

PART 1 - GENERAL

1.1 MEASUREMENT FOR
PAYMENT

- .1 Measurement for payment under this section shall be paid for at the unit bid price per cubic meter and this price shall be full compensation for hauling, shaping placement, compaction, equipment, labour and incidentals necessary to complete the work.

1.2 RELATED WORK

- .1 Submittal Procedures: Section 01 33 00.
- .2 Health and Safety Requirements: Section 01 35 29.
- .3 Environmental Procedures: Section 01 35 43.
- .4 Construction/Demolition Waste Management and Disposal: Section 01 74 21.
- .5 Environmental Protection Plan: Section 01 35 44.

1.3 DESCRIPTION OF WORK

- .1 The work of this Section comprises the furnishing of all labour, materials and equipment necessary for all excavation, trenching, backfilling, compaction including saw cutting of existing asphalt paving and concrete surface, required to complete the work of this Contract, as specified in this Section and as shown on the Drawings.
- .2 The requirements of the following Prince Edward Island, Department of Transportation, Infrastructure & Energy (TIE) Specifications are to be followed for all work relating to the material specifications for fill materials and bedding sand.

1.4 REFERENCES

- .1 ASTM C117-13, Standard Test Method for Material Finer Than: 0.075mm Sieve in Mineral Aggregates by Washing.

- .2 ASTM C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil using Standard Effort.
- .4 ASTM D1557-12, Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- .5 CAN/ULC -S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .6 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .7 CAN/CGSB-71-GP-24M Adhesive, Flexible for Bonding Cellular Polystyrene Insulation

1.5 DEFINITIONS

- .1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass and was unable to be removed by a Caterpillar 235 Excavator, or equivalent, machine.
- .2 Common excavation: excavation of materials of whatever nature, which are not included under the definition of rock excavation, including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.
- .3 Top Soil: Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Cohesionless soil: For compaction purposes, cohesionless soil is:
 - .1 Materials having less than 20% passing 75 micrometres sieve,

regardless of plasticity of fines.

- .5 Cohesive soil: For compaction purposes, cohesive soil is soil not having properties to be classified as cohesionless.

1.6 PROTECTION OF
EXISTING FEATURES

- .1 Existing buried utilities and structures:

- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only; completeness and accuracy are not guaranteed.

- .2 Prior to commencing any excavation work, notify applicable Departmental Representative or authorities, establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.

- .3 Confirm locations of buried utilities by careful test excavation.

- .4 Maintain and protect from damage, water, sewer, gas, electric or other utilities encountered. Obtain direction of Departmental Representative before moving or otherwise disturbing utilities or structures.

- .5 Where indicated re-route existing lines in area of excavation. Pay costs for such work.

- .6 Remove abandoned utility lines to distance of 1.5m from foundations. Cap or otherwise seal lines at cut-off points.

- .7 Record in accordance with requirements of Section 01 78 00 - Closeout Submittals, locations of maintained, re-routed and abandoned underground lines.

- .8 Make good and pay for damage to any lines resulting from work.

- .2 Existing surface features:

- .1 Protect existing surface features which may be affected by work from

damage while work is in progress and repair damage resulting from work.

.2 Where excavation necessitates root or branch cutting do so only under direct control of Departmental Representative.

.3 Provide adequate protection around bench markers, layout markers, survey markers, geodetic monuments and signage.

1.7 SHORING, BRACING AND UNDERPINNING

.1 Comply with Section 01 35 28 - Health and Safety Requirements and applicable local regulations and to protect existing features.

.2 Whenever shoring, sheeting, timbering and bracing of excavations or underpinning is required engage services of a Professional Engineer registered in Canada, to design and assume responsibility for adequacy of shoring, bracing and underpinning.

.3 Design and supporting data submitted to bear the stamp and signature of qualified Professional Engineer registered in Canada.

1.8 COMPACTION DENSITIES

.1 Compaction densities indicated are Standard Proctor Maximum Dry Densities.

1.9 SITE CONDITIONS

.1 The Contractor is responsible to visit the site, assess the setting and become familiar with the existing site conditions.

.2 Before visiting the site the bidders **MUST** apply for and receive permission to visit the site from the Project Officer at Departmental Representative office.

.3 No extra payment will be made to the Contractor, above the Contract Price, for costs resultant from failure to determine the conditions that affect the work.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Type 1 Fill: Crushed rock composed of hard sound, durable uncoated, cubical fragments of consistent quality produced from non-sedimentary bedrock or non-sedimentary boulders, to comply with the PEI Dept of TI&E Specification 401 - Aggregate, for Class "A" material graded within the following limits:

ASTM Sieve Size	Percent Passing
31.5mm	100
25.0mm	95-100
12.5mm	50-83
4.75mm	30-60
1.18mm	15-40
600um	10-32
300um	5-22
75um	3-9

- .2 Type 2 Fill: Crushed rock composed of hard sound, durable uncoated, cubical fragments of consistent quality produced from non-sedimentary bedrock or non-sedimentary boulders, to comply with the PEI Dept of TI&E Specification 401 - Aggregate, for Class "B" material graded within the following limits:

ASTM Sieve Size	Percent Passing
31.5mm	100
25.0mm	95-100
12.5mm	50-83
4.75mm	30-60
1.18mm	15-40
600um	10-32
300um	5-26
75um	3-7

- .3 Type 3 Fill: imported, classified as Common Fill, or material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen, free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.
- .4 Type 4 Fill: natural sand or crushed

rock screening, free from clay, shale or organic matter, to comply with PEI Dept of TI&E Specification 402 - Bedding Sand, graded with the following limits.

ASTM Sieve Size	Percent Passing
9.5mm	100
4.75mm	87-98
2.36mm	55-95
1.18mm	30-90
600um	10-70
300um	0-35
150um	0-15
75um	0-8

- .5 Type 5 Fill: to requirements of PEI Dept of TI&E Specification #206.02.02 - Select Borrow as follows:

Borrow shall be non-plastic and composed of clean, uncoated particles free from lumps of clay or other deleterious material with a maximum particle size of 100mm, and a maximum of 30% of the material passing the 4.75 sieve shall pass the 0.075 mm sieve.

- .6 Type 6 Fill: clean, washed coarse sand free from clay, shale and organic matter and graded within the following limits:

ASTM Sieve Size	Percent Passing
12.5mm	100
4.75mm	90-100
0.85mm	40-100
0.35mm	0-75
0.25mm	0-38
0.75mm	0-8

- .7 Type 7 Fill: Crushed rock, composed of hard, sound, durable, uncoated, cubical fragments of consistent quality produced from non-sedimentary bedrock or non-sedimentary boulders, graded within the following limits, to comply with the PEI Dept of TI&E Specification 401 - Aggregate for Class "D" Material.

ASTM Sieve Size	Percent Passing
50.0mm	100

38.0mm	60-100
31.5mm	50-100
25.0mm	35-70
19.0mm	20-50
12.5mm	10-35
9.5mm	5-25
4.75mm	0-10

- .8 Geotextile filter fabric: Refer to Section 31 32 21.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Where applicable, strip topsoil from within limits of excavation and stockpile as directed by Departmental Representative, for re-spreading.
- .3 Sawcut pavement or concrete neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination and freezing.

3.3 DEWATERING OF EXCAVATIONS

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations, trenches and completed installations against damage due to rainwater, surface run-off, spring water, groundwater, backing up of drains, sewers, flooding from watermain and all other water. Provide pumps, equipment and enclosures required for such protection.
- .3 Dispose of water in a manner not

detrimental to public and private property, or any portion of work completed or under construction, and in accordance with the requirements of the Environmental Protection Plan.

- .4 All new and existing work damaged by failure to provide protection shall be removed and replaced with new work at the expense of the Contractor.

3.4 SAW CUTTING

- .1 Existing pavement to be saw cut to produce neat, straight vertical cuts at interface between existing asphalt roadway and new pavement, where excavation meets with asphalt driveways, and at limits of Contract, or as directed by Departmental Representative.

3.5 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions indicated or required to construct roadways and to install site services.
- .2 Remove demolished foundations, rubble and other obstructions encountered during excavation.
- .3 Excavations must not interfere with normal 45° splay of bearing from bottom of any footing.
- .4 Do not obstruct flow of surface drainage or natural watercourses.
- .5 Earth bottoms of excavations to be dry undisturbed soil, level, free from loose or organic matter.
- .6 Notify Departmental Representative when soil at bottom of excavation appears unsuitable and proceed as directed by Departmental Representative.
- .7 Obtain Departmental Representative's approval of completed excavation.
- .8 Remove unsuitable material from bottom of excavation to extent and depth

directed by Departmental Representative.

- .9 Where required due to unauthorized over-excavation, correct as follows:
 - .1 Fill under other areas with Type 2 compacted to 98% density.
- .10 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed compact foundation soil to density at least equal to undisturbed soil.
- .11 Rock excavation: For the purpose of bidding it is to be assumed that solid sandstone bedrock, as defined under Par. 1.4 above, will not be encountered during the work of this Section.

3.6 FILL TYPES AND COMPACTION

- .1 Dimensions specified in following paragraphs are minimum dimensions of fill after compaction.
- .2 Paved areas:
 - .1 Use fill types and thickness as indicated on drawings. Compact top 100 mm of sandstone sub-base directly under granular base to 100% density.
- .3 Underground services:
 - .1 Use Type 4 Fill (bedding sand) to provide bedding and cover as indicated compacted full width of trench to minimum 95% density.
 - .2 Use Type 3 Fill to underside of topsoil at landscaped areas compacted to density at least equal to adjacent undisturbed soil or minimum 95%.

3.7 BACKFILLING

- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water or frozen ground.

- .3 Do not use backfill material which is frozen or contains ice, snow, or debris.
- .4 Backfilling around site installations.
 - .1 Place bedding and surround material as specified and indicated in applicable Section for service or utility to be installed.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum of 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval has been obtained from Departmental Representative or;
 - .2 If approved by Departmental Representative erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
 - .5 Place material by hand under, around and over installations until 600mm of cover is provided, except where specifically permitted otherwise. Dumping material directly on installations will not be permitted.
- .5 Place backfill material in uniform layers up to grades indicated. Compact each layer before placing succeeding layer. Use methods to prevent damage to installations.

3.8 TESTING AND INSPECTION

- .1 Refer to Section 01 45 00 - Volume 'A'.

3.9 RESTORATION

- .1 Upon completion of work, remove surplus materials and debris, trim slopes and

correct defects noted by Departmental Representative.

- .2 Clean and reinstate areas affected by work to satisfaction of Departmental Representative.

3.10 SURPLUS MATERIAL

- .1 Remove all surplus material from site, and pay all fees as may be charged at disposal site.
- .2 Remove all soil contaminated with oil, gasoline, calcium chloride or other toxic or dangerous materials and dispose of in manner to minimize danger at site and in a manner and to a location off site approved by Provincial Authority governing such disposal.

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PART 1 - GENERAL

1.1 RELATED WORK

- .1 Excavation Trenching and backfilling:
Section 31 23 10.
- .2 Riprap: Section 31 37 10.

1.2 REFERENCES

- .1 CAN/CGSB-4.2-2004, Textile Test Methods.
- .2 CAN/CGSB-148.1-92, Methods of Testing Geotextiles and Geomembranes.
- .3 ASTM D4595-11, Test Method for Tensile Properties of Geotextiles by the Wide Width Strip Method.
- .4 ASTM D4751-99a, Test Method for Determining the Apparent Opening Size of a Geotextile.

1.3 DELIVERY AND STORAGE

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

1.4 MEASUREMENT FOR PAYMENT

- .1 Geotextile filter fabric will be measured in square metres of material incorporated in this work.
- .2 Supply and installation of accessories and other attachments will not be measured but considered incidental to work.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls of minimum 3.5 meters width and in one length.
 - .1 Standard of Acceptance: Synthetic Industries 1001 or an approved equal.
- .2 Synthetic fibre to be rot proof, unaffected by action of oil or salt water and not subject to attack of

insects or rodents.

- .3 Seams or joints to be constructed in accordance with manufacturer's recommendations.
- .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.
- .5 Physical properties:
 - .1 Thickness: minimum 2.54 mm.
 - .2 Mass per unit area: minimum 600 g/m².
 - .3 Tensile strength and elongation (in any principal direction):
 - .1 Tensile strength: minimum 1000 N, wet condition.
 - .2 Elongation at break: 50%.
 - .3 Mullen burst strength: minimum 3600 kPa.
 - .4 Apparent opening size (AOS): 50 to 250 micrometres.
- .6 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to CSA G164.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface and against panels in orientation, manner and locations indicated and retain in position with weights.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

- .4 Place geotextile material behind concrete panel surfaces in one continuous length from bottom of harbour to upper extent of panels as indicated.
- .5 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

3.2 PROTECTION

- .1 Do not permit passage of any vehicle directly on geotextile at any time.

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PART 1 - GENERAL

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| <u>1.1 RELATED WORK</u> | .1 | Geotextiles: Section 31 32 21. |
| <u>1.2 DESCRIPTION OF WORK</u> | .1 | The work of this Section comprises the furnishing of all labour, materials and equipment necessary for the supply and installation of imported riprap on slopes as indicated, as specified and to lines, grades and typical cross sections shown on drawings. |
| | .2 | Do not remove harbour material from water during shaping and construction of riprap slope protection. |
| <u>1.3 MEASUREMENT FOR PAYMENT</u> | .1 | Riprap material will be paid for at the unit bid price in tonne and this shall be full compensation for supplying and placing rocks, hauling, shaping of underlying material, equipment, tools, labour and incidentals necessary to complete the work in acceptable manner to Departmental Representative. |
| | .2 | Toeing in of the stone will be incidental to the supply and placement of the Stones. |
| <u>1.4 MATERIALS</u> | .1 | To requirements of PEI Department of Transportation, Infrastructure and Energy Specification #213 (latest edition) as it relates to imported metamorphic or igneous rock. |
| | .2 | Stone: Imported metamorphic or igneous stones. Random riprap shall consist of clean hard, durable quarried stone, free from seams, cracks or other structural defects having a density of not less than 2.65 tonne/m3. |

.3 The rock material is subject to Los Angeles Abrasion Test (ASTM C131), shall have a loss not greater than 35%.

.4 When tested for soundness, five cycles of magnesium sulphate (ASTM C88), the rock material shall have a loss not greater than 15%.

.5 Geotextile in accordance with Section 31 32 21 - Geotextiles.

1.5 PLACING

.1 Where riprap is to be placed on slopes, excavate toe in slope in accordance with dimensions as indicated or as directed by Departmental Representative.

.2 Fine grade area to be riprapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.

.3 Place geotextile on prepared surface. Place riprap on geotextile so as to avoid puncturing geotextile. Do not drive vehicles directly on geotextiles.

.4 Place riprap in accordance with thickness and details as indicated or as directed by Departmental Representative.

.5 Place riprap in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes and face of slopes.

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PART 1 - GENERAL

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| <u>1.1 Related Sections</u> | .1 | Section 31 23 10 - Excavating, Trenching and Backfilling. |
| | .2 | Section 31 62 19 - Steel Sheet Piles. |
| <u>1.2 Delivery, Storage and Handling</u> | .1 | Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling. |
| | .2 | Replace damaged piles to satisfaction of Departmental Representative. |
| | .3 | Load transport and deliver piles. |
| | .4 | Supply piles as required to complete work. |
| <u>1.3 Protection</u> | .1 | Protect public and construction personnel, adjacent structure, services and work of other sections from hazards due to pile driving operations. |
| <u>1.4 Existing Conditions</u> | .1 | Sub-surface investigation report is available at offices of PWGSC in Charlottetown. |
| | .2 | Notify Departmental Representative in writing if subsurface conditions at site differ from those indicated and await further instructions from Departmental Representative. |
| <u>1.5 Scheduling of Work</u> | .1 | Submit schedule of planned sequence of driving to Departmental Representative and Departmental Representative for review, not less than 2 weeks prior to commencement of pile driving. |

PART 2 - PRODUCTS

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| <u>2.1 Materials</u> | .1 | Material requirements for piles are specified in Section 31 62 16. |
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- .2 Supply full length piles and provide equipment of sufficient capacity to handle full length piles without cutting and splicing.
- .3 Piles to be driven to bedrock and as required by Geotechnical investigation and indicated on drawings.
- .4 Do not splice piles without written permission of Departmental Representative.

PART 3 - EXECUTION

3.1 Equipment

- .1 Prior to commencement of pile installation, submit to Departmental Representative for approval, details of equipment for installation of piles.
- .2 Hammer: Use hammers capable of developing a blow at operating speed with sufficient energy to drive tip of piles to required penetration.
- .3 Leads: Construct pile driver leads to provide free movement of hammer. Hold leads in position at top and bottom, with guys, stiff braces, or other means approved means, to ensure support to pile while being driven.

3.2 Preparation

- .1 Ensure that ground conditions at pile locations are adequate to support pile driving operation. Make provision for access and support of piling equipment during performance of work.

3.3 Field 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, length and location.
- .4 Sequence of driving piles in group.
- .5 Number of blows per metre for entire length of pile and number of blows per 100mm for last 1000mm.
- .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 during driving of each pile.
- .9 Provide Departmental Representative with three copies of records.

3.4 Driving

- .1 All piles must be driven to established resistance in one continuous operation to avoid freeze.
- .2 Use driving caps and cushions to protect piles. Reinforce pile heads if necessary. Piles with damaged heads will be rejected by Departmental Representative.
- .3 Hold piles securely and accurately in position while driving.
- .4 Deliver hammer blows along axis of pile.
- .5 Do not drive piles within 8m of concrete which has been in place less than 3 days.
- .6 Ensure no contact between pile and structure takes place when driving batter piles adjacent to existing structures.
- .7 Re-drive piles lifted during driving of adjacent piles.
- .8 Remove loose and displaced material

from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.

- .9 Use of water jet not permitted.
- .10 Cut off piles neatly and squarely at elevations as indicated. Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
- .11 Remove cut-off lengths from site on completion of work.

3.5 Capacity and Penetration

- .1 Required pile penetration depth to refusal and as indicated.
- .2 Installation of each pile will be subject to approval of Departmental Representative. 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 capacity and penetration depth.
- .3 Drive each pile to bedrock and to pile tip elevation as indicated. Do not overdrive to cause damage to piles in bedrock. Departmental Representative will determine refusal criteria for piles driven to rock based on type of piles and driving equipment.
- .4 Refer to geotechnical investigation for piling recommendations.

3.6 Test Piles

- .1 With a view to determining the required lengths of the piling requirements the contractor may, at his discretion, carry out test driving of piles. The location and number of test piles is left to the discretion

of the contractor.

3.7 Driving Tolerances

- .1 Install piles to the following tolerances: pile heads to be within 75mm of locations shown on drawing and to permit installation of concrete pile caps.
- .2 Top of piles to be aligned to approval of Departmental Representative. Take measure to correct alignment as required.

3.8 Damaged or Defective Piles

- .1 Departmental Representative will reject any pile that is driving out of position, twisted or is damaged during driving or handling.
- .2 Remove rejected pile and replace with a new, and if necessary, a longer pile.
- .3 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

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PART 1 - GENERAL

- 1.1 Scope of Work .1 The Work covered in this Section consists of furnishing all labor, equipment, appurtenances, and materials and performing all operations in connection with the installation of a steel sheet piling wall including wales, ties rods, anchor blocks, etc. in strict accordance with this and other related Sections of the Specifications, and the applicable Drawings, and subject to the terms and condition of the Contract.
- 1.2 Measurement for Payment .1 Steel Sheet Piling acceptably supplied and installed under this contract will be measured for payment by the square metre. Steel Sheet Piling will be measured from the tip elevation driving to the top cutoff and full length of wall.
- 1.1 RELATED SECTIONS .1 Section 31 23 10 - Excavating, Trenching & Backfilling.
- 1.2 REFERENCES .1 ASTM A6/A6M-14 - General Requirements for Rolled Steel Plates, Shapes, Steel Piling, and Bars for Structural Use.
- .2 CAN/CSA G40-21-13 - Structural Quality Steels.
- .3 CSA W59-13 - Welded Steel Construction.
- 1.3 CERTIFICATES .1 At least two weeks prior to fabrication, submit to Departmental Representative, two copies of steel producer certificates in accordance with ASTM A570 and ASTM A611, and mill test reports in accordance with CAN/CSA-G40.20.
- .2 Provide Departmental Representative

with copy of certification for fusion welding in accordance with CSA W47.1 and CSA W47.1S1.

1.4 SOURCE QUALITY CONTROL

- .1 Hot Rolled Sheet Steel Piling: 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 Two tension tests and two bend tests from each heat for quantities of finished material exceeding 50 tonnes.
- .2 Tension tests in accordance with CAN/CSA-G40.20. Bend tests in accordance with ASTM-A6/A6M.

1.5 DELIVERY, HANDLING & STORAGE

- .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. Provide blocking at spacing not exceeding 5m so that there is no excessive sagging in piling. Overhang at ends not to exceed 0.5m. Block between lifts directly above blocking in lower lift.
- .3 If material is stock-piled on structure, ensure that structure is not overloaded.

1.6 QUALITY ASSURANCE

- .1 Inspection and testing of steel sheet piling material will be carried out by testing laboratory designated by Owner at any time during course of work.

- .2 Materials inspected or tested by Owner which fail to meet contract requirements will be rejected.
- .3 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. Departmental Representative to verify acceptability of corrected work.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittals Procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel sheet piles: to CAN/CSA-G40.21, grade 350W, and following:
 - .1 Sheet piling: as manufactured by certified facility to meet required strength & to laterally support design loads specified and indicated. Submit written confirmation.
 - .2 Interlocked joint strength in direct tension of not less than 3000 kN-m.
 - .3 Special corners: provide fabricated special corners as specified by manufacturer for type of sheet piling supplied.
 - .4 Interlocks: to be such that section of interlock bar of 1m minimum length will pass along full length of pile without binding.
 - .5 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
 - .6 Do not precut lifting or slinging holes in sheet piles.
- .2 Structural steel for wales, bearing

plates, wales splices, capping channels, support angles and miscellaneous steel: to CAN/CSA-G40.21, Grade 350W.

- .3 Tie rods, sleeve nuts and turnbuckles:
 - .1 Tie rods: grade 75 (ASTM A615). Dywidag or approved equal to meet required strength & to laterally support design loads specified and indicated. Submit written confirmation.
 - .2 Tie rods: to have upset screwed ends such that diameter of upset end provides 25% excess root area over gross area of plain tie rod.
 - .3 Sleeve nuts, and turnbuckles: to have load capacity in excess of capacity of tie rod.
 - .4 Preassemble, mark and test tie rod assemblies in shop. Align threaded connection to following tolerances at sleeve nut or turnbuckle: 1/80 of normal rod diameter. Deviation of centre line, 1 in 160.
- .4 Nuts and bolts: hexagon nuts, bolts, and washers: to ASTM A572.
- .5 Backfill material: to Section 31 23 10 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do welding in accordance with CSA W59, except where specified otherwise.
- .2 Do not commence pile installation until all required quality control tests have been completed and test results approved by Department Representative.
- .3 Do pile installation work in accordance with Section 31 61 13 -

Pile Foundations General, except where otherwise specified.

- .4 Submit full details of method and sequence of installation of piling to Department Representative for approval prior to start of pile installation work. Details must include guide frames, bracing, setting and driving sequence and number of piles in panels for driving.
- .5 When installing sheet piles in bulkhead wall Provide temporary guide frames or bracing to hold piles in alignment during setting and driving.
- .6 When installation is complete, face of wall at top of sheet piles to be within 75mm of location as indicated and deviation from vertical not to exceed 1 in 100.
- .7 Where indicated, cut drain holes and install steel pipe elbows. Provide filter material in area or weep holes as indicated.

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 Departmental Representative immediately if impossible to drive pile to full penetration, and obtain direction from Departmental Representative on further steps required to complete work.

3.3 HOLES

- .1 Patch holes in sheet pile wall, except where permanent holes are indicated. Use 15mm thick plate of material equal to that of piling to patch holes and overlap not less than hole diameter.

Weld to develop full strength of plate.

- .2 Make holes required in piling by drilling. Do not use flame cutting without permission of Departmental Representative.

3.4 CUTTING

- .1 When flame cutting tops of piles and flame cutting holes in piles, adopt following procedure:
 - .1 When air temperature is above 0°C, no pre-heat is necessary.
 - .2 When air temperature is below 0°C, preheat until steel 25mm on each side of line of cut has reached a temperature very warm to hand (approximately 35°C)
 - .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 indicated.

3.6 TIE ROD ANCHORAGE SYSTEM

- .1 Do not place backfill behind anchored bulkhead or remove material from in front of bulkhead until it has been completely driven, adjusted and secured in final position by anchorage system.
- .2 Support tie rods at intervals along their length as indicated. Piles used for this purpose, in accordance with Section 31 61 13 - Pile Foundations General.
- .3 Fit and adjust tie rod systems so that connections at waling and anchor end of tie rods are tight before

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backfilling.

3.7 BACKFILLING

- .1 Backfill in accordance with Section 31 23 10 - Excavating, Trenching & Backfilling and as indicated.
- .2 Protect piling tie rods and anchorage systems from damage or displacement during backfilling operations.

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