elevation

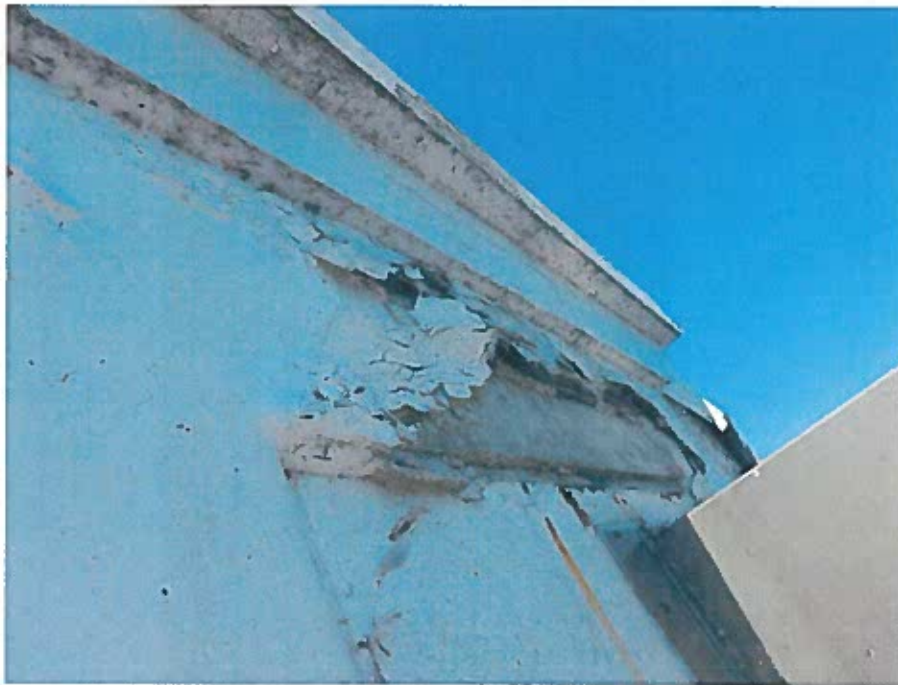


Photo 6 – Northeast Wall – Typical Spalling of Façade



Photo 7 – Northeast Wall – Cracking through Roof Slab and Wall



Photo 8 – Northeast Wall – Crack in Wall Down to Foundation



Photo 9 – Northwest Wall – Deteriorated Façade, Cracked and Spalled Blocks



Photo 10 – Northwest Wall – Damaged Window Sill



Photo 11 – Northwest/Southwest Wall – Delaminated and Spalling Façade



Photo 12 – Southwest Wall – Delaminated Patch



Photo 13 – Southwest Wall – Delaminated Façade



Photo 14 – Southwest Wall – Deterioration at Window Lintel



Photo 15 – Southwest Wall – Deteriorated and Cracked Façade and Blocks



Photo 16 – Southeast Wall – Cracking through Foundation to Crib Cap



Photo 17 – Crib Cap / Floor of Building



Photo 18 – Southwest Wall



Photo 19 – Northwest Wall



Photo 20 – Northeast Wall and Ceiling



Photo 21 – Southeast Wall



Photo 22 – Angle Columns and Tie-rods



Photo 23 – Typical Angle Column and Tie-rod Connection at Ceiling



Photo 24 – Solar Panel on South Corner of Building Roof



Photo 25 – Typical Building Roof



Photo 26 – Typical Tower Connection to Building Roof



Photo 27 – Survey Monument at North Corner of Crib Cap



Photo 28 – Roof Hatch to Access Tower



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canadian
Coast Guard

Garde côtière
canadienne



APPENDIX B5 – MARINE ACCESS REQUIREMENTS

.1 Marine Access

- .1 Vessel(s) employed in the performance of the contract shall be certified as required by the Canada Shipping Act 2001 and its applicable regulations including Marine Personnel Regulation.
 - .1 The bidder shall ensure that the vessel(s) proposed for the work meets all requirements of the Canada Shipping Act 2001 and the applicable Regulations under the Canada Shipping Act.
 - .2 Bidders shall provide copies of the following documentation to facilitate evaluation and award:
 - .1 Proof of vessel registration as a commercial vessel in accordance with the Canada Shipping Act 2001. Either one of two registrations will be accepted:
 - .1 Proof of commercial vessel registration in the Small Vessel Register (SVR) if less than 15 Gross Tons or;
 - .2 Proof of commercial vessel registration in the Canadian Register of Vessels (CRV) if more than 15 Gross Tons.
 - .3 NOTE: Pleasure Craft and Fishing Vessels are not acceptable for the performance of this work – it must be a commercially registered vessel.
 - .2 Where the vessel is registered in the SVR the bidder shall also provide the following:
 - .1 Copy of vessel certification and any limitations the vessel is operating under. Where the vessel is restricted, the operator shall ensure that the vessel can be used to safely perform the work in this specification;
 - .2 Copy of inspection according to the Small Vessel Compliance Program; Bidder shall submit proof of enrolment in the compliance program and;
 - .3 Either a copy of the initial inspection report or the most recent copy of an annual inspection report and;
 - .4 Copy of the crew certification that will be operating the vessel. Crewing and certification of crew shall be in accordance with the Marine Personnel Regulations, latest edition.
 - .3 Where the vessel is registered in the CRV the bidder shall also provide the following:
 - .1 Copy of the latest Annual Inspection Certificate endorsement and;

- .2 Copy of any restrictions that the vessel is operating under and the general sailing limitations of the vessel. Where the vessel is restricted, the operator shall ensure that the vessel can be used to safely perform the work in this specification;
 - .3 Copies of the crew certification that will be operating the vessel. Crewing and certification of crew shall be in accordance with the Marine Personnel Regulations, latest edition.
- .2 Vessels and crew found to be in contravention of the act will not be permitted to be engaged in any elements of the works identified herein. In the event that a vessel or crew is found non compliant a suitable replacement vessel and/or crew will be retained by the Contractor at their sole expense.