

**SPECIFICATIONS FOR**  
**Marginal Wharf Rehabilitation**  
**Gimli, MB**

**F2470-160001/A**



Department of Fisheries & Oceans  
Small Craft Harbours Branch  
Winnipeg, Manitoba

**March 2016**



## TABLE OF CONTENTS

01 11 05	Seals Page
01 11 05	General Instructions
01 35 29 .06	Health and Safety Requirements
01 35 43	Environmental Procedures
01 45 00	Quality Control
02 41 13	Selective Site Demolition
03 10 00	Concrete Forming and Accessories
03 20 00	Concrete Reinforcing
03 30 00.01	Cast-In-Place Concrete Short Form
05 50 00	Metal Fabrications
06 05 73	Wood Treatment
06 10 00.01	Rough Carpentry – Short Form
23 05 00	Common Work Results Mechanical
23 05 05	Installation of Pipework
23 05 23.01	Valves – Stainless Steel
23 21 13.02	Domestic Water Systems: Stainless Steel
23 21 14	Plumbing Specialties
26 05 01	Common Work Results Electrical
26 05 02	General Electrical Work
31 23 33.01	Excavating, Trenching and Backfilling
31 32 19.01	Geotextiles
31 37 00	Rip-Rap
31 61 13	Pile Foundations, General Requirements
31 62 16.13	Steel Sheet Piles
32 11 23	Aggregate Base Courses
32 12 16.01	Asphalt Paving – Short Form
32 91 19.13	Topsoil Placement and Grading
33 05 13	Manholes and Catch Basin Structures

### Drawings:

JML G-1 of 8 Rev. 1	Demolition-Plan and Section
JML G-2 of 8 Rev. 1	New Construction-Plan and Section
JML G-3 of 8 Rev. 1	New Construction-Marginal Wharf Plans, Sections, and Details
JML G-4 of 8 Rev. 1	New Construction-Transitional Wharf Plans, Sections, and Details
JML G-5 of 8 Rev. 1	New Construction-Transitional Wharf Miscellaneous Details
JML G-6 of 8 Rev. 1	Temporary Access to Floating Docks
JML G-7 of 8 Rev. 1	New Construction-Centre Wharf New Electrical Light Standards Plan and Details
JML G-8 of 8 Rev. 1	General Notes and Scope of Work
TBT Engineering/Profor Division M-1 of 3	Marginal and Transitional Wharf Demolition Plan
TBT Engineering/Profor Division M-2 of 3	Marginal and Transitional Wharf Renovation Plan
TBT Engineering/Profor Division M-3 of 3	Marginal and Transitional Wharf Sections, Details, Notes, Scope of Work and Equipment List

TBT Engineering/Profor Division E-1 of 4	Marginal and Transitional Wharf Demolition Plan
TBT Engineering/Profor Division E-2 of 4	Marginal and Transitional Wharf Renovation Plan
TBT Engineering/Profor Division E-3 of 4	Marginal and Transitional Wharf Single Line Diagram, Electrical Details
TBT Engineering/Profor Division E-4 of 4	Marginal and Transitional Wharf Panel Schedules, Electrical Details, Electrical Specification

**Part 1            General**

**1.1            MEASUREMENT FOR PAYMENT**

**.1            Mobilization and Demobilization**

- .1            Payment for mobilization and demobilization shall be lump sum and shall include all works required to:
  - .1            Mobilize equipment, materials, tools, supplies, labour and supervisors.
  - .2            Insurance(s) required for the duration of construction.
  - .3            Fees, certificates and work permits.
  - .4            Temporary construction facilities.
  - .5            Signage.
  - .6            Securing work and storage areas.
  - .7            Vehicle and pedestrian protection.
  - .8            Daily site cleaning, and
  - .9            Demobilization of aforementioned items upon completion of construction.

**.2            Temporary Float Access**

- .1            Payment for temporary float access shall be lump sum and shall include all work to:
  - .1            Obtain Owner supplied temporary floats from Selkirk, MB.
  - .2            Deliver floats to site.
  - .3            Install temporary floats c/w connectors to access finger docks, including existing float and ramp from Transitional Wharf, and ramp at south end of Marginal Wharf.
  - .4            Maintain temporary float access throughout construction.
  - .5            Remove temporary floats upon completion of construction.
  - .6            Pressure wash floats to remove zebra mussels.
  - .7            Return dried temporary floats to Owner in Selkirk, MB upon completion of construction.

**1.2            DESCRIPTION OF WORK**

The work site described in this specification is located in Gimli, Manitoba. Gimli is approximately 100 kilometres north of Winnipeg via Highway 9.

- .1            The scope of work under this Contract, includes but is not limited to the following:

- .1 Establish temporary traffic and pedestrian protection, including temporary floats to access floating docks.
- .2 Establish temporary environmental protection including double walled silt curtain.
- .3 See mechanical and electrical drawings for their portion of the overall scope of work.

**Transitional Wharf:**

- .4 Remove existing concrete bollards and dispose off site.
- .5 Remove and salvage existing electrical panel, light standard, and ramp connection system. Remove and temporarily relocate floating dock and ramp from north end of marginal wharf to location designated by engineer.
- .6 Remove and salvage concrete paving stones as required at concrete fountain pathways.
- .7 Excavate to extents indicated and dispose off site.
- .8 Remove and dispose existing 100 mm dia. storm drain pipe.
- .9 Remove and dispose existing transitional wharf steel sheet pile wall c/w steel tieback cables, ladder, and steel pipe curb.
- .10 Construct new steel sheet pile wall c/w waler, tie-rods, anchors, and corner braces.
- .11 Provide extensions for fountain storm drain and artesian well drain.
- .12 Remove and dispose upper 100 mm of Marginal Wharf steel sheet pile wall c/w steel cap channel and steel pipe curb to limits indicated.
- .13 Backfill and compact as indicated.
- .14 Provide steel cap channel on new steel sheet pile.
- .15 Construct new timber curb c/w spacer timbers and anchor rods on steel cap channel.
- .16 Construct new concrete pedestal for new electrical splice box c/w three new bollards.
- .17 Install salvaged dock connection system, floating dock, and ramp.
- .18 Provide new ladder.
- .19 Touch up grade, compact, and install salvaged concrete paving stones at concrete fountain pathways.
- .20 Extend concrete walls at concrete fountain vertically, as required, to suit new grades.

**Marginal Wharf:**

- .21 Temporarily relocate ramp at south side of marginal wharf.
- .22 Remove and salvage existing concrete parking curbs, concrete picnic table, timber bench and steel flag pole.
- .23 Remove steel bollards near fuel pump and dispose off site.
- .24 Remove and dispose concrete flag pole base and two abandoned steel light standard bases. Make good repairs to cap channel.
- .25 Remove and salvage concrete paving stones at building entrance as required.

- .26 Excavate to extents indicated and dispose off site.
- .27 Remove and dispose three existing monitoring wells. Fill holes with bentonite.
- .28 Remove and dispose existing buried and/or exposed 200 mm +/- concrete slab within excavation limits. sawcut limits of removal.
- .29 Remove asphalt to extents indicated and dispose off site. Sawcut limits of removal.
- .30 Remove 150 mm concrete curb to extents indicated and dispose off site.
- .31 Touch-up paint at steel pipe curb at three floating dock locations.
- .32 Repair steel sheet piling void at southwest corner of marginal wharf with high strength concrete.
- .33 Provide new angles to extend walls and raise elevation of fuel utilidor lid flush with cap channel.
- .34 Provide new concrete flag pole base.
- .35 Plug existing 150 mm dia. CSP storm outlet pipe at catch basin within grass area.
- .36 Construct new soakaway pit by the following:
  - .1 Excavate 1200 mm.
  - .2 Provide 1:1 side slopes.
  - .3 Provide new 150 mm dia. pvc outlet from existing catch basin within grass area to new soakaway pit.
  - .4 Provide 1100 mm thick pit consisting of 19 mm dia. clean stone wrapped in geotextile. Provide compactive effort.
  - .5 Provide 100 mm thick topsoil c/w seed on top of pit.
  - .6 Place salvaged concrete picnic table near soakaway pit.
- .37 Construct new deck slab by the following:
  - .1 Proof roll and compact base.
  - .2 Provide granular base c/w geotextile where indicated. Granular base varies. Refer to drawings for details.
  - .3 Weld shelf angles c/w dowels to steel sheet piling.
  - .4 Place new reinforcing steel.
  - .5 Pour new 150 mm concrete slab.
  - .6 Sawcut control joints and seal all joints.
- .38 Provide steel grating steps and landing at three floating dock locations.
- .39 Construct new 150 mm concrete curb and new sidewalk near building.
- .40 Raise concrete walls at pathway as required.
- .41 Provide three new bollards near fuel pump.
- .42 Repair sanitary manhole barrel.
- .43 Reset sanitary manhole frame cover to suit finished grade.
- .44 Provide topsoil and sod near building as indicated.
- .45 Construct new asphalt areas by the following:
  - .1 Proof roll and compact base.
  - .2 Provide granular base c/w geotextile where indicated. Granular base varies. Refer to drawings for details.

- .3 Place 2-50 mm lifts of HL-4 asphalt.
- .46 Prepare base and install salvaged concrete paving stones to suit finished grade.
- .47 Provide 100 mm topsoil and seed at disturbed areas along edge of new pavement and new concrete curb.
- .48 Reinstall salvaged concrete parking curbs, steel flag pole, and timber bench.
- .49 Remove temporary traffic and pedestrian protection, and temporary floats.
- .50 After removing temporary access floats, pressure wash to remove zebra mussels, and dry prior to transporting back to client.
- .51 Relocate ramp at south side of Marginal Wharf to original location.
- .52 Remove temporary environmental protection.

**Centre Wharf:**

- .53 Remove existing anchor bolts at five light standard locations.
  - .54 Construct new bases, including anchor bolts, to receive new light standards.
  - .55 Provide new light standards.
- .2 The work to be done by the Contractor under this Contract shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, insurance, and all things necessary for and incidental to the satisfactory performance and completion of all work as specified herein. All work to be done in accordance with details shown on the accompanying plans and as specified herein.
- .1 Canadian Standards Association (CSA International)

**1.3 DEFINITIONS**

- .1 The word "provides" means "supply and install".
- .2 For purposes of this contract, "Departmental Representative", "Architect/Engineer" and "Engineer" shall have the same meaning.

**1.4 WORK SCHEDULE**

- .1 Provide within 10 working days after Contract award, schedule showing anticipated progress stages and final completion of work within time period required by contract documents.
- .2 Interim reviews of work progress based on work schedule will be conducted as decided by Engineer and schedule updated by Contractor in conjunction with and to approval of Engineer.
- .3 Work under this Contract is to be performed in a timely manner. Commence planning and preparatory work immediately upon receipt of official notification of acceptance of Contract, and Schedule the work so that the construction can commence on May 30, 2016, and be completed by October 14, 2016.
- .4 Work Sequence:
  - .1 Before work is undertaken, ensure that all materials and trades required are available to finish work in as short a period as possible.



- .2 No area to be renovated shall be placed out of service until it is confirmed that there shall be no need to stop the work waiting for receipt of materials, equipment or labour.
- .5 No on site work to take place during the Canada Day long weekend from 12:00 noon, Thursday, June 30, 2016 until 8:00 AM, Monday, July 4, 2016; the August long weekend from 12:00 noon, Friday, July 29, 2016 until 08:00 AM, Tuesday, August 2, 2016; and the September long weekend from 12:00 noon Friday, September 2, 2016 until 08:00 AM, Tuesday, September 6, 2016. During the months of July and August, no major work activities (i.e. heavy construction equipment and truck traffic, concrete pours, etc.) to take place from 04:00 PM Fridays until 08:00 AM Mondays. Obtain Engineer's approval prior to scheduling any weekend work.
- .6 The Marginal Wharf is to remain accessible to fishers during the fishing season (May 15, 2016 to June 30, 2016). No demolition work at the Marginal Wharf is to occur during the fishing season.
- .7 Marginal Wharf work to be totally completed by August 31, 2016 to allow fishers access during the fall fishing season beginning September 1, 2016.
- .8 Transitional Wharf steel sheet piling is not to be undertaken during July or August.
- .9 Work at the Transitional Wharf may be completed during the fishing season provided there is no interference with fishing activities on the Marginal Wharf.
- .10 Work at the Marginal Wharf shall be coordinated with the Harbour Authority to allow removal and installation of a new fuel dispensing pump to proceed with minimal interruption to fuel dispensing services.

#### **1.5 CERTIFICATES AND TRANSCRIPTS**

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

#### **1.6 FEES, PERMITS AND CERTIFICATES**

- .1 Provide authorities having jurisdiction with information requested. Pay fees and obtain certificates and work permits required.
- .2 Furnish certificates and permits when requested.

#### **1.7 MEASUREMENT FOR PAYMENT - GENERAL**

- .1 Notify Engineer sufficiently in advance of operations to permit required measurements for payment.
- .2 Submit to Engineer, at least 14 days before information for first application for payment, cost breakdown, Progress Payment in detail as directed by Engineer, for parts of Work, aggregating total amount of Contract Price, so as to facilitate evaluation of applications for payment. After approval by Engineer, cost breakdown will be used as basis for progress payments.

#### **1.8 INTERPRETATION OF DOCUMENTS**

- .1 Drawings and Specifications are complementary. When work is shown or mentioned on the Drawings but is not indicated in the Specifications, or when work is indicated in the

Specifications but is not shown or mentioned on the Drawings, it shall nevertheless be included in the Contract.

- .2 The sub-division of the Specification into sections, identified by title and number, is for convenience only and does not modify the singularity of the document, nor does it operate to make or imply that the Engineer is an arbiter to establish the limits or extent of Contract between Contractor and Subcontractors or to determine the limits or extents of work that may be decided by trade unions or contractors' organizations. Extras to the Contract will not be considered on the grounds of differences in interpretation of the Specification and/or Drawings as to which trade performs the work.
- .3 Do not scale off drawings.

#### **1.9 CONTRACTOR'S USE OF SITE**

- .1 A designated Contractor Use Area is shown on attached Figure 1, "Gimli – Contractor Lay-Down Area".
- .2 Co-ordinate use of premises under direction of the Engineer.
- .3 Do not unreasonably encumber the site with materials and equipment.
- .4 Assume full responsibility for protection and safekeeping of products under this Contract.
- .5 Move stored products or equipment which interfere with operations of Engineer or other harbour users.
- .6 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .7 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .8 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Engineer.
- .9 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

#### **1.10 AS-BUILT RECORD DRAWINGS**

- .1 As work progresses, neatly record significant deviations from the Contract Drawings using fine, red marker on full size white prints.
- .2 Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand but shall be neat and accurate. Add at each title block note: "AS BUILT RECORD".
- .3 Record following significant deviations:
  - .1 Depths of various elements and foundations.
  - .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
  - .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.

- .4 Field changes of dimension.
- .5 Other significant deviations which are concealed in construction and can not be identified by visual inspection.

**1.11 SUBMITTALS AND SHOP DRAWINGS**

- .1 Submit to Engineer submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Prior to submission check and certify as correct, Shop Drawings and product data sheets. Issue to Engineer each submission at least 7 days before dates reviewed submission will be needed.
- .5 Submit reproducible transparency (sepia) of Shop Drawings for custom made items. Dimension in metric (SI) units.
- .6 Submit 5 copies of product data sheets for standard manufactured items.
- .7 Shop Drawings of structural items shall bear the stamp of a Registered Professional Engineer.
- .8 Responsibility for errors, omissions or deviations from requirements of Contract Documents is not relieved by Engineer's review of submittals.
- .9 Keep one reviewed copy of each submission on site.

**1.12 EXISTING SERVICES**

- .1 Notify Engineer and utility companies of intended interruption of services and obtain required permission.
- .2 Where work involves breaking into or connecting to existing services, give Engineer 72 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions.
- .3 Establish location and extent of service lines in area of work before starting work. Notify Engineer of findings.
- .4 Submit schedule to and obtain approval from Engineer for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .7 Record locations of maintained, re-routed and abandoned service lines.

**1.13 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy of each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 Change Orders.
  - .6 Other Modifications to Contract.
  - .7 Copy of Approved Work Schedule.
  - .8 Health and Safety Plan and Other Safety Related Documents.
  - .9 Other documents as specified.

**1.14 CODES AND STANDARDS**

- .1 Perform work in accordance with National Building Code of Canada (NBC) and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Work to meet or exceed requirements of contract documents, specified standards, codes and referenced documents.

**1.15 PROJECT MEETINGS**

- .1 Engineer will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

**1.16 SETTING OUT OF WORK**

- .1 Engineer will provide only those survey control points and set such stakes as necessary to define general location, alignment and elevations of work. Give Engineer seven (7) days notice of requirements for such control points and stakes.
- .2 Set grades and lay out work in detail from control points and grades established by Engineer.
- .3 Provide devices needed to lay out and construct work.
- .4 Supply such devices needed to lay out and construct work.
- .5 Supply such devices as straight edges and templates required to facilitate Engineer's inspections of work.
- .6 Supply stakes and other survey markers required for laying out work.

**1.17 ADDITIONAL DRAWINGS**

- .1 Engineer may furnish additional Drawings for clarification. These additional Drawings have same meaning and intent as if they were included with plans referred to in Contract documents.
- .2 When additional Drawings and instructions are required by the Contractor, provide reasonable notice in writing to the Engineer in advance of the date they are required.

**1.18 EXAMINATION**

- .1 Before submitting tender, examine existing conditions and determine conditions affecting work.
- .2 Obtain all information which may be necessary for proper execution of Contract.

**1.19 SITE INSPECTION**

- .1 The submission of a tender is deemed to be a confirmation of the fact that the Tenderer has inspected the site and is fully conversant with all the conditions under which the work is to be carried out.

**1.20 MATERIAL AND EQUIPMENT**

- .1 Use new products unless otherwise specified.
- .2 Deliver and store material and equipment to manufacturer's instructions with manufacturer's labels and seals intact.
- .3 When material or equipment specified by standard performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating the material or equipment meets or exceeds specified requirements.

**1.21 SECURING WORK AREA**

- .1 Secure the work areas in each stage in an approved manner. This includes fencing or barricades to prevent public access to any areas where construction activities occur and construction materials are stored.

**1.22 CONSTRUCTION FACILITY**

- .1 Provide construction facilities in order to execute Work expeditiously. Remove from site all such work after use.
- .2 Do not load or permit to load any part of Work with a weight of force which will endanger the Work.
- .3 Parking will be permitted on site provided it does not disrupt the performance of the Work.
- .4 Provide a heated, office space, lighted and ventilated of sufficient size to accommodate site meetings, and laydown table.
- .5 Locate materials on site in a manner to cause least interference with the Work activities.
- .6 Provide sanitary facilities for workforce in accordance with Sanitary Regulations and ordinances.
- .7 Engineer shall provide details for the construction lay down area.

**1.23 WHARF USER TEMPORARY ACCESS**

- .1 Contractor to transport Owner supplied temporary floating docks from Coast Guard yard, in Selkirk, MB to the site.
- .2 The Contractor shall install the temporary floats and all necessary linkages to match the layout indicated on the Drawings, including relocating the existing ramp and floating dock from the Marginal Wharf.
- .3 The Contractor shall maintain safe pedestrian access along the temporary floats for the duration of construction.
- .4 Upon completion of construction, the Contractor shall remove, pressure wash to remove all zebra mussels, and return temporary floating docks to the Coast Guard yard in Selkirk, MB.

**1.24 WATER LEVELS**

- .1 Water levels on Lake Winnipeg are subject to periods of variable low water conditions followed by periods of variable higher water conditions, with the average range of fluctuation being 2.0 metres.

**1.25 VEHICLE AND PEDESTRIAN PROTECTION**

- .1 Provide snow fencing, wooden barriers, or other approved hoarding to prevent vehicles and pedestrians from accessing the site during construction.
- .2 Contractor shall provide appropriate signage for vehicle and pedestrian protection.
- .3 All hoarding shall include delineation and reflectors to stand out at nightfall.

**1.26 DRAWINGS**

- .1 The following Drawings are to be read in conjunction with this specification:
  - .1 JML G-1 of 8 Rev. 1 Demolition-Plan and Section
  - .2 JML G-2 of 8 Rev. 1 New Construction-Plan and Section
  - .3 JML G-3 of 8 Rev. 1 New Construction-Marginal Wharf Plans, Sections, and Details
  - .4 JML G-4 of 8 Rev. 1 New Construction-Transitional Wharf Plans, Sections, and Details
  - .5 JML G-5 of 8 Rev. 1 New Construction-Transitional Wharf Miscellaneous Details
  - .6 JML G-6 of 8 Rev. 1 Temporary Access to Floating Docks
  - .7 JML G-7 of 8 Rev. 1 New Construction-Centre Wharf New Electrical Light Standards Plan and Details
  - .8 JML G-8 of 8 Rev. 0 General Notes and Scope of Work
  - .9 TBT Engineering/Profor Division M-1 of 3 Marginal and Transitional Wharf Demolition Plan
  - .10 TBT Engineering/Profor Division M-2 of 3 Marginal and Transitional Wharf Renovation Plan

- .11 TBT Engineering/Profor Division M-3 of 3 Marginal and Transitional Wharf Sections, Details, Notes, Scope of Work and Equipment List
- .12 TBT Engineering/Profor Division E-1 of 4 Marginal and Transitional Wharf Demolition Plan
- .13 TBT Engineering/Profor Division E-2 of 4 Marginal and Transitional Wharf Renovation Plan
- .14 TBT Engineering/Profor Division E-3 of 4 Marginal and Transitional Wharf Single Line Diagram, Electrical Details
- .15 TBT Engineering/Profor Division E-4 of 4 Marginal and Transitional Wharf Panel Schedules, Electrical Details, Electrical specification

**1.27 CLEANING**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials off site at regular intervals for disposal.
- .3 Do not burn waste materials on site. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 When Work is substantially completed, remove surplus products, tools, and equipment not required to complete remaining Work.

**1.28 CLOSEOUT**

- .1 Request Engineer inspection after Contractor has substantially completed the work, inspected the work and has repaired the deficiencies.
- .2 Engineer and Contractor will conduct a joint inspection to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Request Engineer Final Inspection after all deficiencies have been corrected. Repair all Works outstanding as observed by Engineer during this inspection.
- .4 Commencement of lien and Warranty Period is the date of Owner's Acceptance of declaration of Substantial Performance unless otherwise required by lien statute at Place of Work.
- .5 Submit to Engineer as-built, shop drawings, product data, field test records, inspection and manufacturers certification at time of Substantial Performance.
- .6 Submit to Engineer copy of warranties applicable for this project.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Health and Safety Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Manitoba
  - .1 The Workers Compensation Act RSM 1987 - Updated 2006.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit site-specific Health and Safety Plan within 7 days after date of Notice to Proceed and prior to commencement of Work.
- .2 Submit copies of incident and accident reports to Engineer.
- .3 Submit WHMIS MSDS – (Material Safety Data Sheets) to Engineer.
- .4 Engineer will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor after receipt of plan. Revise plan as appropriate and resubmit plan to Engineer within 5 days after receipt of comments from Engineer.
- .5 Engineer's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .6 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

**1.3 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

**1.4 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

**1.5 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Observe and enforce construction safety measures required by Canadian Construction Safety Code, Provincial Government, Worker's Compensation Board, and municipal statutes and authorities.
- .3 In the event of a conflict between any provisions of above authorities, the most stringent provision will apply.

**1.6 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

**1.7 UNFORSEEN HAZARDS**

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

**1.8 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with dock reconstruction at an active harbour site.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work.

**1.9 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Manitoba, and in consultation with Engineer.

**1.10 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Engineer.
- .2 Provide Engineer with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Engineer may stop Work if non-compliance of health and safety regulations is not corrected.

**Part 2            Products**

**2.1                NOT USED**

.1            Not used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not used.

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT AND PAYMENT**

- .1 Payment for environmental protection shall be by lump sum and shall include all labour, equipment and materials required for environmental protection as outlined in this section.

**1.2 RELATED REQUIREMENTS**

- .1 Section 02 41 13 – Selective Site Demolition.

**1.3 REFERENCES**

- .1 Definitions:
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

**1.4 FIRES**

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

**1.5 DRAINAGE**

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.6 WORK ADJACENT TO WATERWAYS**

- .1 No in-water work or shoreline work is permitted between April 15 and June 30, with the exception of work done as part of the Transitional Wharf, including installation of steel sheet piling.
- .2 A double silt curtain shall be installed between the Marginal Wharf and the Main Wharf, prior to driving the new steel sheet piling. The silt curtain shall remain and be maintained until backfilling is completed behind the new steel sheet piling at the Transitional Wharf.
- .3 Construction equipment shall not enter the lake.
- .4 Waterways to be kept free of excavated fill, waste material and debris.
- .5 Design and construct temporary crossings to minimize erosion to waterways.

- .6 Do not skid construction materials across waterways.
- .7 Avoid damage to shoreline.
- .8 Restore disturbed areas to previous or better condition.

#### **1.7 VERTICAL DOUBLE SILT CURTAIN**

- .1 The Contractor shall isolate the work area between the Marginal Wharf and the Main Wharf from the lake, with an approved vertical double silt curtain to prevent the drift of sediment from the work area into the lake. The silt curtain must extend from the top of the water to within 300 mm of the lake bottom. The silt curtain must be left in place until all suspended sediments have settled out. On completion of construction, carefully remove the silt curtain to ensure settled sediment is not disturbed. An acceptable product is "Tough Guy" Type 1E Turbidity Barrier or approved equivalent. Costs for supply, installation, maintenance, and removal of the silt curtain are to be included in the lump sum amount for environmental protection.

#### **1.8 POLLUTION CONTROL**

- .1 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .2 Prevent extraneous materials from contaminating air and waterways beyond application area.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .4 Locate temporary fuel storage 100 meters from shore and comply with Provincial Environmental legislation.
- .5 Refueling, servicing or cleaning of equipment within 100 meters of shore is prohibited.
- .6 Contractor shall ensure all equipment operating on project is free of external fluid leaks, grease, oil and mud.
- .7 Contractor to contain all oil leaks from equipment working adjacent to waterways.

#### **1.9 DISPOSAL OF WASTES**

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways. Hazardous waste including fuels, oils and lubricants to be disposed of by a licensed hazardous waste carrier/handler in accordance with Provincial Environmental Legislation.
- .3 Collect all rubbish and waste material and dispose of in accordance with applicable governing authorities.
- .4 Do not allow debris of any type to enter waterway.

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.

<b>Part 3</b>	<b>Execution</b>
<b>3.1</b>	<b>NOT USED</b>
.1	Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 INSPECTION**

- .1 Allow Engineer access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer.
- .3 Engineer will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

**1.2 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by Engineer for purpose of inspecting and/or testing portions of Work.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Engineer at no cost to Owner. Pay costs for retesting and reinspection.

**1.3 ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

**1.4 PROCEDURES**

- .1 Notify Engineer in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.5 REJECTED WORK**

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

- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Engineer it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Engineer.

**1.6 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.

**1.7 MILL TESTS**

- .1 Submit mill test certificates as requested.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 43 Environmental Procedures.
- .2 Section 05 50 00 Metal Fabrications.

**1.2 MEASUREMENT AND PAYMENT**

- .1 Payment for removals shall be by lump sum and shall include the removal of concrete slab, concrete parking curbs, concrete picnic table, timber bench, steel flag pole, concrete flag pole base, steel traffic bollards, two abandoned steel light standard bases, concrete paving stones, concrete curb, floating dock and ramps, and three abandoned monitoring wells at the Marginal Wharf, and concrete bollards, dock connection system, concrete paving stones, and the 100 mm diameter storm pipe at the Transitional Wharf.
- .2 Payment for salvage or disposal off site, will be included in above removal items.
- .3 Payment for asphalt removal shall be as per Section 32 12 16 Asphalt Paving.
- .4 Payment for removal of granular base material shall be as per Section 31 23 33 Excavating, Trenching and Backfilling.
- .5 Payment for restoration of adjacent surfaces outside areas of demolition to be included in above removal item.
- .6 Payment for removal of steel sheet pile c/w steel pipe curb, tieback cables, and steel ladder at the Transitional Wharf shall be as per Section 31 62 16.13 Steel Sheet Piles.
- .7 Payment for Mechanical/Electrical item removals shall be as stipulated under applicable Mechanical/Electrical sections.

**1.3 QUALITY ASSURANCE**

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Storage and Protection.
  - .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Engineer and at no cost to Owner.
  - .2 Remove and store materials to be salvaged, in manner to prevent damage.
  - .3 Store and protect in accordance with requirements for maximum preservation of material.
  - .4 Handle salvaged materials as new materials.

**1.5 SITE CONDITIONS**

- .1 Site Environmental Requirements.
  - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.

- .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
  - .1 Ensure proper disposal procedures are maintained throughout the project.
- .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
- .6 Protect trees, plants and foliage on site and adjacent properties where indicated.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Inspect site with Engineer and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

### **3.2 REMOVAL OF HAZARDOUS WASTES**

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

### **3.3 REMOVAL OPERATIONS**

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Salvage:
  - .1 Items to be salvaged at Marginal Wharf: concrete parking curbs, concrete picnic table, timber bench, steel flag pole, concrete paving stones, and floating dock and ramp.
  - .2 Items to be salvaged at Transitional Wharf: dock connection system and concrete paving stones.

- .3 Salvaged Mechanical/Electrical items shall be as specified under applicable Mechanical/Electrical sections.
- .4 Dismantle items containing materials for salvage and stockpile salvaged materials.
- .4 Disposal of Material:
  - .1 Dispose of materials not designated for salvage or reuse off site, including steel traffic bollards, concrete bollards, two abandoned steel light standard bases, concrete curb, concrete slab, concrete flag pole base, three abandoned monitoring wells, steel sheet piling, pipe curb, steel ladder, and 100 mm diameter storm pipe.
  - .2 Dispose of Mechanical/Electrical items as specified under applicable Mechanical/Electrical sections.

### **3.4 RESTORATION**

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

### **3.5 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
  - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work.
  - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

### **3.6 PROTECTION**

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 20 00 Concrete Reinforcing.
- .2 Section 03 30 00 Cast-In-Place Concrete Short Form

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 No measurement will be made under this Section.
  - .2 Include concrete forming and accessory costs in item of concrete work in Section 03 30 01 Cast-In-Place Concrete Short Form.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
  - .4 CSA O151-04, Canadian Softwood Plywood.
  - .5 CSA O153-M1980(R2003), Poplar Plywood.
  - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
  - .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
  - .8 CSA S269.1[1975(R2003), Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings for formwork and falsework.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
- .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, and locations of temporary embedded parts.
- .3 Indicate sequence of erection and removal of formwork/falsework as directed by Engineer.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Formwork materials:

- .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86.
- .2 Form release agent: non-toxic.
- .3 Form stripping agent: colourless mineral oil, non-toxic, free of kerosene, with viscosity between 15 to 24 mm<sup>2</sup>/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .4 Falsework materials: to CSA-S269.1.

### **Part 3 Execution**

#### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .4 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .5 Use 25 mm chamfer strips on external corners unless indicated otherwise.
- .6 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .7 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .8 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.
- .9 Relative alignment between adjacent formed concrete surfaces shall be less than or equal to 5 mm.
- .10 Plumbness of slab edges shall be within 1:400 measured at any one surface.

#### **3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 7 days for slabs, curbs, sidewalks, and walls.
- .2 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 0001 Cast-In-Place Concrete Short Form.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 No measurement will be made under this Section.
  - .2 Include reinforcement costs in items of concrete work in Section 03 30 00.01 - Cast-In-Place Concrete Short Form.

**1.3 REFERENCES**

- .1 American Concrete Institute (ACI)
  - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 CSA International
  - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
  - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 11 05 – General Instructions.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice SP-66.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Engineer, with identifying code marks to

permit correct placement without reference to structural drawings.

- .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
  - .1 Provide Type B unless otherwise indicated.

## **1.5 QUALITY ASSURANCE**

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
  - .1 Mill Test Report: upon request, provide Engineer with certified copy of mill test report of reinforcing steel, minimum four weeks prior to beginning reinforcing work.
  - .2 Upon request submit in writing to Engineer proposed source of reinforcement material to be supplied.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Engineer.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .5 Mechanical splices: subject to approval of Engineer.
- .6 Plain round bars: to CSA-G40.20/G40.21.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Engineer's written approval for locations of reinforcement splices other than those shown on placing drawings.

- .3 Upon approval of Engineer's, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

**Part 3 Execution**

**3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Engineer.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

**3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Engineer's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Reinforcing steel in the slab may be supported off the granular base using small pieces of concrete block.

**3.3 CLEANING**

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**END OF SECTION**



**Part 1 General**

**1.1 MEASUREMENT FOR PAYMENT**

**.1 Measurement Procedures:**

- .1 Payment for the reinforced concrete deck shall be by cubic metres of concrete poured in place, based upon the design finished grade.
- .2 Payment for the shelf angles c/w dowels shall be included in the shelf angles tender item.
- .3 Payment for the concrete curb shall be by linear metres of concrete poured in place.
- .4 Payment for the vertical concrete wall extensions c/w dowels shall be lump sum.
- .5 Payment for the concrete traffic bollards shall be by each bollard.
- .6 Payment for the concrete sidewalk shall be by square metres.
- .7 Payment for the sheet pile repair at the southwest corner of the Marginal Wharf shall be by lump sum.
- .8 Payment for concrete bases at Centre Wharf shall be lump sum and shall include all labour and equipment to:
  - .1 Remove deteriorated concrete and existing anchor bolts.
  - .2 Provide BASF Master Emaco S 466 Cl Repair Mortar.
  - .3 Provide new 25 mm Hilti HAS Anchors, install using Hilti HY-200 as indicated.
- .9 Payment for concrete pedestal for new electrical splice box shall be by lump sum.
- .10 Payment for concrete flag pole base shall be by lump sum.
- .11 Payment for formwork and falsework, reinforcing steel, and joints are incidental and are deemed to be included with the reinforced concrete items.

**1.2 RELATED REQUIREMENTS**

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing
- .3 Section 05 50 00 Metal Fabrication
- .4 Section 26 05 01 Common Work Results Electrical

**1.3 REFERENCES**

- .1 ASTM International
  - .1 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International

- .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 11 05 – General Instructions.
- .2 Shop Drawings:
  - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
  - .2 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
  - .3 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba.
- .3 Provide testing and inspection results reports for review by Engineer upon request and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Concrete hauling time: provide for review by Engineer deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

#### **1.5 QUALITY ASSURANCE**

- .1 Provide to Engineer, four weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
  - .1 Quality Control Plan: provide written report to Engineer verifying compliance that concrete in place meets performance requirements.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Engineer and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by the Engineer.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

### **Part 2 Products**

#### **2.1 DESIGN CRITERIA**

- .1 To CSA A23.1/A23.2.

## **2.2 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Engineer and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

## **2.3 MATERIALS**

- .1 Use Type 10 cement for all applications.
- .2 Compressive strength when tested in accordance with CAN/CSA-A23.2, (9C): average 28 day compressive strength to be minimum 30 MPa with 7% +/- 1.5% air entrainment.
- .3 Cementing materials content: 290 to 335 kg/m<sup>3</sup> of concrete mix.
- .4 Air content when tested in accordance with CAN/CSA-A23.2, (4C), immediately after discharge: in accordance with CSA A23.1 Table 10.
- .5 Class of exposure: Class C-2
- .6 Use of chemical admixture will be approved only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.
- .7 Water: to CSA A23.1/A23.2.
- .8 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .9 Premoulded expansion joint filler:
  - .1 In slab - Bituminous impregnated fibreboard: to ASTM D1751.
- .10 Expansion joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .11 Control joint sealer/filler: BASF Masterseal SL 1.
- .12 Sheet pile sealer/filler: W.R. Meadows 'Speed-Crete Blue Line' high strength concrete.
- .13 Anchors: 25 mm Hilti HAS Rods installed using Hilti HY-200.
- .14 Centre Wharf Repair: BASF Master Emaco S 466 Cl.
- .15 Other concrete materials: to CSA A23.1/A23.2.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Provide Engineer 24 hours notice before each concrete pour.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.

### **3.2 FORMWORK**

- .1 Install in accordance with Section 03 10 00 – Concrete Forming and Accessories and to following requirements:
  - .1 Provide forms of sufficient strength to support and keep alignment under weight of spreading and finishing machines.
  - .2 Set forms true to line and grade, join neatly and tightly and secure to resist concrete pressure and impact from tampers without springing.
  - .3 Clean and oil forms before each use.
  - .4 Obtain Engineers approval of forms before placing concrete.

### **3.3 SUBGRADE AND SUBBASE PREPARATION**

- .1 Subbase to consist of specified material and have a compacted thickness of not less than specified.
- .2 Subbase shall be compacted to specified density.
- .3 Prepared subbase shall be checked for conformity with the cross-section and grade tolerances. Finished surface of subbase shall not deviate more than 0 mm above and 20 mm below specified grade and cross-section, and surface shall not deviate more than 10 mm at any place on a 3 mm template.
- .4 Repair damage to subbase resulting from hauling or equipment operations.
- .5 Prior to placing concrete, subbase shall be thoroughly wetted. Wetting shall be carried out, such that standing water is not present on grade.
- .6 Surface condition of base to be approved by Engineer before placing concrete.

### **3.4 REINFORCING STEEL AND DOWELS**

- .1 Placing reinforcing steel as indicated and to Section 03 20 00 – Concrete Reinforcing.
- .2 Remove oil, grease, dirt and deleterious material from reinforcing bars before placing concrete.
- .3 Steel placement to be approved by Engineer before placing concrete.

### **3.5 TRAFFIC BOLLARDS**

- .1 Provide new 350 mm diameter sono tube and 152 mm diameter steel pipe filled with concrete.
- .2 Provide fibreboard and joint sealant at perimeter of bollard.
- .3 All as indicated on the drawings.

### **3.6 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Place concrete to lines, grades and depths as indicated.
- .3 Discharge concrete into forms as soon as practical after mixing.
- .4 Use hand placing where machine spreading is not feasible.

- .5 Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing.
- .6 When completing concrete placement for day, carry placement through to scheduled control joint location.
- .7 Where concrete placement is stopped for more than 30 minutes due to breakdowns, weather or other reasons, construct extra bulkhead and construction joint as directed by Engineer.
- .8 Do not place concrete on frozen surface.
- .9 No concrete shall be placed during rain.
- .10 When rain appears imminent pouring operation should cease. Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with CAN/CSA A23.1. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.
- .11 Concrete placed when the ambient temperature is at or above 27 degrees C to be cured by continuous water curing from soaker hoses providing complete coverage of the pavement to minimize the temperature rise of the concrete.
- .12 When concrete has been placed in cold weather and the air temperature is expected to drop below 5 degrees C, insulating curing blankets or other suitable material shall be placed on the concrete pavement and weighted to prevent movement. Curing to continue until the cumulative number of days, or fraction thereof, during which the temperature of the concrete is 10 degrees C, has totalled a minimum of 7 days.
- .13 Deck:
  - .1 Screed to plane surfaces and use wood floats.
  - .2 Provide chamfered edges and joint spacings using standard forms and tools.
  - .3 Broom finish in the transverse direction to provide lightly brushed non-slip finish.
- .14 Sidewalk/Curb:
  - .1 Form and pour sidewalk and curb as indicated on City of Thunder Bay Engineering Standard Drawings RR-111 and R-119 (copies attached).
  - .2 Locations as indicated on the Drawings.
- .15 Tolerances:
  - .1 The average thickness of the deck shall be no more than 10 mm less thickness than the specified thickness, and no individual thickness measurement shall be more than 20 mm less than the specified thickness.
  - .2 Finished elevation of deck shall be within  $\pm 5$  mm from design elevations.
  - .3 The average slope of the finished floor shall not exceed 1:400 from the design centerline profile and deck-fall.
- .16 Centre Wharf Light Bases:
  - .1 Saw cut around perimeter of removal. Saw cut 1" deep or to the first layer of reinforcing steel, whichever is less, at areas of surface damage or around existing anchor bolts.

- .2 Chip down 300 mm x 300 mm in plan view to remove existing anchor bolts.
- .3 Clean all exposed reinforcing steel.
- .4 Repair area of removal with BASF Master Emaco S 466 Cl.
- .5 Provide new 25 mm diameter Hilti HAS Rods, install using Hilti HY-200 Safe Set self-cleaning system.
- .17 Vertical Concrete Wall Extension
  - .1 Roughen surface on top of existing wall within limits of extension.
  - .2 Provide 15M dowels at 300 mm centres along centreline of wall. Install using Hilti HY-200 Safe Set self-cleaning system.
  - .3 Provide 2-15M continuous top bars.
  - .4 Clean exposed surfaces, provide latex bonding agent, and pour new concrete.
  - .5 Provide chamfers along edge of wall.
- .18 Flag Pole Base
  - .1 Provide new 914 mm sonotube.
  - .2 Provide 20M vertical reinforcement and 15M ties, spacing as indicated.
  - .3 Provide 8-19 mm anchor bolts threaded 100 mm. The top of each anchor bolt shall be galvanized for a minimum length of 150 mm.
  - .4 Position anchor bolts to match existing flag pole base plate.
  - .5 Pour new concrete base.
  - .6 Provide 30 mm thick non-shrink grout.
  - .7 Design of flag pole base to be confirmed by engineer.
- 3.7 **CONTROL JOINTS**
  - .1 Cut control joints in deck at locations indicated, to CSA A23.1/A23.2. Install specified joint sealer and silica sand inside joints.
- 3.8 **EXPANSION AND ISOLATION JOINTS**
  - .1 Install premoulded joint filler in expansion and isolation joints full depth of slab to CSA A23.1/A23.2. Install sealant on top of joint flush with finished surface.
- 3.9 **CURING**
  - .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.
- 3.10 **SITE TOLERANCES**
  - .1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.
- 3.11 **FIELD QUALITY CONTROL**
  - .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Owner.

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT FOR PAYMENT**

**.1 Steel Channel Caps**

Payment for the steel channel caps shall be by linear metres and shall include all labour, equipment, and material required to:

- .1 Supply prime painted steel channels to the site.
- .2 Weld steel channels to top of steel sheet piling. If necessary, provide alternative steel clip angles for connection.

**.2 Shelf Angles**

Payment for the shelf angles shall be by linear metres and shall include all labour, equipment, and material required to:

- .1 Provide new shelf angles c/w dowels for the new concrete deck along the perimeter of the Marginal Wharf.
- .2 Weld shelf angles to the inpanels of the steel sheet piling.

**.3 Steps and Landing**

Payment for the steel steps and landing shall be by each unit supplied and installed.

- .1 Touch-up of paint at the steel pipe curb adjacent the steps and landing locations shall be included in the step and landing item.

**.4 Reinstall Salvaged Items**

Payment to reinstall the salvaged items shall be by lump sum and shall include all labour, equipment, and material required to:

- .1 Install salvaged flag pole on new concrete base.
- .2 Weld salvaged dock connection system to steel cap channel at the Transitional Wharf.
- .3 Install salvaged floating dock and ramp at new location at Transitional Wharf.
- .4 Reinstall salvaged ramp at south end of Marginal Wharf.
- .5 Reinstall ramps at A & B docks.
- .6 Install salvaged timber bench.
- .7 Prepare base and install salvaged concrete paving stones to suit finished grade.
- .8 Install salvaged concrete picnic table.
- .9 Install salvaged concrete parking curbs.

**.5 Ladder**

Payment for the ladder at the Transitional Wharf c/w chain ladder shall be lump sum, and shall include all labour, equipment, and material required to:

- .1 Provide grab bar in timber curb.
- .2 Provide new fixed ladder against steel sheet piling.



- .3 Provide cable ladder and rung tabs.

**.6 Fuel Utilidor Angles**

Payment for the Fuel Utilidor Angles steel shall be by linear metres of utilidor, and shall include all labour, equipment, and material required to:

- .1 Provide two new continuous angles at the fuel utilidor.
- .2 Weld angles to channel cap and fuel utilidor to match fuel utilidor lid with finished concrete elevation.
- .3 Reset fuel utilidor lid at new elevation.
- .4 Touch up paint at channel cap as required.

**1.2 REFERENCES**

**.1 ASTM International**

- .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A307 07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

**.2 CSA International**

- .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA S16-09, Design of Steel Structures.
- .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .5 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

**.1 Shop Drawings:**

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
- .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

**1.4 DELIVERY, STORAGE AND HANDLING**

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

**.2 Storage and Handling Requirements:**

- .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and anchor bolts: to ASTM A307, galvanized where exposed to weather.

**2.2 FABRICATION**

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

**2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.

**2.4 SHOP PAINTING**

- .1 Primer: VOC limit 250 g/L maximum to GS-11 CCD-047a CCD-048.
- .2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

**2.5 STEEL CHANNEL CAPS**

- .1 Steel channels: prime painted, C380x50.
- .2 Finish: shop painted.
  - .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied on site.

**2.6 LADDER**

- .1 9.5 mm bent plate stringers prime painted, cut to lengths as indicated.
- .2 Fixed rungs: 19 mm diameter, prime painted, sizes as indicated. Shop weld to stringers at 300 mm centres.
- .3 Primer: VOC limit 250g/L Maximum to GS-11 when applied on site.
- .4 Grab bar in timber curb: hot dipped galvanized c/w washers and nuts.
- .5 Cable ladder: pre-manufactured, Barry Cordage Ltd. #ECH-A Steel Cable Ladder 300 mm wide c/w black steel cables, black shrink tube on rungs, two attachment points, snap hooks at top, length as indicated, or approved equal.

**2.7 SHELF ANGLES**

- .1 Shelf angles: L 150x150x13 c/w 15 M x 600 long dowels at 600 centres, shelf angles shall be 1700 mm in length.
- .2 Finish: unpainted.

**2.8 STEPS AND LANDING**

- .1 Steel channels: prime painted, C310x31, C150x12, C75x6.
- .2 Steel angles: prime painted, L76x76x6.4.
- .3 Finish: shop painted.
  - .1 Primer: VOC limit 250 g/L maximum to GS-11 when applied on site.
- .4 Anchors:
  - .1 19 mm diameter 'Hilti' HDI stainless steel drop-in anchors c/w 19 mm diameter A325 Bolts for concrete installation.
  - .2 Bolthead SP12-M10 Asphalt Anchors c/w M10 A325 bolts for asphalt installation.
- .5 Grating: 25 mm x 3.2 mm welded bar grating 19-W-4, prime painted.

**2.9 MISCELLANEOUS SALVAGED ITEMS**

- .1 Modify connections and bases as required to reinstall all salvaged miscellaneous objects.
- .2 Finish: prime coat painted, colour to match existing steel.

**2.10 FUEL UTILIDOR ANGLES**

- .1 Fuel Utilidor Angles: prime painted colour to match existing steel, L51x38x4.8 and L76x51x4.8.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

**3.2 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Engineer such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to be hot dipped galvanized and /or shall be compatible with material through which they pass.

- .5 Make field connections with bolts to CSA S16.
- .6 Touch-up field welds, bolts and burnt or scratched surfaces with primer;
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.
- .7 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
  - .1 Primer: maximum VOC limit 250 g/L to GS-11.

### **3.3 NEW CAP CHANNELS ON STEEL SHEET PILING**

- .1 Install cap channels as indicated to top of steel sheet piling.
- .2 Weld underside of cap channels to top of steel sheet piling as indicated.
- .3 In areas where direct welding cannot be achieved, provide steel angles to connect the cap channels to the steel sheet piling.
- .4 Weld nuts for threaded rods at timber curb spacer locations to underside of cap channels.

### **3.4 NEW LADDER**

- .1 Install ladder in locations as indicated.
- .2 Ensure rungs are 150 mm clear of steel sheet piling.
- .3 Install top rung/grab bar through top of timber curb c/w nuts and washers.
- .4 Install cable ladder off bottom rung of fixed ladder using snap hooks.
- .5 Ensure no part of new fixed ladder assembly projects beyond face of steel sheet piling outpans.

### **3.5 SHELF ANGLES**

- .1 Weld 1700 mm lengths of shelf angles to inpanels of steel sheet piling, centred on every second outpan.
- .2 Weld dowels to shelf angles at 600 mm centers.

### **3.6 STEPS AND LANDING**

- .1 Install steps and landing in locations as indicated. Coordinate location with engineer.
- .2 Touch-up paint at steel pipe curb adjacent ramps as indicated.

### **3.7 MISCELLANEOUS SALVAGED ITEMS**

- .1 Re-install all salvaged poles, ramps, and miscellaneous items.
- .2 Apply touch up paint to all damaged surfaces upon completion of erection.

### **3.8 FUEL UTILIDOR ANGLES**

- .1 Install angles at fuel utilidor to match fuel utilidor lid with finished concrete elevation.
- .2 Touch up paint at channel cap as required.
- .3 Reset fuel utilidor lid at new elevation.

**3.9 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**3.10 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 06 10 00 01 Rough Carpentry – Short Form.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment.
  - .1 No measurement will be made under this section.
  - .2 Include wood treatment costs in item of new treated timber curb in Section 06 10 00 Rough Carpentry – Short Form.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA O80 Series-97(R2002) - O80S2-05, Wood Preservation.
  - .2 CSA O80.20-1.1-M97(R2002), This Standard applies to the fire-retardant treatment of lumber by pressure processes..
  - .3 CSA O80.201-M89, This Standard covers hydrocarbon solvents for preparing solutions of preservatives.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Quality assurance submittals:
  - .1 Submit certificates in accordance with Section 01 11 05 – General Instructions
  - .2 For products treated with preservative by pressure impregnation submit following information certified by authorized signing officer of treatment plant:
    - .1 Information listed in AWPA M2 and revisions specified in CSA O80 Series, Supplementary Requirement to AWPA M2 applicable to specified treatment.
    - .2 Moisture content after drying following treatment with water-borne preservative.

**1.5 QUALITY ASSURANCE**

- .1 Plant inspection of products treated with preservative by pressure impregnation may be carried out by designated testing laboratory to AWPA M2, and revisions specified in CSA O80 Series, Supplementary Requirements to AWPA M2.
- .2 Each piece of lumber to be identified by CSA O322 certified stamp.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse or recycling.

**Part 2            Products**

**2.1                MATERIALS**

- .1        Preservative: to CSA-O80 Series.

**Part 3            Execution**

**3.1                APPLICATION: PRESERVATIVE**

- .1        Treat timber curbs and spacers to CSA O80 Series 97 Wood Preservations Standards using chromated copper arsenate preservative to obtain minimum net retention of 6.4 kg/m<sup>3</sup> of wood.
- .2        Following water-borne preservative treatment, dry material to maximum moisture content of 19%.

**3.2                APPLICATION: FIELD TREATMENT**

- .1        Comply with AWP A M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWP A M2.
- .2        Remove chemical deposits on treated wood to receive applied finish.

**END OF SECTION**

**Part 1            General**

**1.1            MEASUREMENT FOR PAYMENT**

- .1      Payment for the treated timber curb shall be per linear meter supplied and installed, including riser blocks.
- .2      Preservative treatment and fasteners shall be deemed incidental and included with the treated timber item.

**1.2            RELATED REQUIREMENTS**

- .1      Section 06 05 73 – Wood Treatment.

**1.3            REFERENCES**

- .1      CSA International
  - .1      CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
  - .2      CSA O141-05(R2009), Softwood Lumber.
  - .3      CAN/CSA-Z809-08, Sustainable Forest Management.
- .2      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1      Material Safety Data Sheets (MSDS).
- .3      National Lumber Grades Authority (NLGA)
  - .1      Standard Grading Rules for Canadian Lumber 2010.

**1.4            ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 11 05 – General Instructions.

**1.5            QUALITY ASSURANCE**

- .1      Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2      Sustainable Standards Certification:
  - .1      Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

**1.6            DELIVERY, STORAGE, AND HANDLING**

- .1      Waste Management and Disposal:
  - .1      Separate waste materials for reuse or recycling.



**Part 2 Products**

**2.1 LUMBER MATERIAL**

- .1 Lumber: unless specified otherwise, Group A Douglas Fir, rough sawn for curbs, moisture content 19% or less in accordance with following standards:
  - .1 Grade: No.2 or better.
  - .2 CSA O141.
  - .3 NLGA Standard Grading Rules for Canadian Lumber; BCLMA Grading Authority.

**2.2 ACCESSORIES**

- .1 Nails, spikes and staples: to CSA B111.
- .2 Bolts: 19 mm diameter unless indicated otherwise, complete with nuts and washers, galvanized.

**2.3 FINISHES**

- .1 Galvanizing: to ASTM A123/A123M, use galvanized fasteners for exterior work pressure-preservative treated lumber.

**2.4 WOOD PRESERVATIVE**

- .1 Refer to Section 06 05 73 Wood Treatment.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

**3.2 INSTALLATION**

- .1 Comply with requirements of NBC, supplemented by the following paragraphs.
- .2 Install new treated timber curbs and spacers as indicated and secure using galvanized anchor bolts c/w nuts and washer.

**3.3 ERECTION**

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 MEASUREMENT FOR PAYMENT**

- .1 Payment for mechanical works at the Marginal and Transitional Wharfs shall be by lump sum and shall include all labour, equipment and materials required to do, but not limited to, the following:
  - .1 Disconnect and remove existing domestic water piping and all other redundant piping from wharf to facilitate renovations. Abandon existing poly pipe in Marginal Wharf.
  - .2 Provide new domestic water piping complete with new pipe supports, valves, etc. and install in new utilidor.
  - .3 Reconnect new domestic water piping to existing domestic water piping on float wharves as indicated.

**1.2 RELATED SECTIONS**

**1.3 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 11 05 – General Instructions.
- .2 Shop drawings; submit drawings stamped and signed by responsible individual from office of installing contractor.
- .3 Submit shop drawings as defined in the General Conditions of the Contract for the following equipment:
  - .1 Stainless steel valves.
  - .2 Stainless steel domestic water piping and clamps
  - .3 Plumbing specialties
- .4 Shop drawings to show:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances.
- .5 Shop drawings and product data accompanied by:
  - .1 Detailed drawings of bases, supports, and anchor bolts.
  - .2 Manufacturer to certify current model production.
  - .3 Certification of compliance to applicable codes.
- .6 Closeout Submittals:
  - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 11 05 – General Instructions.
  - .2 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.
  - .3 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

- .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.
  - .2 Make changes as required and re-submit as directed by Consultant.
- .5 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .6 Site records:
  - .1 Consultant will provide 1 set of mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems.
  - .2 Transfer information to drawings, revising as required to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .7 As-built drawings:
  - .1 Prior to final acceptance, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Consultant for approval and make corrections as directed.
  - .4 Submit completed as-built drawings with Operating and Maintenance Manuals.

#### **1.4 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and deposit at local recycling depot.

**Part 2            PRODUCTS**

**2.1            N/A**

**Part 3            Execution**

**3.1            PROTECTION**

- .1    Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 23 05 00 – Common Work Results.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 No measurement will be made under this Section.
  - .1 Include pipe installation costs in Section 25 05 00 –Common Work Results Mechanical

**1.3 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic and corrugated cardboard packaging material for recycling.
- .4 Divert unused metal materials from landfill to metal recycling facility.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 CLEARANCES**

- .1 Provide clearance around components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
- .2 Provide space for disassembly, removal of components as recommended by manufacturer or as indicated (whichever is greater).

**3.2 DRAINS**

- .1 Install drain valves in piping systems where indicated complete with isolating valves.

**3.3 PIPEWORK INSTALLATION**

- .1 Screwed fittings jointed with Teflon tape.
- .2 Protect openings against entry of foreign material.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Valves:
  - .1 Install in accessible locations.
  - .2 Install with stems above horizontal position unless otherwise indicated.
  - .3 Valves shall be accessible for maintenance without removing adjacent piping.
  - .4 Use butterfly valves at branch take-offs for isolating purposes except where otherwise specified.

**3.4 FLUSHING OUT OF PIPING SYSTEMS**

- .1 Before start-up, clean interior of piping systems in accordance with requirements of authority having jurisdiction.

**3.5 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK**

- .1 Pework: Test at 1-1/2 times normal operating pressure.
- .2 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time by authority having jurisdiction.
- .3 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure.
- .4 Pay costs for repairs or replacement, retesting, and making good. Consultant shall determine whether repair or replacement is appropriate.

**3.6 EXISTING SYSTEMS**

- .1 Connect into existing piping systems at times approved by Consultant.
- .2 Request written approval 10 days minimum prior to commencement of work.
- .3 Ensure daily clean-up of existing areas.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

**.1 Section Includes:**

.1 Stainless Steel - valves.

**.2 Related Sections:**

.1 Section 01 11 05 – General Instructions.

.2 Section 23 05 01 - Installation of Pipework.

**1.2 PRICE AND PAYMENT PROCEDURES**

**.1 Measurement and Payment:**

.1 No measurement will be made under this Section.

.1 Include valve costs in Section 25 05 00 –Common Work Results  
Mechanical

**1.3 REFERENCES**

**.1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).**

.1 ANSI/ASME B1.20.1-1983(R2001), Pipe Threads, General Purpose (Inch).

.2 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.

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

.1 ASTM A276-04, Specification for Stainless Steel Bars and Shapes.

.2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.

.3 ASTM B283-99a, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).

.4 ASTM B505/B505M-02, Specification for Copper-Base Alloy Continuous Castings.

**.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).**

.1 MSS-SP-25-1998, Standard Marking System for Valves, Fittings, Flanges and Unions.

.2 MSS-SP-80-2003, Bronze Gate Globe, Angle and Check Valves.

.3 MSS-SP-110-1996, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

**1.4 SUBMITTALS**

.1 Submittals in accordance with Section 01 11 05 – General Instructions.

.2 Product Data:

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit data for valves specified in this section.
- .3 Closeout Submittals:
  - .1 Submit maintenance data for incorporation into manual specified in Section 01 11 05 – General Instructions.

## **1.5 QUALITY ASSURANCE**

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **1.6 DELIVERY STORAGE AND DISPOSAL**

- .1 Waste Management and Disposal:
- .2 Collect and separate for disposal paper, plastic and corrugated cardboard packaging material for recycling.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Valves:
  - .1 Except for specialty valves, to be single manufacturer.
- .2 End Connections:
  - .1 Connection into adjacent piping/tubing:
    - .1 Steel pipe systems: Screwed ends to ANSI/ASME B1.20.1.
- .3 Ball Valves:
  - .1 NPS 2 and under:
    - .1 Body and cap: investment cast 316 stainless steel.
    - .2 Pressure rating: 1000 psig.
    - .3 Connections: Screwed ends to ANSI B1.20.1 with hexagonal shoulders.
    - .4 Stem: 316 stainless steel.
    - .5 Ball and seat: 316 stainless steel solid ball and Teflon seats.
    - .6 Stem seal: Teflon with external packing nut.
    - .7 Operator: lockable lever handle.



**Part 3          Execution**

**3.1            INSTALLATION**

- .1      Install valves in upright position with handle horizontal.
- .2      Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal where required.

**END OF SECTION**

**Part 1 General****1.1 SUMMARY****.1 Section Includes.**

.1 Materials and installation for stainless steel piping for domestic water service.

**.2 Related Sections.**

- .1 Section 01 11 05 – General Instructions.
- .2 Section 01 35 29.06 - Health and Safety Requirements.
- .3 Section 21 05 01 - Common Work Results for Mechanical.
- .4 Section 23 05 01 - Installation of Pipework.
- .5 Section 23 05 23 01 - Valves – Stainless Steel

**1.2 PRICE AND PAYMENT PROCEDURES****.1 Measurement and Payment:**

.1 No measurement will be made under this Section.

- .1 Include pipe costs in Section 25 05 00 –Common Work Results Mechanical

**1.3 REFERENCES****.1 American Society of Mechanical Engineers (ASME).**

- .1 ASME B16.1-98, Cast Iron Pipe Flanges and Flanged Fittings.
- .2 ASME B16.3-98, Malleable Iron Threaded Fittings.
- .3 ASME B16.5-03, Pipe Flanges and Flanged Fittings.
- .4 ASME B16.9-01, Factory-Made Wrought Butt welding Fittings.
- .5 ASME B18.2.1.03, Square and Hex Bolts and Screws (Inch Series).
- .6 ASME B18.2.2-87(R1999), Square and Hex Nuts (Inch Series).

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

- .1 ASTM A47/A47M-99, Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A53/A53M-02, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- .3 ASTM A536-84(1999) e1, Standard Specification for Ductile Iron Castings.
- .4 ASTM B61-02, Standard Specification for Steam or Valve Bronze Castings.
- .5 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .6 ASTM E202-00, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

**.3 American Water Works Association (AWWA).**

- .1 AWWA C111-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International).
  - .1 CSA B242-M1980(R1998), Groove and Shoulder Type Mechanical Pipe Couplings.
  - .2 CAN/CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).
- .5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-67-025, Butterfly Valves.
  - .2 MSS-SP-70-98, Cast Iron Gate Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-71-97, Cast Iron Swing Check Valves Flanged and Threaded Ends.
  - .4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
  - .5 MSS-SP-85-02, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

#### **1.4 SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01 11 05 – General Instructions.
- .2 Closeout Submittals.
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 11 05 – General Instructions.

#### **1.5 QUALITY ASSURANCE**

- .1 Health and Safety.
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal.
  - .1 Separate waste materials for recycling.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Collect and separate for disposal paper, plastic and corrugated cardboard packaging material for recycling.
  - .4 Fold up metal banding, flatten and recycle.

### **Part 2 Products**

#### **2.1 PIPE**

- .1 Stainless steel pipe: to ASTM A312, as follows:
  - .1 To NPS 2: Sch. 40, 304.

**2.2 PIPE JOINTS**

- .1 NPS2 and under: screwed fittings with PTFE tape.

**2.3 FITTINGS**

- .1 Screwed fittings: 304 stainless steel to ASTM A351, MSS-SP-114, Class 150.
- .2 Ball valves:
  - .1 NPS2 and under: as specified Section 23 05 23.01 - Valves – Stainless Steel.

**Part 3 Execution**

**3.1 PIPING INSTALLATION**

- .1 Install pipework in accordance with Section 23 05 01 - Installation of Pipe Work.

**3.2 CLEANING, FLUSHING AND START-UP**

- .1 In accordance with requirements of authority having jurisdiction.

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

**.1 Section Includes:**

- .1 The supply and installation of Hydronic Specialties Equipment.

**.2 Related Sections:**

- .1 Section 01 11 05 - Submittal Procedures.
- .2 Section 01 35 29.06 - Health and Safety Requirements.

**1.2 PRICE AND PAYMENT PROCEDURES**

**.1 Measurement and Payment:**

- .1 No measurement will be made under this Section.
  - .1 Include plumbing specialties costs in Section 25 05 00 –Common Work Results Mechanical

**1.3 REFERENCES**

**.1 American Society of Mechanical Engineers (ASME).**

- .1 ASME- 04, Boiler and Pressure Vessel Code.

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

- .1 ASTM A47/A47M-99, Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A278M-01, Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (345 degrees C).
- .3 ASTM A516/A516M-96(e1), Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
- .4 ASTM A536-84(1999) e1, Specification for Ductile Iron Castings.
- .5 ASTM B62-93, Specification for Composition Bronze or Ounce Metal Castings.

**.3 Canadian Standards Association (CSA International).**

- .1 CSA B51-0, Boiler, Pressure Vessel, and Pressure Piping Code.

**1.4 SUBMITTALS**

**.1 Submittals in accordance with Section 01 11 05 - Submittal Procedures.**

**.2 Product Data:**

- .1 Submit shop drawings and product data in accordance with Section 01 11 05 – General Instructions.

**.3 Closeout Submittals:**

- .1 Submit maintenance data in accordance with Section 01 11 05 – General Instructions.

**1.5 QUALITY ASSURANCE**

**.1 Health and Safety:**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.6 DELIVERY STORAGE AND DISPOSAL**

**.1 Waste Management and Disposal:**

- .1 Separate waste materials for recycling.  
.2 Collect and separate for disposal paper, plastic and corrugated cardboard packaging material for recycling.

**Part 2 Products**

**2.1 HOSE CONNECTION VACUUM BREAKER**

- .1 Brass body with screwed end connections.  
.2 Stainless steel internals.  
.3 Rubber diaphragm and disc.

**Part 3 Execution**

**3.1 GENERAL**

- .1 Install as indicated and to manufacturer's recommendations.  
.2 Maintain proper clearance to permit service and maintenance.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 MEASUREMENT FOR PAYMENT**

- .1 Payment for electrical works at the Marginal and Transitional Wharfs shall be by lump sum and shall include all labour, equipment and materials required to do, but not limited to, the following:

**A. POWER TO MAIN WHARF**

- .1 At the Main Distribution Cabinet locate the three circuit breakers currently providing power to the Main Wharf and position the circuit breakers to the 'OFF' position.
- .2 Locate the three existing direct buried teck cables providing power to the main wharf.
- .3 The marginal wharf and transitional wharf is to be excavated for resurfacing. Coordinate with the general contractor to expose the three existing teck cables. Oversee the method of excavation to ensure the teck cables are not damaged.
- .4 Once the three teck cables have been exposed cut the three teck cables at starting point of main wharf. Pull back the three teck cables to the starting point of the marginal wharf renovation near the tourist information center.
- .5 Provide a new trench as indicated. The trench is to start near the tourist information center and end at the new splitter box concrete base provided by others.
- .6 Install the three existing teck cables in the trench and stub up into the new concrete pad for the new splitter box. The concrete pad is to be provided by others.
- .7 Prior to covering up or backfilling of the ducts ensure the electrical inspection department has been notified and permission to cover has been granted.
- .8 Cover up and backfill the trench.
- .9 Supply and install a new splitter box
- .10 Terminate the three teck direct buried teck cables to the bus bars in the new splitter box. Provide lugs and all required accessories.
- .11 Terminate the three free air teck cables on the main wharf utilidor to the bus bars in the new splitter box. Provide lugs and all required accessories.
- .12 Provide fittings as required for the teck cables exiting the new splitter box to ensure the Nema 3R rating of the splitter box is maintained.
- .13 Confirm continuity of each of the three circuits.
- .14 Turn the three circuit breakers in the Main Distribution Cabinet to the 'ON' position to re-establish power to the Main Wharf.

**B. SPARE DUCTS TO DOCK 'A' AND DOCK 'B'**

- .1 Existing direct buried teck cables to Dock 'B', Dock 'A' and Panel 'J1' are to remain as is. Locate teck cables and coordinate with general contractor to ensure the teck cables are not damaged during the excavation of the marginal wharf.
- .2 The power feed for the teck cables originates at Panel 'J'. Position the circuit breakers to the 'OFF' position during the excavation of the marginal wharf.
- .3 Provide a trench for the installation of three new direct buried ducts for Dock 'A'.
- .4 Provide a trench for the installation of three new direct buried ducts for Dock 'B'.
- .5 Provide three new direct buried 100mm diameter DB2 PVC ducts in each of the two trenches. The ducts are to be stubbed up at the face of the existing concrete support for the fence surrounding the fuel compound as indicated. The other end of the ducts are to exit the face of the steel sheet piling at locations indicated.
- .6 Provide a polypropylene fish wire in each duct.
- .7 Provide a duct plug and end cap at each end of the six newly installed ducts.
- .8 Prior to covering up or backfilling of the ducts ensure the electrical inspection department has been notified and permission to cover has been granted.
- .9 Cover up and backfill the trench.

**C. INSTALLATION OF NEW LIGHT STANDARDS AT CENTER WHARF**

- .1 Provide and install 5 new light standards for the center wharf.
- .2 Orientate the handhole in the pole so that it is accessible from the wharf.
- .3 Concrete bases for the light standards to be provided by others.

**1.2 RELATED SECTIONS**

- .1 Painting and finishing for electrical work: as specified.

**1.3 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with the General Conditions of the Contract and as specified in each section of Division 26.

**1.4 AS-BUILT DRAWINGS**

- .1 Submit "as built" drawings in accordance with the specifications.
- .2 Colour code changes using red for additions, and green for deletions.



## **1.5 REGULATORY REQUIREMENTS**

- .1 Materials and workmanship shall be in accordance with requirements and recommendations of applicable rules, regulations, standards and codes as specified hereunder. All products shall bear certification label of CSA, ULC, The Electrical Safety Authority, as applicable.

The Electrical Safety Code (OESC)-publication containing Canadian Electrical Code and The Electrical Safety Authority Supplements.

Underwriter's Laboratories of Canada (ULC)

National Building Code (NBC)

National Fire Code (NFC)

- .2 Permits, Fees and Certificates: Except as provided in the General Conditions of the Contract, give notices, obtain permits, pay fees required for work of Division 26. Before final certificate of payment is issued by Owner, furnish certificates as evidence that work installed conforms with laws and regulations of all governing authorities. Determine detailed requirements of local authorities having jurisdiction and conform to those requirements.

- .3 Qualifications

- .1 Work shall be executed by Electrical Contractor or his designated sub-contractor, holding a valid Contractors' license (Master License).
- .2 Work shall be performed by qualified Electricians holding valid certificates of qualifications.
- .3 Work on signal, communication, related control and other similar systems shall be performed by relevant competent tradesmen.

## **1.6 PROJECT/SITE CONDITIONS**

- .1 Existing Conditions

- .1 Examine Site and Contract Documents in accordance with Instructions to Bidders.
- .2 Electrical installations in areas classified as hazardous locations, corrosive environments, and other special area application, shall be governed by relevant Industry Standards and Regulatory Requirements.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Inserts: Supply and deliver inserts, anchors, bolts, sleeves, ferrules and other items to be built into work of other Divisions, with necessary templates, adequate instructions and assistance for locating and installing.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Where any parts of systems and/or pieces of equipment are located by dimensions on Drawings, check and verify such dimensions at Site.
- .2 Notify Owner's Designee before proceeding further if any discrepancy or interference with other equipment is found which will necessitate revision in or deviation from Work as indicated or specified.
- .3 Location of conduit, raceways, wiring and other equipment shall be altered without charge to Owner if so directed by Owner's Designee provided change is ordered before installation, and does not necessitate additional labour and material.

### **3.2 INSTALLATION**

- .1 Instruct and supervise other Sections doing related work.
- .2 Electrical products and methods of installation shall be in accordance with relevant Sections of Division 26, and applicable requirements of other Divisions.
- .3 Correct installed work as directed by authorized inspector of such authorities.
- .4 Notwithstanding the General Conditions of the Contract, no increase to Contract Price shall apply for electrical items relocated from location indicated and prior to installation requiring extra labour and material up to 3 meters (10'-0") from original location, nor will decrease to Contract Price apply where relocation up to 3 meters (10'-0") reduces materials and labour.

### **3.3 SYMBOLS**

- .1 Electrical work is indicated generally on Drawings using standard symbols.

### **3.4 MOUNTING HEIGHTS**

- .1 Heights are subject to change to suit Site conditions, and therefore as work progresses, and before installing equipment, obtain instructions or directions from Owner's Designee for alternative heights or relocation.

### **3.5 MOUNTING OF EQUIPMENT**

- .1 The method of mounting existing equipment to be submitted to Engineer for review and approval.

### **3.6 Grounding**

- .1 Ground electrical equipment in accordance with requirements of The Electrical Safety Authority Electrical Safety Code.
- .2 Arrange grounds so that under normal operating conditions, no injurious amount of current will flow in any grounding conductor. Connect single phase loads so that there is least possible unbalance of supply.

### **3.7 FIELD QUALITY CONTROL**

- .1 Trial Usage
  - .1 Trial usage by Owner's Designee of any electrical device, machinery, apparatus, equipment and other work supplied under this Division before final completion and written acceptance by Owner's Designee is not to be construed as evidence of acceptance by Owner.
  - .2 Owner shall have privilege of such trial usage as soon as Contractor claims that said work is completed, in accordance with Drawings and specifications for such reasonable length of time as Owner's Designee deems sufficient for making a complete test.
  - .3 No claim for damage shall be made for injury to or breaking of any parts of such tested work, whether caused by weakness or inaccuracy of structural parts or by defective materials or workmanship of any kind whatsoever.
- .2 Tests
  - .1 At completion of installation, conduct grounding resistance test, voltage test, and empty conduit test in presence of Owner's Designee and make corrections where necessary and as directed.
  - .2 Voltage provided to equipment in installation shall not exceed minimum and maximum permissible limits for equipment.
  - .3 Perform insulation tests for installed wiring and equipment with appropriate "Megger" testing equipment. Megger lighting and power circuit feeders and if resistance to ground is less than recommendations on any lighting or power circuit, consider such circuit defective and replace it.
  - .4 Test performance of equipment for mechanical and electrical defects. Make adjustments necessary for such equipment. When equipment has been placed in permanent operation give to operating personnel all necessary tuition and instructions for its operation and maintenance.
  - .5 Test conduits which are required to be installed but left empty for clear bore, using ball mandrel, brushes and snake. Use lignum vitae ball of diameter equal to approximately 85% of conduit inside diameter. Clear any conduit which rejects ball mandrel in an approved

manner and without damage thereto.

- .6 Furnish labour, materials, instruments and bear other costs in connection with all tests, obtain required certificates of approval, acceptance, and compliance with regulations of agencies having jurisdiction and as specified. Work shall not be deemed complete and final certificate of acceptance will not be issued, until such certificates have been delivered to Owner's Designee.

### **3.8 CLEANING**

- .1 Ensure no foreign objects, tools, and materials are left inside switchgears, cabinets, panelboards, control panels and similar enclosures before such equipment is energized.
- .2 Refer to specifications for other applicable final clean-up requirements.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 MEASUREMENT FOR PAYMENT**

- .1 No measurements will be made under this section.
- .2 Payment under this section shall be incidental and are deemed to be included with Section 26 05 01 Common work results – Electrical.
- .1 Conform to Sections of division 01 as applicable.
- .2 Conform to Section 26 05 01 – Common Work results – Electrical as applicable.

**1.2 REFERENCES**

CSA C22.2 No. 29	Panelboards
CSA C22.2 No. 131	Teck 90 Cables
CSA C22.2 No.211.1	PVC DB2 Duct

**1.3 SUBMITTALS - Submit shop drawings as defined in the General Conditions of Contract for following equipment;**

- .1 Ducts
- .2 Wire and Cables
- .3 Conduit Plug and End Cap
- .4 Splice Box
- .5 Light Standard
- .6 Light Pole

**Part 2 PRODUCTS**

**2.1 MATERIALS AND EQUIPMENT**

- .1 Ducts
  - .1 PVC DB2 Duct to CSA C22.2 No. 211.1.
- .2 Wires and Cables, and Accessories
  - .1 Multi-conductor Teck 90 cables to CSA Standard C22.2 No. 131. Aluminum sheathed cable, sized as indicated with copper conductors, 1000 volt insulation, aluminum sheath applied to form continuous corrugated seamless sheath free from holes or defects with an outer jacket of PVC applied over sheath. Cable to be rated for minus 40°C temperature.

- .2 Compression Connectors: Properly sized for joining conductors and insulated, or as recommended by cable manufacturer, Burndy, Ideal, G & W Electric, Ilasco, Joslyn, Thomas & Betts, and others.
- .3 Conduit Plug and End Cap
  - .1 Plug with pulling eye and end cap for 100mm diameter DB2 PVC Duct.  
  
Royal Building Product Cat. No. PLUG04 (Plug) or Approved Equal  
Royal Building Product Cat. No. CAP04 (End Cap) or Approved Equal
- .4 Splitter Box
  - .1 Pad mount splitter box. Details as follows;
    - A. 600 volt, 3 phase, 3-wire
    - B. Bus rating: 200 amps minimum
    - C. Splitter to accommodate three individual 600 volt, 3 phase, 3 -wire circuits
    - D. Each splitter section to have its own incoming and outgoing cable section
    - E. Nema 3R rated enclosure
    - F. Padlockable handle c/w 3 point, latch, rods and guides
    - G. Common ground bus
    - H. 12 gauge steel
    - I. Zinc rich primer and two coats of special epoxy paint
    - J. Neoprene gasket
    - K. ASA #61 gray finish
    - L. Lamacoid Nameplate: 'MAIN WHARF SPLITTER BOX'  
Littelfuse Cat. No. CSTE 431-PMA-3WAY or Approved Equal
- .5 Light Standard

LED high performance, high efficacy, long life luminaire, cool white colour temperature, type short distribution, round pole mounting, Nema twist-lock receptacle, photocell, natural aluminum finish, integral slip fitter for tenon mounting, 100,000 hours expected life service.

Lithonia Cat. No.  
DSXO - 20C -1000 - 40K - T2S – RPA – PER - DLL127F1.5JU - DNAXD - AST20-190  
(no equal)
- .6 Light Pole

20 foot high round tapered aluminum pole complete with cast aluminum pole cap, satin aluminum finish, internal damper for 2nd mode vibration dampening, grounding provision, reinforced handhole with cover, 9.5 inch bolt circle diameter, tenon mounting.

Hapco Cat. No. RTA20C6B4-01(tenon mount) (no equal)

### **Part 3 EXECUTION**

#### **3.1 INSTALLATION**

##### **.1 Ducts**

- .1 Install ducts direct buried in trenches. Place pull cord in ducts.**
- .2 Provide all fittings as required to ensure a reliable installation.**
- .3 Use a mitre saw or a saw guide to ensure a square cut. Deburr the cut end using a knife or a file.**
- .4 Protect conduits from damage where they stub out of the concrete and provide sleeves in advance of concrete, pour, where conduits pass through slab.**
- .5 Raceway systems to be completely installed , dry and clean before pulling conductors.**
- .6 Install a continuous plastic marker tape above the direct buried electrical cables in ducts to show location of the cable to prevent damage that might be caused by future excavations in the vicinity.**

##### **.2 Wires and Cables and Accessories**

- .1 Install wires and cables in accordance with Canadian Electrical Code requirements and other regulatory bodies having jurisdiction.**
- .2 Terminate conductors using approved wire terminating materials and accessories.**

##### **.3 Conduit Plug and End Cap**

- .1 Six empty ducts complete with pull cords will be installed at the Marginal wharf. Install conduit plug and end cap at ends of each of the ducts to prevent water ingress.**
- .2 Refer to manufacturer's instructions when installing components.**

##### **.4 Splitter Box**

- .1 Install splitter box on concrete pad as indicated.**
- .2 Connect main wharf cables to bus bars in splitter box. Terminate conductors using approved wire terminating materials and accessories.**

##### **.5 Light Standards**

- .1 Provide and install 5 new light standards for the center wharf.**
- .2 Orientate the handhole so that it is accessible from the wharf.**
- .3 Concrete bases for the light standards to be provided by others.**

### **3.2 TRENCHING**

- .1 Excavate trench with suitable machinery to depths and dimensions as shown in trench details. Trench details are provided as a guide only. Electrical contractor to confirm all depths are compliant with manitoba Electrical safety code.
- .2 Provide vinyl marker tape mounted halfway between cable installation and grade level.
- .3 Cut and trim sides of trenches evenly and as near vertical as possible and shore as required to prevent cave-in.
- .4 Keep bottom of trench clean and clear of loose material and slope or grade as required.
- .5 Sandfill shall be uniformly graded clean sand with a maximum aggregate size of 2.00 mm and maximum of 8% passing the number of 200 sieve.
- .6 No covering up or backfilling of electrical equipment shall be performed until the Electrical Inspector has been notified and permission to cover has been granted.
- .7 Backfill trenches to the satisfaction of the owner.

### **3.3 TESTING AND INSPECTION**

- .1 Conduct visual inspection at times for signs of physical damages or defects prior to and after installation.
- .2 Test installed equipment and wiring for grounds and short-circuit upon completion of work. See also Section 26 05 01 – Common Work Results - Electrical for additional instructions.

**END OF SECTION**



**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 43 – Environmental Procedures.
- .2 Section 26 05 01 – Common Work Results Electrical

**1.2 MEASUREMENT OF PAYMENT**

- .1 Excavated materials will be by lump sum and shall include all labour, equipment and materials required to excavate to the limits indicated and dispose excavated materials off site, including trenches for underground services.
- .2 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment.
- .3 Payment for geotextiles shall be as per Section 31 32 19 – Geotextiles.
- .4 Payment for backfilling using new 'A' limestone shall be as per Section 32 11 23 – Aggregate Base Courses.
- .5 Payment for backfilling using new 'B' limestone shall be as per Section 32 11 23 – Aggregate Base Courses.
- .6 Payment for backfilling using new backfill shall be as per Section 32 11 23 - Aggregate Base Courses.
- .7 Payment for backfilling trenches shall be included in the new 'B' limestone item.
- .8 Payment for sandfill for bedding material and surround at underground services shall be deemed incidental and shall be included in the electrical item, as per Section 26 05 01 - Common Work Results Electrical
- .9 Payment for backfilling using new clean stone at the soakaway pit shall be as per Section 32 11 23 -Aggregate Base Courses.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-05 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-63 2002, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

- .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

#### **1.4 DEFINITIONS**

- .1 Excavation classes: one class of excavation will be recognized; common excavation.
  - .1 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .3 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .4 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .5 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 ASTM C136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

#### **1.5 SUBMITTALS**

- .1 Quality Control:
  - .1 Submit for review by Engineer proposed dewatering methods as described in PART 3 of this Section.
  - .2 Submit to Engineer written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
  - .3 Submit to Engineer written notice when bottom of excavation is reached.
  - .4 Submit to Engineer testing results as described in PART 3 of this Section.
- .2 Preconstruction Submittals:
  - .1 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, and location plan of relocated and abandoned services, as required.

#### **1.6 QUALITY ASSURANCE**

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Keep design and supporting data on site.
- .3 Engage services of qualified professional Engineer who is registered or licensed in Province of Manitoba, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

**.4 Health and Safety Requirements:**

- .1 Do construction occupational health and safety in accordance with Provincial standards.**

**1.7 EXISTING CONDITIONS****.1 Buried services:**

- .1 Before commencing work verify location of buried services on and adjacent to site.**
- .2 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.**
- .3 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before removing or re-routing.**
- .4 Record location of maintained, re-routed and abandoned underground lines.**

**.2 Existing buildings and surface features:**

- .1 Conduct, with Engineer, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.**
- .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Engineer.**

**Part 2 Products****2.1 MATERIALS**

- .1 Geotextiles: Section 31 32 19.01 - Geotextiles**
- .2 Base Course: Section 32 11 23 - Aggregate Base Courses**
- .3 Sandfill: Uniformly graded clean sand with maximum aggregate size of 2.0 mm and maximum 8% passing the number 200 sieve.**

**Part 3 Execution****3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

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

**3.2 SITE PREPARATION**

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

**3.3 PREPARATION/PROTECTION**

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Protect buried services that are required to remain undisturbed.

**3.4 DEWATERING**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Engineer approval details of proposed dewatering methods, including dikes, well points, and sheet pile cut-offs.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.

**3.5 EXCAVATION**

- .1 Advise Engineer at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
  - .1 In addition, remove all topsoil, organic matter, debris, and other loose and harmful matter encountered at subgrade level.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Excavate trenches to provide uniform continuous bearing and support for 250 mm thickness of bedding material.
- .5 Dispose of surplus and unsuitable excavated material off site.
- .6 Base of excavations to be free from loose, soft or organic matter.
- .7 Notify Engineer when bottom of excavation is reached.
- .8 Obtain Engineer approval of completed excavation.
- .9 Correct unauthorized over-excavation, and fill all exposed voids, as follows:
  - .1 Fill with Granular B Limestone material compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .10 Level and compact base of excavation to 95% SPD to ensure a smooth profile free of sharp edges.
- .11 Install geotextile at limits of excavation, as indicated on the Drawings and in accordance with Section 31 32 19.01 - Geotextiles.

**3.6 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated and specified below.
  - .1 Marginal Wharf (Area Below Removed Concrete Slab)
    - .1 Proof roll subgrade and compact to 95% SPD.
    - .2 Provide 300 mm new 'B' limestone granular material.

- .3 Compact subbase course in 150 mm lifts to 98% SPD.
- .4 Provide 150 mm new 'A' limestone granular material.
- .5 Compact base course in 150 mm lift to 100% SPD.
- .2 Marginal Wharf (All Other Areas)
  - .1 Proof roll subgrade and compact to 98% SPD.
  - .2 Provide 150 mm new 'A' limestone granular material.
  - .3 Compact base course in 150 mm lift to 100% SPD.
- .3 Transitional Wharf
  - .1 Place new backfill behind the new steel sheet pile to elevation indicated.
  - .2 Compact backfill in 150 mm lifts to 95% SPD.
  - .3 Provide 300 mm new 'B' limestone granular material.
  - .4 Compact subbase in 150 mm lifts to 98% SPD.
  - .5 Provide 150 mm new 'A' limestone granular material.
  - .6 Compact base course in 150 mm lift to 100% SPD.
- .4 Soakaway Pit
  - .1 Place new clean stone at soakaway pit wrapped in geotextile.
  - .2 Provide compactive effort to solidify stone assembly.
- .5 In Trenches
  - .1 Provide 250 mm thick sandfill for bedding material and surround at underground services, as indicated.
  - .2 Provide new limestone 'B' granular material as indicated. Compact in 150 mm lifts to 98% SPD.
- .6 Tie-Rods
  - .1 Provide 450 mm new 'A' limestone around each tie-rod.
  - .2 Compact 'A' limestone to 100% SPD.

**3.7****BACKFILLING**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Engineer has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place granular backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

**3.8****RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris off site.

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT AND PAYMENT**

- .1 Payment for geotextiles shall be by square metres of surface covered by material. No allowance will be made for seams and overlaps.

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-4.2 No. 11.2-[2004], Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
  - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
    - .1 No.2-M85 Methods of Testing Geosynthetics - Mass per Unit Area.
    - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
    - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
    - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
    - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .2 Ontario Provincial Standard Specifications (OPSS)
  - .1 OPSS 1860-November 2010, Material Specification for Geotextiles.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 11 05 – General Instructions.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports:
  - .1 If requested, submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect geotextiles from direct sunlight and UV rays.
- .3 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 MATERIAL**

- .1 Non-woven geotextiles shall be Class II and consist of a manufactured sheet, web, or batt of directionally or randomly oriented fibres, filaments, or other elements produced by bonding or interlocking the elements by mechanical, thermal, or chemical means.
- .2 Tensile strength, Marv, minimum 660 N to CAN/CGSB 148.1, Method No. 7.3.
- .3 Elongation at break, typical, >50% to CAN/CGSB 148.1, Method No. 7.3.
- .4 Tear strength, MARV, minimum, 250 N to CAN/CGSB 4.2, Method No. 12.2.
- .5 Puncture strength, MARV minimum, 1375 N to ASTM D 6241.
- .6 Permittivity, minimum, to 0.05 CAN/CGSB 148.1, Method No. 4 s<sup>-1</sup>.
- .7 Ultraviolet stability, minimum, 50% retained tensile strength at 500 hours to ASTM D 4355.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Engineer.
  - .2 Inform Engineer of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 INSTALLATION**

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.
- .2 Place geotextile at the following locations:
  - .1 At the limit of excavation for asphalt and concrete areas where existing concrete slab has been removed, at the Marginal Wharf.
  - .2 At limit of excavation at the Transitional Wharf.
  - .3 Around clean stone at soakaway pit.
  - .4 At lake bottom behind new steel sheet piling.
  - .5 Beneath new rock protection at lake bed in front of new steel sheet piling.
  - .6 At corners of new steel sheet piling.
- .3 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 After installation, cover with overlying layer within 4 hours of placement.
- .7 Replace damaged or deteriorated geotextile to approval of Engineer.
- .8 Place and compact soil layers in accordance with Section 32 11 23 – Aggregate Base Courses.

### **3.3 CLEANING**

- .1 Progress Cleaning:
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.4 PROTECTION**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**



**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 32 19.01 - Geotextiles.
- .2 Section 32 11 23 - Aggregate Base Courses.

**1.2 MEASUREMENT PROCEDURES**

- .1 Payment for rock protection along base of new Transitional Wharf steel sheet piling shall be lump sum and shall include all labour, equipment and materials required to:
  - .1 Supply, place and consolidate rock protection materials as required.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C144-99, Standard Specification for Aggregate for Masonry Mortar.
  - .2 ASTM C618-00, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .2 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1-00, Concrete Materials and Methods of Concrete Construction.
  - .2 CAN/CSA-A3000-98, Cementitious Materials Compendium.

**Part 2 Products**

**2.1 STONE**

- .1 Hard, dense with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:
  - .1 Large rock protection to be used at base adjacent to the new steel sheet piling:
    - 1. Gradation requirements as follows:

Approximate Dimension of an Equivalent Cube in cm	Rock Protection
50.0	100
30.5	↑ Well- Graded
26.5	
21.0	

18.0	↓
15.5	
12.5	
10.5	0-10
10.0	-
6.0	-

## **2.2 GEOTEXTILE FILTER**

- .1 Geotextile: in accordance with Section 31 32 19.01 - Geotextiles.

### **Part 3 Execution**

## **3.1 PLACING**

### **3.1.1 Rock Protection Along Base of Sheet Piling**

- .1 Place rock protection at base of new steel sheet piling on lake bottom over new geotextile to length and thickness indicated.

**END OF SECTION**

**Part 1 General****1.1 MEASUREMENT FOR PAYMENT**

- .1 No measurement to be made under this section. For measurement refer to Section 31 62 16.13 Steel Sheet Piles.

**1.2 SUBMITTALS**

- .1 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .2 Submit schedule of planned sequence of driving to Engineer for review, as specified.
- .3 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in Province of Manitoba.
- .4 Equipment:
  - .1 Submit prior to pile installation for review by Engineer, list and details of equipment for use in installation of piles.
  - .2 Impact hammers: submit manufacturer's written data as specified.
  - .3 Non-impact methods; submit characteristics to evaluate performance.
- .5 Quality assurance submittals:
  - .1 Test reports: submit copy of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .3 Replace damaged piles as directed by Engineer.

**1.4 SCHEDULING**

- .1 Drive piles in what is considered most economical sequence.
- .2 Submit schedule of planned sequence of driving to Engineer for approval, not less than 2 weeks prior to commencement of pile driving.

**Part 2 Products****2.1 MATERIALS**

- .1 Material requirements for piles are specified in Section 31 62 16.13.

- .2 Supply full length piles and provide equipment of sufficient capacity to handle full length piles without cutting or splicing.
- .3 Do not splice piles without written permission from Engineer.
- .4 Pile lengths indicated on plans are based on lengths to be supplied. 300 mm to be cut off after installation of piles.

## **2.2 EQUIPMENT**

- .1 Impact hammers: provide manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.
- .2 Non-impact methods of installation such as augering, jacking, vibratory hammers or other means: provide full details of characteristics necessary to evaluate performance.
- .3 Hammer:
  - .1 Hammers to be selected on basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.
  - .2 Driveability analysis to include, but not be limited to, following: hammer, cushion, and cap block details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses and energy throughput at representative penetrations.
  - .3 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Protection:
  - .1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.
  - .2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures.
  - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation.
  - .1 Make provision for access and support of piling equipment during performance of Work.

### **3.2 INSTALLATION**

- .1 Leads: construct pile driver leads to provide free movement of hammer.
  - .1 Hold leads in position at top and bottom, with guys, stiff braces, or other means to ensure support to pile while being driven.
- .2 Followers:
  - .1 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.

- .3 Installation of each pile will be subject to approval of Engineer.
- .4 Drive each pile to pile tip elevation indicated on drawings.

### 3.3 APPLICATION / DRIVING

- .1 Hold piles securely and accurately in position while driving.
- .2 Deliver hammer blows along axis of pile.
- .3 Cut off piles neatly and squarely at elevations as indicated.
- .4 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
- .5 Remove cut-off lengths from site on completion of work.

### 3.4 DRIVING TOLERANCES

- .1 Pile heads to be within 75 mm of locations as indicated.
- .2 Piles not to be more than 2% of length out of vertical alignment.

### 3.5 REPAIR AND RESTORATION

- .1 Pull out rejected piles and replace with new piles.
  - .1 Remove rejected pile and replace with a new and if necessary, a longer pile.
  - .2 Engineer will reject any pile that is driven out of position, is driven below cut-off elevation, or is damaged during driving or handling.
- .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

### 3.6 FIELD QUALITY CONTROL

- .1 Measurement:
  - .1 Maintain accurate records of driving for each pile, including:
    - .1 Type and make of hammer, stroke or related energy.
    - .2 Other driving equipment including water jet, driving cap, cushion.
    - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
    - .4 Sequence of driving piles in group.
    - .5 Number of blows per metre for entire length of pile and number of blows per 10 mm for last 75 mm.
    - .6 Final tip and cut-off elevations.
    - .7 Other pertinent information such as interruption of continuous driving, pile damage.
    - .8 Record elevation taken on adjacent piles before and after driving of each pile.
  - .2 Provide Engineer with three copies of records.

### 3.7 CLEANING

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

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 02 41 13 Selective Site Demolition.
- .2 Section 03 30 00 Cast-In-Place Concrete Short Form
- .3 Section 05 50 00 Metal Fabrications
- .4 Section 23 05 00 Common Work Results Mechanical
- .5 Section 26 05 01 Common Work Results Electrical
- .6 Section 31 23 33 Excavating, Trenching and Backfilling
- .7 Section 32 11 23 Aggregate Base Courses

**1.2 MEASUREMENT FOR PAYMENT**

- .1 Payment for the supply of Z profile steel sheet piling will be measured in square metres of piling delivered to site.
- .2 Payment for the installation of Z profile steel sheet piling will be measured in square metres of piling remaining in place after cut-off. Piling will be measured in plane of bulkhead, calculated by multiplying straight horizontal centre line length of bulkhead measured at top of piles by average vertical length of piles installed and left in work.
- .3 Payment to provide new Dywidag tie rods shall be by each tie rod. Bearing plates, washers, and all other associated hardware to be included in the cost of the tie rods.
- .4 Payment to provide new steel waler shall be by linear metres. Nuts, pipe spacers, splice and corner plates, plate washers, tie bolts, and all other associated hardware shall be included in the lineal metre cost of the steel waler.
- .5 Payment to provide waler braces to existing steel sheet piling at the Main Wharf and Marginal Wharf shall be lump sum.
- .6 Payment to provide edge sheets consisting of bent plates to seal joints between the new and existing steel sheet piling shall be lump sum and shall include all labour, equipment, and materials required to:
  - .1 Weld bent plates above the waterline only.
  - .2 Provide concrete below waterline at interior of bent plate enclosure to seal corners.
- .7 Payment to remove existing sheet piling shall be lump sum and shall include all labour, equipment and material required to:
  - .1 Remove and dispose off site existing steel sheet piling at Transitional Wharf c/w steel tieback cables, steel pipe curb, and ladder.
  - .2 Remove and dispose off site top 0.1 metres of existing steel sheet piling at Marginal Wharf c/w steel pipe curb and steel cap channel to extents indicated.
  - .3 Provide extensions for fountain drain and artesian well drain.

**1.3 REFERENCES**

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

- .1 ASTM A6/A6M-02b, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- .2 ASTM A307-02, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- .3 ASTM A1011/A1011M-02, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .4 ASTM A328/A328M-07, Standard Specification for Steel Sheet Piling.
- .2 Canadian Standards Association (CSA International).
  - .1 CAN/CSA G40.20/G40.21-98, June 2000), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CSA W47.1-92(R2001), Certification of Companies for Fusion Welding of Steel Structures.
  - .3 CSA W47.1S1-M1989(R1998)], Supplement No.1-1989 to W47.1-1983, Certification of Companies for Fusion Welding of Steel Structures.
  - .4 CSA W59-M1989(R2001), Welded Steel Construction (Metal Arc Welding) (Metric Version).
  - .5 CSA W59S1-M1989(R1998)], Supplement No.1-M1989, Steel Fixed Offshore Structures, to W59-M1989, Welded Steel Construction (Metal Arc Welding).

#### **1.4 SUBMITTALS**

- .1 Submit shop drawings for following items:
  - .1 A plan layout of the steel sheet piling sections comprising the wall indicating all dimensions.
  - .2 A plan layout of the tie rods and anchors.
  - .3 Details of the steel sheet piling sections including welding details for plates.
  - .4 Special details for corners and bends in the wall.
  - .5 Details for all miscellaneous steel elements.
- .2 At least 2 weeks prior to fabrication, submit to Engineer, 2 copies of steel producer certificates in accordance with ASTM A1011/A1011M, and mill test reports in accordance with CAN/CSA-G40.20/G40.21.

#### **1.5 QUALITY ASSURANCE**

- .1 Inspection and testing of steel sheet piling material may be carried out by testing laboratory designated by Engineer at any time during course of Work.
- .2 Materials inspected or tested by Engineer which fail to meet contract requirements will be rejected.
- .3 Materials failing to meet contract requirements may be rejected.
- .4 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, Contractor to pay costs for additional tests or inspections. Engineer to approve corrected work.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.



- .2 Store sheet piling on level ground or provide supports so that sheet piling is level when stored.
  - .1 Provide blocking at spacing not exceeding 5 m so that there is no excessive sagging in piling.
  - .2 Overhang at ends not to exceed 0.5 m.
  - .3 Block between lifts directly above blocking in lower lift.
- .3 If material is stock-piled on structure, ensure that structure is not overloaded.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Steel sheet piles: to CAN/CSA-G40.21, including chemical and mechanical requirements and following:
  - .3 Continuous interlocking flat web with minimum web thickness 9.5 mm and minimum mass of 115 kg/m.
  - .5 Continuous interlocking Z section:
    - .1 Minimum effective section modulus of 1310 cm<sup>3</sup> per metre of wall for Grade 300W.
    - .2 Minimum flange thickness of 9.5 mm.
    - .3 Minimum web thickness of 9.5 mm.
    - .4 Sheet piling:
      - .1 Minimum thickness of any portion of web or flange to be 9.5 mm.
  - .6 Special corners: shop fabricate by welding as indicated.
  - .7 Interlocks: to be such that section of interlock bar of 1 m minimum length will pass along full length of pile without binding.
  - .8 Mark each piece of sheet piling legibly by stencilling or die-and-stamping with following information.
    - .1 Heat Number.
    - .2 Manufacturer's Name.
    - .3 Length and Section Number.
  - .9 Do not precut lifting or slinging holes in sheet piles.
- .10 Structural steel for wales, bearing plates, wales splices, capping channels, support angles and miscellaneous steel: to CAN/CSA-G40.21, Grade 300W.
- .11 Tie rods, sleeve nuts and turnbuckles:
  - .1 Tie rods: Dywidag Threadbar, Grade 75, with double corrosion protection.
  - .2 Sleeve nuts, and connector sleeves: to have load capacity in excess of capacity of tie rod.
  - .3 Preassemble, mark and test tie rod assemblies in shop. Align threaded connection to following tolerances at sleeve nut or connector sleeve: 1/80 of normal rod diameter, deviation of centreline, 1 in 160.
  - .4 Nuts and bolts: hexagon nuts, bolts, and washers: to ASTM A307.
- .12 Backfill material: to Section 31 23 33 - Excavating, Trenching and Backfilling.

**2.2 SOURCE QUALITY CONTROL: HOT ROLLED SHEET STEEL PILING**

- .1 Provide results of tests of sheet piling material to be used on project as follows:
  - .1 One tension test and one bend test from each heat for quantities of finished material less than 50 tonnes.
  - .2 Tension tests in accordance with CAN/CSA-G40.20/G40.21. Bend tests in accordance with ASTM A6/A6M.

**2.3 SOURCE QUALITY CONTROL: COLD FORMED STEEL SHEET PILING**

- .1 Provide results of tension tests of sheet piling material to be used on project as follows:
  - .1 One tension test from each heat for quantities of finished material less than 50 tonnes.
- .2 Tension tests in accordance with CAN/CSA-G40.20/G40.21.
- .3 Provide results of bend tests of sheet piling material to be used on project as follows:
  - .1 Bend tests in accordance with [ASTM A6/A6M, with following amendments:
    - .1 S14.1 Bend tests to be performed with material in condition as used in cold forming operation. Three tests to be made from each heat and each thickness of material produced. Bend test specimens to be taken from edge of each coil. Longitudinal axis of specimen to be transverse to coil rolling direction.
    - .2 S14.1.1 - Except as provided below, bend test specimens to have minimum width to thickness ratio of 8, with both edges parallel throughout section in which bending occurs, and is maintained.
    - .3 S14.2 - Minor surface separations less than 0.8 mm in depth related to superficial steel surface or subsurface discontinuities to not cause rejection. Surface separations in excess of 0.8 mm depth and/or cracks normal to metal surface to cause rejection.

**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Do welding in accordance with CSA W59 and CSA W59S1, except where specified otherwise.
- .2 Do not begin pile installation until required quality control tests have been completed and test results approved by Engineer.
- .3 Do pile installation Work in accordance with Section 31 61 13 - Pile Foundations, General Requirements except where otherwise specified.
- .4 Submit full details of method and sequence of installation of piling to Engineer for approval prior to start of pile installation work. Details must include templates, bracing, setting and driving sequence and number of piles in panels for driving.
- .5 When constructing the anchored sheet pile wall, use the following procedure:
  - .1 Install steel sheet piling wall.
  - .2 Excavate to limits indicated.
  - .3 Install steel sheet piling anchors.
  - .4 Remove existing sheet pile wall panels only at new tie rod locations.

- .5 Install waler assembly and tie rods.
- .6 Backfill behind new sheet pile wall to underside of new tie rods.
- .7 Cut and remove existing sheet pile wall tieback cables.
- .8 Remove remainder of existing sheet pile wall.
- .9 Complete remainder of backfilling.
- .6 When installing steel sheet piling wall, use the following procedure:
  - .1 Provide temporary templates or bracing to hold piles in alignment during setting and driving.
  - .2 Drive piles two at a time. Drive first double pile to full depth, then place panel of five to eight double sheet piles in templates and secure last (end) double pile in location to prevent spreading of piles in panel.
  - .3 Drive end double pile in panel sufficiently deep into ground to ensure that it will remain plumb, then, drive remaining double piles in panel to full depth beginning with double pile next to end double pile and finishing with double pile next to double pile first driven.
  - .4 After one panel has been driven, place and drive succeeding panels in similar manner. Complete the driving of end double pile of first panel after double piles of second panel have been driven.
- .7 When installation is complete, face of wall at top of sheet piles to be within 75 mm of location as indicated and deviation from vertical not to exceed 1 in 100.

### 3.2 OBSTRUCTIONS

- .1 If obstruction encountered during driving, leave obstructed pile and proceed to drive remaining piles. Return and attempt to complete driving of obstructed pile later.
- .2 Advise Engineer immediately if impossible to drive pile to full penetration, and obtain direction from Engineer on further steps required to complete Work.

### 3.3 HOLES

- .1 Patch holes in sheet pile wall, except where permanent holes are indicated.
  - .1 Use 9.5 mm thick plate of material equal to that of piling to patch holes and overlap not less than hole diameter.
  - .2 Weld to develop full strength of plate.
- .2 Drill any required holes in piling.

### 3.4 CUTTING

- .1 When flame cutting tops of piles, and when permitted flame cutting holes in piles approved by Engineer, use following procedure:
  - .1 When air temperature is above 0 degrees C, no pre-heat is necessary.
  - .2 When air temperature is below 0 degrees C, pre-heat until steel 25 mm on each side of line of cut has reached a temperature very warm to hand (approximately 35 degrees C). Tempil sticks may be used to measure temperature.
  - .3 Use torch guiding device to ensure smooth round holes or straight edges.
  - .4 Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5 mm.

**3.5 SPLICING**

- .1 Use full length piles unless splicing is approved by Engineer.

**3.6 TIE ROD ANCHORAGE SYSTEM**

- .1 Do not place backfill behind new steel sheet pile until piles have been completely driven, adjusted and secured in final position by anchorage system.
- .2 Support tie rods at intervals along their length as required.
- .3 Fit and adjust tie rod systems so that connections at waling and anchor end of tie rods are tight before backfilling.

**3.7 BACKFILLING**

- .1 Backfill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling and as indicated.
- .2 Protect piling tie rods and anchorage systems from damage or displacement during backfilling operations.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 32 12 16 - Asphalt Paving Short Form.

**1.2 MEASUREMENT AND PAYMENT**

- .1 Payment for providing new granular backfill material behind the new steel sheet pile shall be in tonnes and checked by tickets supplied from quarry of material incorporated into Work and accepted in writing by Engineer.
- .2 Payment for providing new 'B' limestone granular material shall be in tonnes and checked by tickets supplied from quarry of material incorporated into Work and accepted in writing by Engineer. It shall include all labour, equipment and materials required to:
  - .1 Proof roll subgrade and compact to 95% SPD.
  - .2 Provide new 'B' limestone granular material to complete the 300 mm overall thickness of the base course below the new deck slab and asphalt pavement areas.
  - .3 Compact subbase course in 150 mm lifts to 98% SPD.
  - .4 Provide new 'B' limestone granular material in trenches for underground services. Compact in 150 mm lifts to 98% SPD.
- .3 Payment for providing new 'A' limestone granular material shall be in tonnes and checked by tickets supplied from quarry of material incorporated into Work and accepted in writing by Engineer. It shall include all labour, equipment and materials required to:
  - .1 Provide new 'A' limestone granular material to complete the 150 mm overall thickness of the base course below the new deck slab and asphalt pavement areas.
  - .2 Compact base course in 150 mm lift to 100% SPD.
  - .3 Provide 450 mm new 'A' limestone granular material around tie rods. Compact to 100% SPD.
- .4 Payment for providing new 'clean stone' granular material at the soakaway pit shall be in tonnes and checked by tickets supplied from quarry of material incorporated into Work and accepted in writing by Engineer.

**1.3 REFERENCES**

- .1 ASTM International
  - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).

- .5 ASTM D1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
- .6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .7 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

#### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 05 – General Instructions.

### Part 2 Products

#### 2.1 MATERIALS

- .1 Granular base: material in accordance with the following requirements:
  - .1 Type 'A' limestone.
  - .2 Type 'B' limestone.
  - .3 Backfill.
  - .4 Clear Stone.
  - .5 Gradations to be within limits specified when tested to ASTM C136 ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
    - .1 Gradation Method #1 to:

Sieve Designation	% Passing			
	Type 'A'	Type 'B'	Backfill	Clean Stone
100 mm	-	-	-	-
75 mm	-	-	100	-
50 mm	-	-	95-100	-
37.5 mm	-	-	-	-
26.5 mm	-	-	-	100
25 mm	-	-	-	-
19 mm	100	100	85-100	90-100
16 mm	-	-	75-100	-
12.5 mm	-	-	-	-
9.5 mm	-	-	57-83	0-55
4.75 mm	35-70	30-75	37-61	0-10
2.00 mm	-	25-65	-	-
1.18 mm	-	-	12-32	-
0.425 mm	10-30	15-35	8-23	-
0.180 mm	-	-	-	-
0.075 mm	8-17	8-18	2-5	0-2

**Part 3 Execution**

**3.1 PLACEMENT AND INSTALLATION**

- .1 Place backfill, granular subbase, and granular base after sub-grade surface is inspected and approved in writing by Engineer.
- .2 Placing:
  - .1 Do not commence backfilling until areas of work to be backfilled have been inspected and approved by Engineer. All organic material to be removed prior to backfilling.
  - .2 Areas to be backfilled shall be free from debris, snow, ice, water, organic material, or frozen ground. Backfill material shall not be frozen or contain ice, snow, or debris.
  - .3 Complete backfilling at anchor piles after tie rods are installed and encased.
  - .4 Construct granular base to depth and grade in areas indicated.
  - .5 Place 450 mm 'A' limestone around tie rods.
  - .6 Place new 'B' limestone granular material to thickness indicated.
  - .7 Place new 'A' limestone granular material to thickness indicated.
  - .8 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .9 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
    - .1 Engineer may authorize thicker lifts (layers) if specified compaction can be achieved.
  - .10 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .11 Remove and replace that portion of layer in which material becomes segregated during spreading.
  - .12 Construct soakaway pit using clean stone wrapped in geotextile.
- .3 Compaction Equipment:
  - .1 Ensure compaction equipment is capable of obtaining required material densities.
  - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Engineer before use.
  - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting:
  - .1 Compact backfill to density not less than 95% corrected maximum dry density.
  - .2 Compact in 150 mm lifts new limestone 'B' subbase to density not less than 98% corrected maximum dry density.
  - .3 Compact in 150 mm lifts new limestone 'A' base to density not less than 100% corrected maximum dry density.
  - .4 Provide compactive effort to clean stone at soakaway pit.

- .5 Compact in 150 mm lifts to 150 mm above the top of anchors to not less than 98% maximum dry density in accordance with ASTM D698-78 method C.
- .6 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .7 Apply water as necessary during compacting to obtain specified density.
- .8 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Engineer.
- .9 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof rolling:
  - .1 Obtain written approval from Engineer to use non standard proof rolling equipment.
  - .2 Proof roll sub-grade as indicated.
  - .3 Where proof rolling reveals areas of defective sub-grade:
    - .1 Remove sub-grade material to depth and extent as directed by Engineer.
    - .2 Backfill excavated sub-grade with limestone granular material and compact in 150 mm lifts to 98% Standard Procter Density.

### **3.2 SITE TOLERANCES**

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

### **3.3 CLEANING**

- .1 Progress Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

### **3.4 PROTECTION**

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

**END OF SECTION**



**Part 1 General**

**1.1 MEASUREMENT FOR PAYMENT**

- .1 Payment for asphalt paving at the Marginal Wharf shall be by square metres and shall include all labour, equipment, and materials required to:
  - .1 Remove existing asphalt pavement at limits of construction and haul disposed material off site.
  - .2 Place and compact two-50 mm lifts of asphalt at areas indicated.
  - .3 Overlap top lift with existing base lift after scraping at limits of construction as indicated.
- .2 Payment for asphalt paving at the Transitional Wharf shall be by square metres and shall include all labour, equipment, and materials required to:
  - .1 Remove existing asphalt pavement at limits of construction and haul disposed material off site.
  - .2 Place and compact two-50 mm lifts of asphalt at areas indicated.
  - .3 Overlap top lift with existing base lift after scraping at limits of construction as indicated.

**1.2 RELATED REQUIREMENTS**

- .1 Section 32 11 23 - Aggregate Base Courses.

**1.3 REFERENCES**

- .1 American Association of State Highway and Transportation Officials (AASHTO)
  - .1 AASHTO M320-10, Standard Specification for Performance Graded Asphalt Binder.
- .2 Asphalt Institute (AI)
  - .1 AI MS-2-1994 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- .3 ASTM International
  - .1 ASTM C88-05, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
  - .2 ASTM C127-07, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
  - .3 ASTM C128-07a, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
  - .4 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .5 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

- .6 ASTM D995-95b (2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot Laid Bituminous Paving Mixtures.
- .7 ASTM D3203-94 (2005), Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Use equipment capable of removing the pavement surface full depth without disturbing, damaging, or overstressing the existing steel sheet piling, including anchor rods.

### **2.2 MATERIALS**

- .1 Asphalt concrete: Hot Laid HL4, maximum aggregate size 19 mm.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Inspect site with Engineer and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

### **3.2 REMOVAL OPERATIONS**

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Salvage:
  - .1 Items to be salvaged: concrete picnic table, timber bench, steel flag pole, concrete pavers, dock connection system, and floating dock and ramp.
  - .2 Salvaged Mechanical/Electrical items shall be as specified under applicable Mechanical/Electrical sections.
  - .3 Dismantle items containing materials for salvage and stockpile salvaged materials.

### **3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
  - .2 Remove debris, trim surfaces and leave work site clean, upon completion of work.
  - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

### **3.4 FOUNDATIONS**

- .1 Foundations for wharf comprised of limestone granular material in accordance with Section 32 11 23 – Aggregate Base Courses.

### **3.5 PAVEMENT THICKNESS**

- .1 Pavements for wharf:
  - .1 Base course: 50 mm HL4.
  - .2 Wear course: 50 mm HL4.

### **3.6 PAVEMENT CONSTRUCTION**

- .1 Obtain Engineer approval of base prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines as indicated.
- .3 Placing conditions:
  - .1 Place asphalt mixtures only when air temperature is 5 degrees C minimum.
  - .2 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .4 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.
- .5 Compact by rolling asphalt continuously using established rolling pattern.
- .6 Operate roller slowly initially to avoid displacement of material.
- .7 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.
- .8 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.

**END OF SECTION**

## **Part 1 General**

### **1.1 MEASUREMENT FOR PAYMENT**

- .1 Payment for topsoil and sod shall be by lump sum.

### **1.2 REFERENCES**

- .1 Agriculture and Agri-Food Canada
  - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
  - .1 PN1340-2005, Guidelines for Compost Quality.
- .3 Canadian Green Building Council (CaGBC)
  - .1 LEED Canada-NC Version 1.0-December 2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.3 DEFINITIONS**

- .1 Compost:
  - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
  - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
  - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 50, and contain no toxic or growth inhibiting contaminants.
  - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

### **1.4 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01001.7 - Submittals.
- .2 Quality control submittals:
  - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
  - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## 1.5 QUALITY ASSURANCE

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with 01001.8 - Schedules - Bar (GANTT) Chart.

## 1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01001 - General Requirements.
- .2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Contract Administrator.
- .3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

## Part 2 Products

### 2.1 TOPSOIL

- .1 Topsoil for planting, seeded and sodded areas: mixture of mineral particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
  - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 45 % sand, 35 % silt, and 5-15 % organic matter by weight.
  - .2 PH value 6.5 to 8.0.
  - .3 Contain no toxic elements or growth inhibiting materials.
  - .4 Finished surface free from:
    - .1 Debris and stones over 50 mm diameter.
    - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .5 Consistence: friable when moist.

### 2.2 SOIL AMENDMENTS

- .1 Fertilizer to be added as required to achieve the following minimum standards:
  - .1 Fertility: major soil nutrients present in following amounts:
  - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
  - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
  - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
  - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
  - .6 PH value: 6.5 to 8.0.
  - .7 Fertilizer containing phosphorus may only be applied subsurface.
  - .8 Surface application of fertilizer may only be conducted using phosphorus-free fertilizers.
- .2 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.

- .2 Elastic and homogeneous, brown in colour.
- .3 Free of wood and deleterious material which could prohibit growth.
- .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to coarse textured.
- .4 Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
- .6 Limestone:
  - .1 Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%.
  - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .7 Bone Meal:
  - .1 Finely ground with a minimum analysis of 20% phosphoric acid.
- .8 Manure:
  - .1 Well rotted and aged a minimum of three years.
  - .2 May be sheep or steer manure.

## **2.3 SOURCE QUALITY CONTROL**

- .1 Advise Contract Administrator of sources of topsoil to be utilized with sufficient lead time for testing, a minimum of 7 days in advance of starting work.
- .2 Contractor is responsible for soil analysis and requirements for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory approved by Consultant.
  - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

## **Part 3 Execution**

### **3.1 TEMPORARY EROSION AND SEDIMENTARY CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.2 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as indicated after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated.
  - .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile in locations as directed by Contract Administrator.
  - .1 Stockpile height not to exceed 3 m.
- .4 Do not handle topsoil while in a wet or frozen condition or in any manner in which soil structure is adversely affected.
- .5 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill.
- .6 Protect stockpiles from contamination and compaction.

### **3.3 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct.
  - .1 If discrepancies occur, notify Contract Administrator and do not commence work until instructed by Contract Administrator.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
  - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
  - .2 Remove debris which protrudes more than 50 mm above surface.
  - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
  - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

### **3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after Consultant has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm over unfrozen subgrade free of standing water.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement and 80% compaction.
  - .1 100 mm for seeded areas.
  - .2 100 mm for sodded areas.
  - .3 300 mm for annual and perennial beds.
  - .4 450 mm for shrub beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

### **3.5 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
  - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Contract Administrator.
  - .1 Leave surfaces smooth, uniform and firm against deep foot printing.

### **3.6 ACCEPTANCE**

- .1 Contract Administrator will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

### **3.7 SURPLUS MATERIAL**

- .1 Dispose of materials except topsoil not required where directed by Contract Administrator off site.

### **3.8 CLEANING**

- .1 Proceed in accordance with Section 01001 – General Requirements.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**



**Part 1        General**

**1.1        RELATED REQUIREMENTS**

- .1        Section 03 30 00.01 – Cast-In-Place Concrete Short Form.
- .2        Section 03 20 00 – Concrete Reinforcing.
- .3        Section 31 23 33.01 - Excavating Trenching and Backfilling.

**1.2        MEASUREMENT FOR PAYMENT**

- .1        Payment for excavation and backfill shall be in accordance with Section 31 23 33.01 – Excavating Trenching and Backfilling.
- .2        Payment for catch basin modifications shall be lump sum and shall include all labour, equipment and material required to:
  - .1        Plug existing 150 mm diameter CSP outlet.
  - .2        Provide new 150 mm diameter PVC outlet to new soakaway pit.
- .3        Payment for sanitary manhole repair shall be lump sum and shall include all labour, equipment and material required to:
  - .1        Repair deteriorated interior of sanitary manhole barrel.
  - .2        Adjust top of manhole to suit finished grade.

**1.3        REFERENCES**

- .1        American Society for Testing and Materials International (ASTM)
  - .1        ASTM A48/A48M-[00], Standard Specification for Gray Iron Castings.
  - .2        ASTM C117-[04], Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .3        ASTM C136-[05], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4        ASTM C139-[05], Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
  - .5        ASTM C478M-[06], Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
  - .6        ASTM D698-[00a], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>(600 kN-m/m<sup>3</sup>)).
- .2        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
  - .2        CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
- .3        Canadian Standards Association (CSA International)
  - .1        CAN/CSA-A23.1-[04]/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

- .2 CAN/CSA-A3000-[03(R2005)], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .1 CSA-A3001-[03], Cementitious Materials for Use in Concrete.
  - .2 CSA-A3002-[03], Masonry and Mortar Cement.
- .3 CAN/CSA-A165 Series-[04], CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
- .4 CAN/CSA-G30.18-[M92(R2002)], Billet Steel Bars for Concrete Reinforcement.
- .5 CAN/CSA-G164-[M92(R2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 Ontario Provincial Standard Specifications (OPSS)
  - .1 OPSS 407-[November 2004], Construction Specification For Maintenance Hole, Catch Basin, Ditch Inlet And Valve Chamber Installation.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Cast-in-place concrete:
  - .1 In accordance with Section 03 30 00 - Cast-in-Place Concrete.
  - .2 Concrete reinforcement: in accordance with Section 03 20 00 - Concrete Reinforcing.
- .2 Joints: made watertight using cement mortar.
- .3 Manhole Repair Mortar: BASF Master Emaco N 205.
- .4 Adjusting rings: to ASTM C478M.
- .5 Catch Basin Outlet: 150 mm diameter PVC pipe.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Plug existing catch basin outlet.
- .2 Provide new 150 mm diameter PVC outlet to new soakaway pit at a minimum slope of 2%. Repair wall at new penetration.
- .3 Repair spalled concrete areas at interior of sanitary manhole barrel.

### **3.2 ADJUSTING TOPS OF EXISTING UNITS**

- .1 Remove existing gratings and frames and store for re-use at locations designated by Engineer.

- .1 Lower straight walled unit by removing grade adjustment rings as required.

### **3.3 CLEANING**

- .1 Proceed in accordance with Section 01 11 05 – General Instructions.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**



Figure 1 - "Gimli - Contractor Lay-Down Area"

Technical drawing of a bridge deck cross-section. The drawing shows a rectangular deck with a central section that is wider and has a slightly curved top surface. Dimensions are indicated on the left side: a total width of 12 m MAX. (COMMERCIAL DRIVEWAY), a central width of 3 m MAX. 6 m MAX. (RESIDENTIAL DRIVEWAY), and a top width of 1.0 m (TYP.) 2.0 m MAX. (SEE NOTE BELOW). A section line A-A is shown on the right side. A note indicates the material is 30 MPa CONCRETE WITH 7% AIR ENTRAINMENT. A scale bar at the bottom right indicates 1:175.

30 MPa CONCRETE WITH 7% AIR ENTRAINMENT

## NOTES:

- This standard is not to be used for new road construction. Use only in special cases like repair of existing curbs and for parking lots if required.
- \*<sub>1</sub> - Length may be extended from 1.0 m to 2.0 m max. when sidewalk is adjacent to curb.
- \*<sub>2</sub> - A 25 mm lip may be used at the gutter line to control erosion behind the curb in driveway cuts where high water volumes or velocities are expected. Sidewalk drops shall always be 0 mm at gutter line.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

**ENGINEERING  
STANDARDS**

**City of  
Thunder Bay**  
Sustained by Nature

**CONCRETE CURB (ONLY)**

DATE JUNE/78  
M.D.

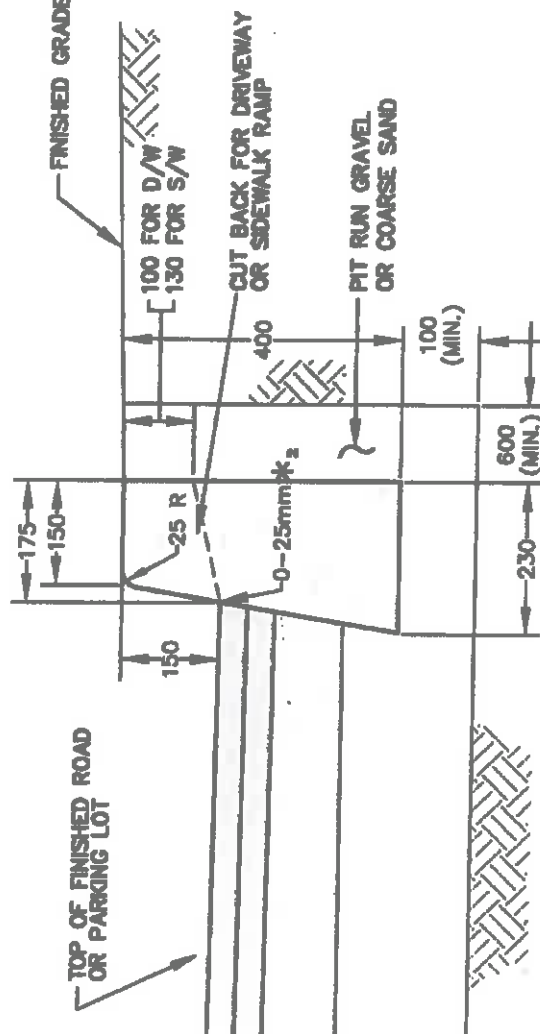
REVISÉ: JAN. 2015

**SCALE** **N. T. S.**

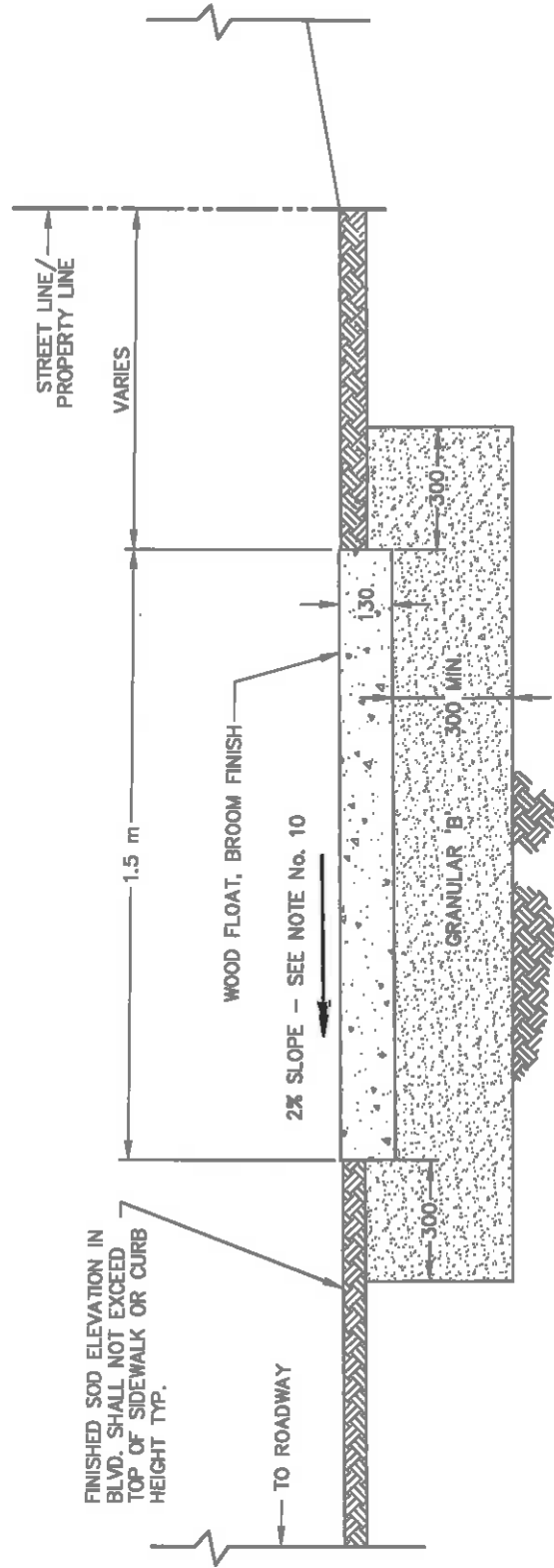
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2. Very Good Business/Good Business/OK



## SECTION A-A



# NOTES:

- 1) CONCRETE TO BE 30 MPA WITH 7% AIR ENTRAINMENT.
- 2) DUMMY JOINTS TO BE AT 1.5 m INTERVALS.
- 3) EXPANSION JOINTS TO BE OF 12 mm PRE-MOULDED BITUMINOUS MATERIAL AND PLACED AT THE INTERSECTION WITH OTHER SIDEWALKS AND WHERE SIDEWALK MEETS THE CURB.
- 4) PROVIDE CONTRACTION JOINT (40 mm DEEP SAW CUT OR A GUILLOTINE KNIFE CUT) AT 6 m INTERVALS.
- 5) SIDEWALKS TO BE WOOD FLOAT FINISHED AND LIGHTLY BROOMED TO PROVIDE A TEXTURED NON-SLIP SURFACE. THE SIDEWALK SHALL BE EDGED WITH 5 mm RADIUS EDGING TOOL, EDGING TO A DEPTH TO MATCH THE BROOM FINISH.
- 6) SIDEWALK TO BE REINFORCED AT ALL DRIVEWAYS AND LANE CROSSINGS WITH MW 13.3 x MW 13.3 WIRE 152 mm x 152 mm OPENING WIRE MESH.
- 7) ALSO SEE STANDARD DRAWING R-120.
- 8) SIDEWALK TO BE SPRAYED WITH WHITE PIGMENTED RESIN-BASED MEMBRANE CURING COMPOUND MEETING THE LATEST A.S.T.M. SPECIFICATION C-308, OR AS OTHERWISE DIRECTED BY THE CITY ENGINEER.
- 9) VOLUME OF CONCRETE REQUIRED -  $0.195 \text{ m}^3/\text{m}$  OR  $0.130 \text{ m}^3/\text{m}^2$ .
- 10) BACK OF SIDEWALK AND DRIVEWAY SHALL BE LOWERED AS APPROVED BY THE CITY FOR PROBLEM DRIVEWAYS TO ENSURE 4% PREFERRED TO 6% MAXIMUM SLOPE FROM THE FRONT TO THE BACK OF THE SIDEWALK.
- 11) BOULEVARDS TO BE RESTORED WITH 75 mm TOPSOIL AND SOD. (MATCH EXISTING BOULEVARD GRADE)
- 12) DEPTH OF BASE MATERIAL MAY BE INCREASED IN AREAS WHERE THE SUB-BASE MATERIAL IS DETERMINED TO BE UNSUITABLE BY THE INSPECTOR OR CONTRACT ADMINISTRATOR.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

CITY OF Thunder Bay  
ENGINEERING STANDARDS

TITLE  
CONCRETE SIDEWALK  
1.5 m RESIDENTIAL

DWN. M.D. DATE DEC/70  
REVISED: DEC. 2013  
SCALE N. T. S.  
DWG. NO. R-119

MANAGER, ENGINEERING DIVISION  
Z:\ENR\Standard Drawings\Std Draw\R-119