

PART 1 - GENERAL

- 1.1 Related Sections
- .1 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
  - .2 Section 01 35 43 - Environmental Procedures.
- 1.2 Measurement Procedures
- .1 Excavation: All excavation work and disposal or stockpiling of material will be included in the item for payment under Section 01 74 21.
  - .2 Backfilling: All backfilling materials such as base, sub-base, and all rip-rap will be paid under this item as one item and measured by the metric tonnes of material supplied and acceptably placed in the works to the lines and grades specified. Payment will include supply, handling, stockpiling, mixing, placing, compacting, trucking and all related work.
- 1.3 References
- .1 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
  - .2 American Society for Testing and Materials (ASTM)
    - .1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
  - .3 New Brunswick Department of Transportation Standard Specification, latest edition.
- 1.4 Submittals
- .1 Samples:
    - .1 Submit samples in accordance with Section 01 33 00.
    - .2 Inform Departmental Representative at least 4 weeks prior to commencing Work, of proposed source of fill materials and provide access for sampling.
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- 1.5 Protection of Existing Features .1 Existing buried utilities and structures:
- .1 Maintain and protect from damage, water, electric, and other utilities and structures encountered.
  - .2 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before removing or re-routing. Costs for such Work to be paid by Engineer.
  - .3 Record location of maintained, re-routed and abandoned underground lines.

PART 2 - PRODUCTS

- 2.1 Materials .1 Rip-Rap Stone (200-500 KG): granitic or 2.65 when tested to ASTM C127-12 (AASHTO T85-14). Larger stone to be placed as directed by Engineer.
- .1 Greatest dimension of each stone not to exceed two times least dimension.
  - .2 The average size of the rip-rap stones being placed will be in the mid range of accepted gradation which will ensure that there is a uniform gradation of stone across the size range. The contractor will arrange the placement of stone to ensure that he has a proper gradation not being high or low.
- .2 Random R5 Rip-Rap: to consist of hard, durable, quarry or pit run material of an approved quality. The material will be free from frost, snow stumps, weeds, sod, roots, logs, silt, organic material, garbage, or any other waste materials and must be capable of being compacted to degree as specified herein and meeting approval of Engineer. Material to be uniformly graded having a stone size between 70 to 220 mm (R5 random rip-rap) on any dimension. Slate, sandstone or shale rock will not be accepted. Specific gravity not less than 2.65 when tested to ASTM C127-12 (AASHTO T85-14).
- .1 Gradation to meet NBDOT 'R5' Random Rip-Rap limits as follows:

<u>ASTM Sieve size</u>	<u>% passing</u>
220 mm	100
190 mm	70 - 90
150 mm	40 - 55
70 mm	0 - 15

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- .3 Granular Base and Sub-Base:
- .1 Granular Base rock, clear, hard durable, angular, crushed quarried rock aggregate free from silt, clay lumps, organic matter, foreign substances and free from splits, seams or defects. Specific gravity not less than 2.6 when tested to ASTM C127-12 (AASHTO T85-14).
- .2 Gradation to be within following limits when tested to ASTM C136-06 and ASTM C117-13 and giving a smooth curve without sharp breaks when plotted on a semi-log grading chart.
- .3 Gradation - Granular Base:

ASTM Sieve Size	% Passing
31.5 mm	95-100
25.0 mm	81-100
19.0 mm	66-90
12.5 mm	50-77
9.5 mm	41-70
4.75 mm	27-54
2.36 mm	17-43
1.18 mm	11-32
300 µm	4-19
75 µm	0-8

- .4 Gradation - Granular sub-base material:

ASTM Sieve Size	% Passing
75.0 mm	100
0.425 mm	30 max
0.075 mm	8 max

### PART 3 - EXECUTION

- 3.1 EXCAVATION .1 Site excavation to consist of the removal of all material and substrate bottom material to the excavation limits as indicated on the drawing and as directed by the Engineer.

- 3.2 Backfilling .1 Do not proceed with backfilling operations until Engineer has inspected and approved areas to be backfilled.
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- .2 Install filter fabric on top of existing fill material as shown.
- .3 Place R5 random rip-rap backfill material into the bottom of the backfilled areas.
- .4 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .5 Do not use backfill material which is frozen or contains ice, snow or debris.
- .6 Place backfill material in uniform layers not exceeding 300 mm compacted thickness. Compact each layer to 95% of Standard Proctor dry density before placing succeeding layer.
- .7 When using hand operated tamping devices, place backfill material in layers not exceeding 100 mm in thickness.
- .8 Backfilling around installations.
  - .1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

### 3.3 Granular Base

- .1 Do not place granular base until sub-base surface is compacted, inspected and approved.
- .2 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.
- .3 Place materials to the lines, grades, and depths as indicated on Plan or as directed by the Engineer.
- .4 Remove and replace portion of work in which material becomes segregated during spreading.
- .5 Compact to a density not less than 98% of maximum dry density ASTM D698-12, (AASHTO T99-10, Method D).
- .6 Shape and roll alternately to obtain a smooth, even and uniformly compacted base.

- .7 Apply water as is necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .8 In areas not accessible to rolling equipment, compact to required density with approved mechanical tampers.

3.4 Granular Sub-Base

- .1 Do not place granular sub-base until finished sub-grade is inspected and approved by engineer.
  - .2 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.
  - .3 Begin spreading sub-base material on a crown line or high side of a one way slope.
  - .4 Place material in uniform layers not exceeding 150mm when compacted or to such other depth as approved by engineer.
  - .5 Shape each layer to a smooth contour and compact to specified density before a succeeding layer is placed.
  - .6 Remove and replace portion of a layer in which material has become segregated during spreading.
  - .7 Compact to 95% maximum density, AASHTO T99-10, Method D except last 150mm up to subgrade elevation. Compact last 150mm to 100% maximum density, AASHTO T99-10, Method D.
  - .8 Shape and roll alternately to obtain a smooth, even and uniformly compacted sub-base.
  - .9 Apply water as is necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
  - .10 In areas not accessible to rolling equipment, compact to required density with approved mechanical tampers.
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- 3.5 Rip-Rap
- .1 Place stone material to lines, grades and dimensions indicated or as directed.
  - .2 Place stones in manner approved by Engineer to secure surface and create a stable mass.
  - .3 Material may be placed with the aid of mechanical means or other approved method subject to Engineer's review and approval. End dumping onto sloped areas will not be permitted.
  - .4 Contractor will choose his stones and place them in such a way that the whole structure will be bonded and consolidated to as great an extent as nature or rock will allow.

- 3.6 Restoration
- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21.
  - .2 Remove surplus materials and debris and correct defects noted by Engineer.

PART 1 - GENERAL

- 1.1 Description .1 This section specifies requirements for the supply and installation of synthetic non-woven filter fabric to be used under the rip-rap and filter rock material as shown.
- 1.2 RELATED SECTIONS .1 Section 01 33 00 - Submittal Procedures.  
.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- 1.3 MEASUREMENT PROCEDURES .1 Supply and installation of filter fabric of surface covered as shown on drawings will be measured as a fixed price item.
- 1.4 REFERENCES .1 American Society for Testing and Materials International, (ASTM)  
.1 ASTM D 4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.  
.2 ASTM D 4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.  
.3 ASTM D 4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.  
.2 Canadian General Standards Board (CGSB)  
.1 CAN/CGSB-148.1-M, Methods of Testing Geotextiles and Complete Geomembranes.
- 1.5 SUBMITTALS .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.  
.2 Submit to Engineer the following at least 4 weeks prior to beginning Work.  
.1 manufactures specifications on the proposed materials to be used.  
.2 samples of proposed materials.
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- .3 Submit to Engineer 2 copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.6 DELIVERY,  
STORAGE AND  
HANDLING

- .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

1.7 WASTE  
MANAGEMENT AND  
Disposal.

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21.
- .2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 Filter Fabric

- .1 Non-woven synthetic fibre fabric, rot proof, unaffected by action of oil or salt water and not subject to attack by marine life, insects or rodents to be supplied in rolls.
- .2 Physical properties:
  - .1 Mass per unit area: minimum 380 g/m<sup>2</sup>.
  - .2 Grab tensile strength and elongation:
    - .1 Breaking force: minimum 1,600 N, wet condition.
    - .2 Elongation at break: minimum - maximum 70-100%.
  - .3 Bursting strength: minimum 3,700 kPa.
- .3 Hydraulic properties:
  - .1 Apparent opening size (AOS):75 to 150 micrometres.
  - .2 Permeability (K cm s<sup>-1</sup>)2.0x10<sup>-1</sup>.
- .4 Factory seams: sewn in accordance with manufacturer's recommendations.
- .5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Place geotextile material by unrolling in orientation, manner and locations indicated and retain in position with securing pins and washers or weights.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .4 Pin successive strips of geotextile with securing pins as recommended by manufacturer.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material.
- .6 After installation, cover with overlying layer within 4 hrs of placement.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative .

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 62 19 - Timber Piles.
- .2 Section 31 62 16.16 - Steel H Piles.
- .3 Section 31 62 16.19 - Steel Pipe Piles

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Spliced piles are not permitted.
- .4 Quality assurance submittals:
  - .1 Test reports: submit 3 copies of certified test reports for piles from approved independent testing laboratories, including 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 Piles damaged by the contractor will be replaced as directed by the Departmental Representative at contractor's cost.
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- 1.4 EXISTING CONDITIONS
- .1 Various Sub-surface investigation reports are available for viewing at PWGSC office 4th floor Unit 100, 1045 Main Street, Moncton, N.B., during the following business hours: 8:30 to 12:00 noon and from 13:00 to 16:00, Monday to Friday. Contact the Department Representative.
  - .2 Any information pertaining to soils and all borehole logs are furnished by the Departmental Representative as a matter of general information only. Borehole descriptions shown on the logs are only descriptive of conditions at locations described by the boreholes themselves.
  - .3 The Contractor must make his own evaluation of soil conditions.
- 1.5 SCHEDULING
- .1 Provide schedule of planned sequence of driving to Departmental Representative for review, not less than two weeks prior to commencement of pile driving.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Timber Piles as indicated on drawings are already supplied and are stored on site.
  - .2 Supply full length steel piles (H and pipe) as indicated in accordance with sections 31 62 16.16 and 31 62 16.19.
  - .3 Provide equipment to handle full length piles without cutting and splicing.
- 2.2 EQUIPMENT
- .1 Prior to pile installation, submit to Departmental Representative for review, details of equipment for installation of piles.
    - .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.
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.2 Non-impact methods of installation such as augering, jacking, vibratory hammers or other means: provide full details of characteristics necessary to evaluate performance.

- .2 Hammer:
- .1 When required criteria can not 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 structures and ground conditions at pile locations are adequate to support pile driving operation.
- .1 Make provision for access and support of piling equipment during performance of Work.
- .2 Contractor to assess state of access structure(s) for load carrying capability.

#### 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 Length: except for piles driven through water, provide sufficient length of leads to ensure that use of follower is unnecessary.
- .3 Swing leads:
- .1 Obtain approval from Departmental Representative prior to using swing leads.
- .2 Firmly guy top and bottom to hold pile in position during driving operation.
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- .2 Installation of each pile will be subject to review of Departmental Representative.
  - .1 Departmental Representative will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine load capacity.
  - .2 Departmental Representative to review final driving of all piles prior to cutting and removal of pile driving rig from site.
- .3 Drive each timber pile to practical refusal to bedrock.
  - .1 Do not overdrive to cause damage to piles in bedrock.
  - .2 Departmental Representative will determine refusal criteria for piles driven to rock based on type of pile and driving equipment.
- .4 Steel piles to be set a minimum 2.0 metres into mudstone bedrock as shown on drawings.

### 3.3 APPLICATION / DRIVING

- .1 Use driving caps and cushions to protect piles.
  - .1 Reinforce pile heads as required by Departmental Representative.
  - .2 Piles with damaged heads as determined by Departmental Representative will be rejected.
- .2 Hold piles securely and accurately in position while driving.
- .3 Deliver hammer blows along axis of pile.
- .4 Restrike already driven piles lifted during driving of adjacent piles to assure set.
- .5 Cut off piles neatly and squarely at elevations as indicated on drawings.
  - .1 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
- .6 Remove cut-off lengths from site on completion of work.

### 3.4 Field Measurements

- .1 Maintain accurate and daily records of driving for each pile, including:
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- .1 Type and make of hammer, rated energy, observed stroke, and observed number of blows per minute.
- .2 Other installation equipment including details on use of pile cushion, follower, etc.
- .3 Pile size and length, location of pile in pile group, and location or designation of pile group.
- .4 Time for start and finish of driving pile and sequence of pile driving for piles in group.
- .5 Penetration for own weight and weight of hammer, number of blows per meter of penetration from start of driving and numbers of blows per 100 mm for the last meter and numbers of blows per 25mm for the last 100mm.
- .6 Toe elevation upon termination of driving pile and final toe and cutoff elevations upon completion of pile group.
- .7 Records of restriking.
- .8 Other pertinent information, such as interruption of continuous driving, observed pile damage, etc.
- .9 Records of elevations of adjacent piles before and after driving of pile.
- .10 Record all information on forms provided by Departmental Representative.

3.5 Final Penetration Resistance

- .1 Installation of each pile will be subject to approval of Departmental Representative, who will be sole judge of acceptability of pile with respect to final penetration resistance, depth of penetration, or other criteria. Departmental Representative to approve final penetration resistance of all piles prior to removal of pile driving equipment from site.
- .2 Each pile shall be installed as shown. Do not overdrive to cause damage to piles.
- .3 Departmental Representative will determine refusal criteria for piles.
  - .1 Timber Piles: Refusal may be taken as 10 blows per 25 mm of pile penetration when driven using a hammer with a maximum rated driving energy in the order 750 joules times the pile tip diameter in centimetres.

.2 Steel Pipe Piles: Drive each pile a minimum of 2.0 metres into bedrock as indicated. Provide a hammer of sufficient size (developping an energy at least 100000 joules) in order to install the piles 2.0 meter in to the bedrock as shown.

.1 Or, 10 blows per 25mm increments for four consecutive increments.

.3 Piles to be re-tapped 24 hours after driving with same driving criteria.

### 3.6 OBSTRUCTIONS

.1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, proceed as directed by Departmental Representative.

### 3.7 REPAIR AND RESTORATION

.1 Pull out rejected piles and replace with new piles.

.2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Submittal Procedures: Section 01 33 00.
- .2 Miscellaneous Metals: Section 05 50 00.
- .3 Pile foundations - General requirements:  
Section 31 61 13.

1.2 Delivery and  
Handling

- .1 Protect piles from damage due to excessive handling during delivery, storage and bending stress, impact, abrasion or other causes handling.

1.3 Existing Sub-  
Surface Conditions

- .1 Sub-surface investigation report is available for inspection at PWGSC office 4th floor Unit 100, 1045 Main Street, Moncton, N.B., during the following business hours: 8:30 to 12:00 noon and from 13:00 to 16:00, Monday to Friday. Contact the Department Representative.
- .2 Any information pertaining to soils and all borehole logs are furnished by the Departmental Representative as a matter of general information only. Borehole descriptions shown on the logs are only descriptive of conditions at locations described by the boreholes themselves.
- .3 The Contractor must make his own evaluation of soil conditions.

1.4 MEASUREMENT  
PROCEDURES

- .1 Steel H-piles: The supply and installation of steel H-piles as shown for this work will be paid by the unit of piling acceptably incorporated in the work, after trimming and cutting of the piles. Piles will be measured from top elevation to pile tip remaining in the work.
  - .2 Supply and installation of cap steel plates, pile points and steel bent plates to fastened to the wharf as shown will be considered incidental to the work.
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- 1.5 REFERENCES .1 Canadian Standards Association (CSA International)  
.1 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.  
.2 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- 1.6 SUBMITTALS .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.  
.2 Quality Assurance:  
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- 1.7 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Steel H piles: to CSA-G40.20/G40.21, Grade 350.  
.1 Size and weight as indicated.  
.2 Welding materials: to CSA W48.  
.3 Do not splice piles.

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 The steel H-piles are to be installed true and plumb along the baseline as shown on drawings.  
.2 All piles are to be installed a minimum of 2.0 meters into the mudstone bedrock as shown on the drawings. The bottom elevations may vary depending on the exact location of the bedrock.
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- .3 Hold piles securely and accurately in position while installation.
- .4 Prior to commencement of pile installation operation, submit to Engineer for approval, details of equipment and method to be used for the installation of piles.
- .5 Cut off piles squarely at required elevation.

### 3.2 Tolerances

- .1 H-piles are to be install as shown on the plans and specified herein.
- .2 Deviations from the vertical in any direction shall not exceed 1 to 50 for all piles.
- .3 Piles must be install in such a manner so the face of the H-pile is square with the face of the wharf. Tolerance Maximum rotation tolerance about axis of pile layout to be  $\pm 10$ .
- .4 Each set of piles at the mud line to be within  $\pm 30$  mm of the location indicated on the drawing for the direction parallel to the wharf, with no two piles/dock having a centerline spacing less than 2900 mm. Tolerance at the top of the wharf will be  $\pm 15$  mm.

### 3.3 WELDING

- .1 Weld to CSA W59.
- .2 Welding certification of companies: to CSA W47.1.

### 3.4 RECORDS

- .1 Keep complete and accurate record of each pile driven.
- .2 Indicate:
  - .1 Pile location.
  - .2 Deviations from design location.
  - .3 Cross section shape and dimensions.
  - .4 Original length.
  - .5 Ground elevation.
  - .6 Tip elevation.
  - .7 Cutoff elevation.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 -  
Cleaning.
- .2 On completion and verification of performance  
of installation, remove surplus materials,  
excess materials, rubbish, tools and  
equipment.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 03 30 00 - Cast-in-place concrete.
- .3 Section 05 50 00 - Metal Fabrications.
- .4 Section 31 61 13 - Pile Foundation, General Requirements.

1.2 MEASUREMENT  
PROCEDURES

- .1 Measure supply of steel pipe piles in metres delivered to site, in lengths indicated.
- .2 Measure installation of piles in linear meter of piles acceptably driven following of cutting and trimming of the piles. Measurement will be taken from tip elevation to top of pile elevation remaining in the work.
  - .1 Price will also include pile cleanout, the supply and placing of cast-in-place concrete and reinforcing steel in the pile as shown.
- .3 Concrete Encasement: refer to section 03 30 00 Cast-in-place concrete for payment.
- .4 Measure pile shoes will be considered as incidental to the work.
- .5 Mobilization of equipment will be considered incidental to this item.

1.3 REFERENCES

- .1 American Petroleum Institute (API)
    - .1 API SPEC 5L-04, Specification for Line Pipe, Includes Errata 1, 43rd Edition.
  - .2 American Society for Testing and Materials International (ASTM)
    - .1 ASTM A 252-98(2002), Standard Specification for Welded and Seamless Steel Pipe Piles.
  - .3 Canadian Standards Association (CSA International)
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- .1 CSA-G40.20/G40.21-2013, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
- .3 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- .4 CSA W59-03, Welded Steel Construction (Metal Arc Welding) (metric version).
- .5 CSA-Z245.1-02, Steel Pipe.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Submit shop drawings for pile shoes.
- .4 Quality Assurance: test reports:
  - .1 Prior to fabrication, and, if requested, provide Departmental Representative with two copies of steel producer's certificates in accordance with ASTM A 252 API SPEC 5L.
  - .2 One Charpy V-notch test required per heat and results reported to Engineer by manufacturer.
  - .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 DELIVERY,  
STORAGE, AND  
HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Deliver new, undamaged materials to site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on pipe piling.
- .3 Storage and Protection:
  - .1 Store and handle pipe piling in accordance with manufacturer's written instructions to prevent permanent deflection, distortion or damage to interlocks.

- .2 Support pipe piling on level blocks or racks spaced not more than 3 m apart and not more than 0.60 m from ends.
- .3 Store pipe piling to facilitate required inspection activities and prevent damage to coatings and corrosion prior to installation.

1.6 Waste Management and Disposal

- .1 Separate waste materials reuse and recycling in accordance with section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .3 Divert unused concrete materials from landfill to the approved contractor's construction and demolition disposal site.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel pipe: straight longitudinal seam, 355 mm outside diameter by 12.7mm thick wall, plain bevelled flame machine cut ends to API SPEC 5L. Spiral welded pipe is not permitted.
- .2 Pipe material to have following minimum properties:
  - .1 Yield strength: 310 MPa.
  - .2 Tensile strength: 450 MPa.
  - .3 Elongation at rupture: 20% in 50 mm.
  - .4 Weldable steel: to CSA W59. Welding certification in accordance with CSA 47.1
- .3 Pipe chemical composition: to ASTM A252, grade 3.
- .4 Pile driving shoes: to CSA-G40.20/G40.21, Grade 350.
- .5 Do not splice piles.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 FABRICATION

- .1 Fabricate full length piles to eliminate splicing during installation wherever possible.
- .2 Allowable tolerance on axial alignment to be 0.25 % as measured by 3 m straight edge.
- .3 Allowable deviation from straight line over total length of fabricated pile to be not more than 0.2% of total pile length.
- .4 Repair damaged exterior protective coating of piles as per manufacturer's recommendation.

3.3 INSTALLATION

- .1 Install piling in accordance with Section 31 61 13 - Pile Foundations, General Requirements.
  - .2 The steel piles are to be installed true and plumb along the baseline as shown on drawings.
  - .3 All piles are to be installed a minimum of 2.0 meters into the mudstone bedrock as shown on the drawings. The bottom elevations may vary depending on the exact location of the bedrock.
  - .4 Hold piles securely and accurately in position while installation.
  - .5 Prior to commencement of pile installation operation, submit to Engineer for approval, details of equipment and method to be used for the installation of piles.
  - .6 Cut off piles squarely at required elevation.
  - .7 Perform internal visual inspection of steel pipe, joints and base prior to placing of concrete.
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- .1 Ensure pipe inside is free from foreign matter.
- .8 Assemble and install reinforcement cages as indicated.
- .9 Install concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .10 Fill steel pipe pile with concrete using methods to limit free fall and to prevent segregation. Ensure adequate vibration to completely fill cross section of pipe.
- .11 Install driving shoes as part of field work.

#### 3.4 TOLERANCES

- .1 Piles are to be install as shown on the plans and specified herein.
- .2 Deviations from the vertical in any direction shall not exceed 1 to 50 for all piles.
- .3 The piles at the mud line to be within  $\pm 30$  mm of the location indicated on the drawing for the direction parallel to the wharf. Tolerance at the top of the wharf will be  $\pm 15$  mm.

#### 3.5 WELDING

- .1 Weld to CSA W59.
- .2 Welding certification of companies: to CSA W47.1.

#### 3.6 RECORDS

- .1 Keep complete and accurate record of each pile driven.
  - .2 Indicate:
    - .1 Pile location.
    - .2 Deviations from design location.
    - .3 Cross section shape and dimensions.
    - .4 Original length.
    - .5 Ground elevation.
    - .6 Tip elevation.
    - .7 Cut off elevation.
-

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 11 -  
Cleaning.
- .2 On completion and verification of performance  
of installation, remove surplus materials,  
excess materials, rubbish, tools and  
equipment.

PART 1 - GENERAL

1.1 RELATED  
SECTIONS

- .1 Section 31 61 13 - Pile Foundation, General Requirements.

1.2 MEASUREMENT  
PROCEDURES

- .1 Consider shoes, cap plates, straps, cut off, preservative treatment and all hardware incidental to installation of piles.
- .2 Installation of timber bearing piles will be measured by the unit.
- .3 Installation of timber power pole as shown will be measured by the unit.
- .4 Timber Piles are supplied by DFO and are stored near the construction site. Refer to 2.1 for pile details.
- .5 Mobilization of equipment will be considered incidental to this item.
- .6 Handling, transportation of piles from the storage site to the construction site is part of this Work. Cleaning and reinstatement of storage site and disposal of debris/tarps will be considered incidental to the work.
- .7 Extra piling to replace damaged piles will be considered incidental to the work and will not be measured for payment.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
- .1 CAN-056-10, Round Wood Piles.
- .2 CSA 080 Series-08(R2012), Wood Preservation.
- .1 CSA-080.3-97(R2002), Pressure Treated Piles and Timbers in Marine Construction.

1.4 SUBMITTALS

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

- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Spliced piles are not permitted.
- .4 Equipment: submit prior to pile installation for review by the Departmental Representative, list and details of equipment for use in installation of piles.

1.5 WASTE  
MANAGEMENT AND  
DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Construction/Demolition Waste Management and Disposal.
- .2 Do not dispose of preservative treated woodDo not dispose of preservative treated wood through incineration.
- .3 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.
- .4 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill as approved by the Departmental Representative.
- .5 Dispose of unused wood preservative material at official hazardous material collections site.
- .6 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 The following Treated Round timber piles (CCA treated), 300 mm minimum butt size, are supplied by DFO and are as follows:
  - .1 to CAN-056, with tip diameter related to length as indicated in table A-1 of 056-1979 (R2001).
    - .1 108 each at 12.20 metres long.
    - .2 14 each at 13.72 metres long.

- .2 Pile species: Red Pine.
- .3 Pressure treated in accordance with Section 06 05 73 - Wood Treatment.
- .4 Piles have been stored on site since 2010. Contact the Departmental Representative to confirm location.

2.2 EQUIPMENT

- .1 Pile hammer: select and use pile hammer of sufficient weight and energy to suitably install specified pile without damage into soils as indicated.

2.3 PRESERVATIVE TREATMENT

- .1 Preservative Treatment: to CSA-080 Series.

2.4 PILE SHOES

- .1 Provide size to fit tip indicated.
- .2 Fabricate point type of 6 mm steel plates, fully welded and sized to adequately cover full pointed area of pile. Provide each plate with 4 nail hole.

2.5 ACCESSORIES

- .1 Wire nails, spikes, staples: to ASTM F1667-13.
- .2 Bolts, nuts and washers: to ASTM A307.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PROTECTION

- .1 Avoid dropping, bruising or breaking of wood fibres.
  - .2 Avoid breaking surfaces of treated piles.
-

- .3 Do not damage surfaces of treated piles below cutoff elevation.
- .4 Treat cuts, breaks or abrasions on surfaces of treated piles, bolt holes and field cuts in accordance with CSA 080 Series.

3.3 PREPARATION

- .1 Select piles in each bent for uniformity of size and straightness to facilitate placing of brace timbers.
- .2 Submit details of proposed method of pile head and tip protection during driving to the Departmental Representative for review.

3.4 INSTALLATION

- .1 Install piles in accordance with Section 31 61 13 - Pile Foundations, General Requirements.
- .2 Restrain lateral movement of piling, during driving at intervals not exceeding 6 m over length between ground surface and driving head.
- .3 Treat exposed ends of cut off piles with two liberally brushed coats of CCA product allowing sufficient interval between applications to permit total absorption.
- .4 Protection: treat end cut-offs and bolt holes with preservative.

3.5 BRACING

- .1 Install bracing as indicated.

3.6 APPLICATION /  
DRIVING

- .1 Place cap and cushion block combination capable of protecting pile head between top of pile and ram to prevent impact damage to pile.
  - .2 Replace block if it is damaged, split, highly compressed, charred or burned or has become spongy or deteriorated, with a new block.
-

3.7 TOLERANCES IN  
DRIVING

- .1 Center of butts: within 50 mm of location indicated.
- .2 Manipulation of piles: not be permitted.
- .3 Remove and replace damage piles, mislocated piles, driven out of alignment piles and provide additional piles, driven as directed.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.