

PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u> | .1 | Section 01 74 21 - Construction/Demolition Waste Management and Disposal. |
| | .2 | Section 01 33 00 - Submittal Procedures. |
| | .3 | Section 03 30 00 - Cast-in-Place Concrete. |
| | .4 | Section 32 11 16.01 - Granular Sub-Base. |
| | .5 | Section 32 11 23 - Aggregate Base Courses. |
| | .6 | Section 32 12 16.01 - Asphalt Paving. |
| <u>1.2 REFERENCES</u> | .1 | 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. |
| <u>1.3 SAMPLES</u> | .1 | Submit samples in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Allow continual sampling by Departmental Representative during production. |
| | .3 | Provide Departmental Representative with access to source and processed material for sampling. |
| | .4 | Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling. |
| | .5 | Pay cost of sampling and testing of aggregates which fail to meet specified requirements. |
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| 1.4 WASTE
MANAGEMENT AND
DISPOSAL | .1 | Divert unused granular materials from landfill to facility to satisfaction of Departmental Representative. |
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PART 2 - PRODUCTS

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| 2.1 MATERIALS | .1 | Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended. |
| | .2 | Flat and elongated particles of coarse aggregate: to ASTM D 4791.
.1 Greatest dimension to exceed five times least dimension. |
| | .3 | Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
.1 Natural sand.
.2 Manufactured sand.
.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag. |
| | .4 | Coarse aggregates satisfying requirements of applicable section to be crushed rock:
.1 Gravel or crushed gravel will not be acceptable.
.2 River or beach gravels will not be acceptable.
.3 Salt water submerged deposits will not be acceptable. |
| | .5 | Aggregate to be placed in watercourses to be clean, non-erodible, non-orebearing and non-toxic. Aggregate material must be obtained from a non-watercourse source. |

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| 2.2 SOURCE APPROVAL
AND QUALITY CONTROL | .1 | Source(s) of materials to be incorporated into work or stockpiled to be to satisfaction of Departmental Representative. |
| | .2 | Provide all necessary test data to demonstrate that aggregate materials meet the specified requirements in this and all related sections. |

2.2 SOURCE APPROVAL
AND QUALITY CONTROL
(Cont'd)

- .3 Inform Departmental Representative of proposed source of aggregates and provide access for sampling within four (4) weeks of commencing production.
- .4 If, in opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .5 Advise Departmental Representative four (4) weeks in advance of any change in material source to allow sampling, testing and approval.
- .6 The Contractor will pay all costs associated with sampling, testing, and approval of any material source change made after approval of the initial source.
- .7 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Processing
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment to the satisfaction of Departmental Representative.
 - .3 Wash aggregates, if required to meet specifications. Use only equipment satisfactory to Departmental Representative.
 - .4 When operating in stratified deposits, use excavation equipment and methods that produce uniform, homogeneous aggregate.
- .2 Handling

- 3.1 PREPARATION
(Cont'd)
- .2 (Cont'd)
- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Stockpiling
- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 h of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
- .1 Max 1.5 m for coarse aggregate and base course materials.
- .2 Max 1.5 m for fine aggregate and sub-base materials.
- .3 Max 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

- 3.2 CLEANING
- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

- 3.2 CLEANING
(Cont'd)
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
 - .3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

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PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u> | <ul style="list-style-type: none"> .1 Section 01 33 00 - Submittal Procedures .2 Section 31 09 17 - Pile Tests .4 Section 31 61 13 - Pile Foundations General Requirements |
| <u>1.2 REFERENCES</u> | <ul style="list-style-type: none"> .1 All reference standards in this section shall be current issue or latest revision at the first date of project tender advertisement. .2 American Society for Testing and Materials International (ASTM) <ul style="list-style-type: none"> .1 ASTM A252-98 (2002), Standard Specification for Welded and Seamless Steel Pipe Piles. .2 ASTM A307-04, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile. .3 ASTM A325M-05, Standard Specification for Structural Steel Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric. .4 ASTM A490M-04a, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3 for Structural Steel Joints Metric. .3 Canadian Standards Association (CSA International) <ul style="list-style-type: none"> .1 CAN/CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels. .2 CAN/CSA-S16-14, Design of Steel Structures. .3 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures. .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding. .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (metric version). .6 CAN/CSA S6-14, Canadian Highway Bridge Design Code (CHBDC). .4 Canadian General Standards Board (CGSB) <ul style="list-style-type: none"> .1 CAN/CGSB-1.171-98, Inorganic Zinc Coating. .2 CAN/CGSB-1.184-98, Coal Tar-Epoxy Coating. .5 The Master Painters Institute (MPI)/Architectural Painting Specification Manual, (ASM-[February |

2004])).

.1 MPI #19, Inorganic Zinc Rich Primer.

.6 The Society of Protective Coatings (SSPC)

.1 SSPC-SP 5/NACE No.1-2000, White Metal Blast Cleaning Joint Surface Preparation Standard.

1.3 SYSTEM DESCRIPTION

.1 Design Requirements: design templates to safely withstand following loads:

.1 Gravity loads to which template are subjected.

.2 Lateral loads to firmly hold pile in position when driving.

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.

.1 Include product characteristics, performance criteria, and limitations.

.3 Submit shop drawings and indicate following items:

.1 Material.

.2 Anchorage, field control and alignment methods.

.3 Design parameters.

.4 Tolerance for driving pile.

.5 Removable method.

1.5 WASTE MANAGEMENT

.1 Separate waste materials for disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21- Type 350W.

.2 Welding materials: to CSA W48 and CSA W59.

.3 Bolts, nuts and washers: to ASTM A325.

2.2 FABRICATION

.1 Fabricate structural steel for templates: to CAN/CSA-S16.

.2 Welding: to CSA W59.

.3 Use welding companies qualified under CSA W47.1.

PART 3 - EXECUTION

- 3.1 EXECUTION
- .1 The design of pile templates are the responsibility of the Contractor. All pile template designs shall be stamped by a Professional Engineer Licensed to Practice in the Province of Nova Scotia, Canada.
- 3.2 POSITIONING
- .1 Position and hold template in location to receive piles.
.1 Ensure pile positions are within tolerances specified.
- .2 Secure templates to piles in accordance with shop drawings.
- 3.3 REMOVAL OF TEMPLATES
- .1 Avoid damage to piling when removing templates.
- .2 When instructed by Departmental Representative, remove templates from Project site.
- 3.4 CLEANING
- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- 3.5 PROTECTION
- .1 Protect templates from damage.
- .2 Repair damage to templates, formwork or concrete arising from operations as reviewed by Departmental Representative at no extra cost.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 01 33 00 - Submittal Procedures
 - .2 Section 31 09 16 - Pile Driving Templates
 - .3 Section 31 61 13 - Pile Foundations, General Requirements
- 1.2 REFERENCES
- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D1143-81 (1994) e1, Standard Test Method for Piles Under Static Axial Compressive Load.
 - .2 ASTM D4945-00, Standard Test Method for High-Strain Dynamic Testing of Piles.
 - .2 AASHTO T298-99, Standard Method of Test for High-Strain Dynamic Testing of Piles.
 - .3 Englobe Geotechnical Investigation Report No. 20335, Dated August 7, 2015 (Attached in Appendix A).
- 1.3 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Quality assurance submittals:
 - .1 Test reports: submit 3 copies of dynamic test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

PART 2 - PRODUCTS

- 2.1 NOT USED
- .1 Not used.

PART 3 - EXECUTION

- 3.1 GENERAL
- .1 Contractor to notify Departmental Representative of pile driving operations at least seven (7) days in advance of work.
 - .2 If a pile is suspect of meeting refusal on a boulder and within the native soils, Pile Driving Analyser
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(PDA) testing should be conducted to confirm capacity.

- .3 Supply and erect equipment and temporary structures necessary for making tests.
- .4 Departmental Representative to select piles for testing during performance of work.
- .5 Test to be performed in presence of Departmental Representative.
- .6 Provide shelter, enclosures and lighting for observation, testing and recording of data.
- .7 If PDA testing indicates that the design capacity is not obtained, the obstruction shall be removed by drilling through pile, followed by removal of the obstruction and re-driving the pile.
- .8 PDA tests shall be performed on at least one (1) HP360x152 pile per abutment to ensure pile capacities noted on the Drawings are met.

3.2 TESTING

- .1 Do PDA testing in accordance with AASHTO T298.

3.3 TEST EVALUATION

- .1 Qualified geotechnical engineer to interpret results for predicting pile performance and capacity.
- .2 Carry out additional load tests as directed by Departmental Representative if pile fails to sustain test load.
- .3 Test validity determined by Engineer.

3.4 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

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|-----------------------------|----|---|
| <u>1.1 RELATED SECTIONS</u> | .1 | Section 01 74 21 - Construction Demolition Management System. |
| | .2 | Section 31 23 33.01 - Excavation, Trenching, and Backfilling. |
| | .3 | Section 31 14 13 - Soil Stripping and Stockpiling. |
| | .4 | Section 01 35 43 - Environmental Procedures. |

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| <u>1.2 REFERENCES</u> | .1 | 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. |
| | .2 | Environment Canada. |
| | .3 | When conflicts occur between EPA and Environment Canada, the more stringent requirement shall apply. |

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| <u>1.3 DEFINITIONS</u> | .1 | Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris. |
| | .2 | Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris. |
| | .3 | Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris. |
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<u>1.3 DEFINITIONS</u> (Cont'd)	.4	Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris off site.
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	.5	Grubbing consists of excavation and disposal of stumps, roots, boulders, rock fragments to not less than specified depth below existing ground surface.
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<u>1.4 QUALITY ASSURANCE</u>	.1	Do construction occupational health and safety in accordance with Section 01 35 29.06 - Safety Requirements.
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<u>1.5 STORAGE AND PROTECTION</u>	.1	Prevent damage to fencing, root systems of trees, bench marks, survey markers and monuments, existing pavement, landscaping, natural features, utility lines, site appurtenances, and water courses which are to remain. .1 Repair damaged items to approval of Departmental Representative. .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.
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PART 2 - PRODUCTS

<u>2.1 MATERIALS</u>	.1	Soil Material for Fill: .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials. Must be approved for use by the Departmental Representative for use on this project.
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PART 3 - EXECUTION

<u>3.1 PREPARATION</u>	.1	Inspect site and verify with Departmental Representative items designated to remain.
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3.1 PREPARATION
(Cont'd)

- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
- .3 Notify all applicable utility authorities before starting clearing and grubbing.

3.2 CLEARING

- .1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal occurring within cleared areas.
- .2 Clear as indicated by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .3 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.3 ISOLATED TREES

- .1 Cut off isolated trees as indicated or as directed by Departmental Representative at height of more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.

3.4 GRUBBING

- .1 Remove and dispose of roots larger than 75 mm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m³.

3.4 GRUBBING
(Cont'd)

- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.5 REMOVAL AND
DISPOSAL

- .1 Remove cleared and grubbed materials off site in accordance with all applicable municipal, provincial and federal regulations.
- .2 Cut timber greater than 125 mm diameter and stockpile. Stockpiled timber becomes property of Contractor.
- .3 Remove diseased trees identified by Departmental Representative and dispose of this material in accordance with all applicable municipal, provincial and federal regulations.

3.6 FINISHED
SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations and stripping of topsoil, to approval of Departmental Representative.

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 01 35 43 Environmental Procedures.
	.2	Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCES	.1	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.
	.2	Environment Canada.
	.3	When conflicts occur between EPA and Environment Canada, the more stringent requirement shall apply.

PART 2 - PRODUCTS

2.1 NOT USED	.1	Not Used.
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PART 3 - EXECUTION

3.1 STRIPPING OF TOPSOIL	.1	Ensure that procedures are conducted in accordance with applicable federal, provincial and municipal requirements.
	.2	Remove topsoil before construction procedures commence to avoid compaction of topsoil.
	.3	Handle topsoil only when it is dry and warm.
	.4	Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.
	.5	Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.

3.1 STRIPPING OF
TOPSOIL
(Cont'd)

- .6 Strip topsoil to depths as indicated and to satisfaction of Departmental Representative.
 - .1 Avoid mixing topsoil with subsoil.
- .7 Pile topsoil in berms in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2 m.
- .8 Dispose of unused topsoil as indicated and in accordance with all applicable federal, municipal and provincial regulations.
- .9 Protect stockpiles from contamination and compaction.
- .10 Cover topsoil that has been piled for long term storage with anchored waterproof and insulated tarps, as required to resist wind, water and winter conditions. Place straw bales around the stockpile to filter sediment entering or exiting the pile.

3.2 PREPARATION OF
GRADE

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.
 - .1 Grade area only when soil is dry to lessen soil compaction.
 - .2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.3 PLACING OF
TOPSOIL

- .1 Place topsoil only after Departmental Representative has accepted subgrade.
 - .2 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.
 - .3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
 - .4 Cultivate soil following spreading procedures.
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- 3.4 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 REFERENCES .1 Definitions:
- .1 Rock: any solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Not used.

PART 3 - EXECUTION

- 3.1 ROCK REMOVAL .1 Prior to any rock removal, allow exposed rock surfaces to be inspected by professional geotechnical engineer designated by Departmental Representative as required.
- .2 Perform excavation in accordance with Erosion and Sedimentation Control Plan.
- .3 Co-ordinate this Section with Section 01 35 29.06 - Health and Safety Requirements.
- .4 Remove rock as required to construct, to alignments, profiles, and cross sections as indicated or as directed by Departmental Representative.
- .5 Rock excavation:
- .1 Notify Departmental Representative, when material appearing to confirm to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide 12 hour notification.
- .2 Submit rock excavation program to Departmental Representative, for approval 48 hours minimum before start of Work.

- 3.1 ROCK REMOVAL
(Cont'd)
- .5 (Cont'd)
- .2 (Cont'd)
- .1 do not proceed without written approval of no blasting program from Departmental Representative.
- .3 Reduce overbreak and increase stability of rock faces by using smooth no blasting techniques.
- .4 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.
- .5 No underdrained pockets shall be left in the rock surface.
- .6 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and avoid damage to adjacent structures and rock slopes.
- .7 Excavate rock in areas of bearing to horizontal surfaces.
- .8 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.
- .9 Cut trenches to widths as indicated.
- .10 Remove boulders and fragments which may slide or roll into excavated areas.
- .11 Correct unauthorized rock removal at no extra cost, to satisfaction of Departmental Representative.
- 3.2 CLEANING
- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Rock Disposal:
- .1 Dispose of surplus removed rock off site.
- .2 Do not dispose removed rock into landfill. Send material to appropriate facility in accordance with applicable municipal, provincial and federal guidelines.
- .3 Move removed rock to locations as directed by Departmental Representative for stockpiling. Stockpile heights not to exceed 2 m.

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| <u>3.2 CLEANING</u>
(Cont'd) | .3 | Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management Disposal. |
| <u>3.3 PROTECTION</u> | .1 | Prevent damage to surroundings and injury to persons in accordance with Section 01 56 00 - Temporary Barriers and Enclosures. |

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PART 1 - GENERAL

<u>1.1 RELATED SECTIONS</u>	.1	Section 31 05 16 - Aggregate Materials.
	.2	Section 32 11 16.01 - Granular Sub Base.
	.3	Section 32 11 23 - Aggregate Base Courses.
<u>1.2 REFERENCES</u>	.1	American Society for Testing and Materials International (ASTM)
	.1	ASTM C 117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
	.2	ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
	.3	ASTM D 422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
	.4	ASTM D 698-10, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³) (600 kN-m/m ³).
	.5	ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
	.2	Canadian General Standards Board (CGSB)
	.1	CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
	.3	Department of Justice Canada (Jus)
	.1	Canadian Environmental Protection Act (CEPA), 1999, c.33.
	.2	Transportation of Dangerous Goods Act(TDGA), 1992, c.34.
	.4	Nova Scotia Department of Transportation and infrastructure Renewal (NSTIR)
	.1	Standard Specification - Highway Construction and Maintenance (latest edition).
<u>1.3 DEFINITIONS</u>	.1	Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

1.3 DEFINITIONS (Cont'd)

- .1 (Cont'd)
 - .1 Rock: solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95m³-1.15m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan and frozen materials.
- .2 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .6 Unsuitable materials:
 - .1 Weak, chemically unstable, wet and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318-10, and gradation within limits specified when tested to ASTM D 422-63(2007) and ASTM C 136-06: Sieve sizes to CAN/CGSB-8.2-M88.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

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- 1.3 DEFINITIONS (Cont'd)
- .6 (Cont'd)
 - .2 (Cont'd)
 - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
 - .7 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

- 1.4 SUBMITTALS
- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Quality control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit to Departmental Representative testing results and reports as described in Part 3 of this section.
 - .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of work.
 - .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source(s) of fill materials and provide access for sampling.

- 1.5 QUALITY ASSURANCE
- .1 For design of ant temporary structures submit design and supporting data at least 2 weeks prior to installation or construction.
 - .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Nova Scotia, Canada.
 - .3 Keep design and supporting data on site.

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1.5 QUALITY
ASSURANCE
(Cont'd)

- .4 Engage services of qualified professional Engineer who is registered or licensed in Province of Nova Scotia, Canada in which Work is to be carried out to design and inspect shoring, bracing and underpinning required for Work.

1.6 EXISTING
CONDITIONS

- .1 Examine geotechnical report prepared by LVN/Maritime Testing, dated December 2013, Ref No. 18103, attached in Appendix A.
- .2 Existing buried utilities and structures:
- .1 Before commencing work obtain all required digging permits from local utilities and/or authorities, and verify and establish location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations and/or structures: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify Departmental Representative or authorities to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by hand digging or careful test excavations in presence of Departmental Representative. Hand dig all cables one metre either side of cable prior to machine excavation.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where unidentified utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or otherwise disturbing utilities or structures.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
- .3 Existing surface features:

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1.6 EXISTING CONDITIONS
(Cont'd)

.3 (Cont'd)

.1 Conduct, with Departmental Representative, condition survey of existing fencing, trees and other plants, service poles, wires, lighting fixtures, pavement, survey benchmarks and monuments, and all other surface features which may be affected by Work.

.2 Protect existing surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.3 Protect existing asphalt and concrete pavements which may be affected by Work from damage while work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

.4 Where required for excavation, cut roots or branches as directed by Departmental Representative.

1.7 SHORING, BRACING, AND UNDERPINNING

.1 Shoring, Bracing or underpinning may be required to prevent undermining of adjacent structures, underground utilities and/or traffic areas.

.2 Comply with safety requirements and applicable local legislation to protect existing features.

.3 Engage services of qualified Professional Engineer who is registered in the Province of Nova Scotia to design and inspect cofferdams, shoring, bracing and underpinning required for work.

.4 At least 2 weeks prior to commencing work, submit design and supporting data.

.5 Design and supporting data submitted to bear the stamp and signature of qualified Professional Engineer licensed in the Province of Nova Scotia.

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PART 2 - PRODUCTS

- | | |
|----------------------|--|
| <u>2.1 MATERIALS</u> | <ul style="list-style-type: none"> .1 Fill Against Structure: 'Fill Against Concrete Structure' in accordance with Division 3, Section 10 of NSTIR Standard Specification - Highway Construction and Maintenance (latest edition). .2 Clean Rock Fill: 'Clear Stone C4' in accordance with Division 3, Section 4 of NSTIR Standard Specification - Highway Construction and Maintenance (latest edition). .3 Select Backfill Material: from excavations or other sources, approved by the Departmental Representative for use intended, dry, unfrozen and free from rocks larger than 80 mm, cinders, ashes, sods, refuse or other deleterious or unsuitable materials. .4 Geotextiles: to Section 31 32 19.01 - Geotextiles. .5 Unshrinkable Fill: proportioned and mixed to provide: <ul style="list-style-type: none"> .1 Maximum compressive strength of 1.0 MPa at 28 days. .2 Maximum Portland cement content of 25 kg/m³. .3 Minimum strength of 0.07 MPa at 24 h. .4 Concrete aggregates: to CAN/CSA-A23.1. .5 Portland cement: Type GU. .6 Slump: 150 minimum. |
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PART 3 - EXECUTION

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| <u>3.1 SITE PREPARATION</u> | <ul style="list-style-type: none"> .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated. .2 Sawcut pavement neatly along limits of proposed removal in order that surface may break evenly and cleanly in accordance with Section 02 41 13.14 - Asphalt Paving Removal. |
|-----------------------------|--|

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- 3.2 STOCKPILING
- .1 Stockpile fill materials in areas designated by Departmental Representative.
 - .1 Stockpile granular materials in manner to prevent segregation.
 - .2 Protect fill materials from contamination.
 - .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

- 3.3 COFFERDAMS, SHORING, BRACING AND UNDERPINNING
- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements and Health and Safety Act for the Province of Nova Scotia.
 - .2 Obtain permit from authority having jurisdiction for any temporary diversion or pumping of water course.
 - .3 During backfill operation:
 - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .4 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

- 3.4 DEWATERING
- .1 Keep excavations free of water while Work is in progress.
 - .2 Submit for Departmental Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
 - .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

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3.4 DEWATERING (Cont'd)

- .3 (Cont'd)
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, existing facilities, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.5 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 For foundation and structures:
 - .1 Excavate as required to carry out work, in all materials encountered, to level of competent bearing stratum, described in geotechnical report as compact to dense glacial till or 'bedrock'. Do not disturb soil or rock below bearing surface.
 - .2 Inspection by professional geotechnical engineer designated by Departmental Representative, as required.
 - .3 If bearing surface is unsatisfactory, perform additional excavation as directed by Departmental Representative. Replace excavated material to satisfaction of Departmental Representative.
 - .4 Obtain Departmental Representative's approval of completed excavation.
- .3 Remove concrete and asphalt paving, demolished foundations and rubble and other obstructions encountered during excavation.

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3.5 EXCAVATION (Cont'd)

- .4 Excavation must not interfere with normal 1:1 (H:V) spray of bearing capacity of adjacent foundations and traffic areas. If interference will occur, excavation must be shored, braced or underpinned as described elsewhere in this specification.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated materials off-site in accordance with applicable provincial and municipal regulations.
- .10 Do not obstruct flow of surface drainage or natural watercourses. Diversions of flow are to be submitted in detailed plan and approved by Departmental Representative and other authorities before proceeding.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached and/or appears unsuitable and proceed as directed by Departmental Representative.
- .13 Obtain Departmental Representative's approval of completed excavation.

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3.5 EXCAVATION (Cont'd)

- .14 If encountered, remove unsuitable material from excavation bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
 - .1 In areas occupied by foundations or structures, replace excavated material with Fill Against Structure compacted to not less than 100% Standard Proctor maximum dry density.
- .15 Correct unauthorized over-excavation as follows:
 - .1 In areas not occupied by foundations or structures, replace excavated material with Select Backfill Material compacted to not less than 98% of Standard Proctor Maximum Dry Density.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .17 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.6 BACKFILL TYPES AND COMPACTION

- .1 Use types of backfill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698.
 - .1 Clean Rock fill: compact to 100% of maximum dry density.
 - .2 Fill Against Structure: compact to 95% of maximum dry density.
 - .3 Select Backfill Material: compact to 95% of maximum dry density.
 - .4 Bedding: compact to 100% of maximum dry density.

3.7 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Removal of concrete formwork.

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3.7 BACKFILLING (Cont'd)

- .1 (Cont'd)
- .3 Removal of shoring and bracing;
- .4 Backfilling of voids with satisfactory soil material.
- .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 backfill material in uniform layers not exceeding 200 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer. Departmental Representative may authorize thicker lifts if it can be shown specified compaction can be achieved.
- .5 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .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 14 days or until it has sufficient strength to withstand earth and compaction pressure and obtain approval from Departmental Representative.
 - .5 Place unshrinkable fill in areas as indicated or directed by Departmental Representative. Consolidate and level unshrinkable fill with internal vibrators.

3.8 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil, seed and fertilize as indicated.

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3.8 RESTORATION
(Cont'd)

- .3 Reinstall pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 29.06 - Health and Safety
- .3 Section 01 35 43 - Environmental Procedures
- .4 Section 02 41 16 - Structure Demolition
- .5 Section 03 30 00 - Cast-In-Place Concrete
- .6 Section 31 05 16 -Aggregate Materials
- .7 Section 31 24 14 - Fill against Structure
- .8 Section 31 23 16.26 - Rock Removal
- .9 Section 31 32 19.01 - Geotextiles
- .10 Section 31 37 00 -Rip Rap
- .11 Section 32 11 16.01 - Granular Sub-base
- .12 Section 32 11 23 - Aggregate Base Courses

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Conduct, with Departmental Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected.
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- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovering.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Install temporary barrier and temporary retaining structures to separate and protect work zone from highway traffic.
- .3 Two lanes of undivided traffic shall be maintained on the existing bridge and approaches throughout construction / until traffic is diverted onto the new structure and realigned highway. Prior to and during abutment excavation, the temporary retaining walls detailed on the Contract Drawings shall be installed to retain the approaches of the existing highway.

3.3 TEMPORARY DAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety and Health and Safety Act for the Province of Nova Scotia, Canada.
- .2 Construct temporary Works to depths, heights and locations as indicated or directed by Departmental Representative.

3.4 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water by pumping into vegetated areas in approved collection runoff areas and in manner not detrimental to public, private property, watercourse, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

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.2 Do not allow sediment laden water to reach adjacent watercourses.

3.5 EXCAVATION

- .1 Advise Departmental Representative 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 on the drawings or as directed by Departmental Representative.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Keep excavated and stockpiled materials safe distance away from construction activities.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of surplus and unsuitable excavated material in approved location as directed by the Departmental Representative.
- .7 Do not obstruct flow of surface drainage or natural watercourses.
- .8 Ensure excavation completed in a phased manner as indicated to maintain two lanes of traffic on the existing bridge and approaches facilities in any manner.
- .9 Earth bottoms of excavations to be undistributed soil, level, free from loose, soft or organic matter.
- .10 Notify Departmental Representative when bottom of excavation is reached.
- .11 Obtain Departmental Representative approval of completed excavation.
- .12 Remove unsuitable material from excavation bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .13 Correct unauthorized over-excavation as follows:
 - .1 Fill with Fill Against Structure gravel

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compacted to not less than 98% of corrected Standard Proctor maximum dry density.

- .14 Install geotextiles in accordance with Section 31 32 19.02 - Geotextiles.
- .15 Protect environment from erosion and sediment, transport as per requirements of Environment Protection Plan.
- .16 The use of explosive or other means, which in the opinion of the Departmental Representative might disturb the existing structure, etc. shall not be permitted.
- .17 Boulders removed shall be satisfactorily utilized or disposed of as directed by the Departmental Representative.
- .18 After removal of forms and the required concrete strength has been achieved as noted on the Contract Drawings, the excavations around the structure shall be backfilled up to the level shown on the Contract Drawings, utilizing the backfill materials noted in the Contract Documents. Materials obtained from the foundation excavation shall not be used as backfill unless written approval to do so is provided by the Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 03 30 00 - Cast-in-Place Concrete
- .2 Section 31 23 33.02 - Excavating for Bridge
- .3 Section 31 37 00 -Rip-Rap
- .4 Section 31 62 16.16 - Steel H Piles

1.2 REFERENCES

- .1 ASTM C117, Test Method for Material Finer Than 75 m Sieve in Mineral Aggregate by Washing.
- .2 ASTM C131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136, Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Crushed and screened gravel or rock approved by the Departmental Representative prior to placement.
- .2 Material shall be tested in accordance with ASTM C117 and ASTM C136 and shall conform to the following gradation:

<u>Sieve Size</u> μm	<u>Percent Passing</u>
112 000	100
40 000	60 - 85
5 000	25 - 50
315	5 - 15
80	2 - 7
- .3 Fill Against Structure shall conform to the physical properties requirements listed in the following:

<u>Property</u>	<u>Test Method</u>	<u>FAS</u>
LA Abrasion (Grading A)	ASTM C131	45
Plasticity Index (Sand Portion)	ASTM D4318	< 6

PART 3 - EXECUTION

3.1 PLACING

- .1 The embankment underlying the Fill Against Structures shall be compacted as indicated on the drawings.
- .2 Prior to placing structural fill, inspect subgrade and concrete abutment structures to assure stability. Do not proceed with filling operations until these areas are approved by the Departmental Representative.
- .3 Fill material shall be placed in layers not exceeding 300 mm in thickness and each layer compacted as specified herein by means of a vibratory compactor. Refer to Contract Drawings for allowable compaction equipment adjacent to fully integral abutment caps. Compaction of fills behind each abutment shall not be undertaken until the deck and top portion of the integral abutment cap are cast and reach at least 35 MPa. Backfilling and compaction of the Fill Against Structure material behind each abutment shall be carried out simultaneously in equal lifts to equalize longitudinal loads applied on the fully integral abutments.
- .4 Fill Against Structure shall be compacted using special equipment, suitable for work in confined spaces and as outlined on the Contract Documents.
- .5 Compaction of Fill Against Structure shall be compacted as indicated on the Drawings.
- .6 Extents of Fill Against Structure adjacent and surrounding each abutment on both approaches shall be as indicated on the Drawings or as determined by the Departmental Representative.
- .7 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .8 Do not use Fill Against Structure material which is frozen or contains ice, snow or debris.

3.2 SITE TOLERANCES

- .1 The extent of Fill Against Structure shall be as indicated on the plans or as determined by the
-

Departmental Representative.

3.3 PROTECTION

- .1 Upon completion of Work, remove waste materials and debris and correct defects as directed by Departmental Representative.
- .2 Maintain finished slopes and lines until subsequent material is placed covering the Fill Against Structure.
- .3 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .4 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

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PART 1 - GENERAL

<u>1.1 RELATED SECTIONS</u>	.1	Section 01 33 00 - Submittal Procedures
	.2	Section 31 23 33.01 - Excavating, Trenching and Backfilling.
	.3	Section 31 24 13 - Temporary Roadway Embankments.
<u>1.2 REFERENCES</u>	.1	American Society for Testing and Materials International, (ASTM)
	.1	ASTM D 4491-99a(2011), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
	.2	ASTM D 4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
	.3	ASTM D 4716-08(2013), Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
	.4	ASTM D 4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
	.2	Canadian General Standards Board (CGSB)
	.1	CAN/CGSB-4.2 No. 11.2-M89(2004), Textile Test Methods - Bursting Strength - Ball Burst Test (Reaffirmation 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.

1.2 REFERENCES (Cont'd)

- .2 (Cont'd)
- .2 (Cont'd)
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/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.
- .4 Nova Scotia Department of Transportation and infrastructure Renewal (NSTIR)
 - .1 Standard Specifications - Highway Construction and Maintenance, (latest edition).

1.3 SUBMITTALS

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative following samples at least 4 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
- .3 Submit to Departmental Representative copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

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

1.5 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 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

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|---|----|--|
| 1.5 WASTE
MANAGEMENT AND
DISPOSAL
(Cont'd) | .3 | Collect and separate for disposal paper, plastic polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan. |
| | .4 | Fold up metal banding, flatten and place in designated area for recycling. |

PART 2 - PRODUCTS

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|--------------|----|---|
| 2.1 MATERIAL | .1 | Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
.1 Medium Weight geotextile to Division 6, Section 12 of NSTIR Standard Specification - Highway Construction and Maintenance, (latest edition). |
| | .2 | Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m ² to CAN/CSA G164. |
| | .3 | Factory seams: sewn in accordance with manufacturer's recommendations. |
| | .4 | 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 onto graded surface in orientation, manner and locations indicated and retain in position with. |
| | .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 | Overlap each successive strip of geotextile in accordance with manufacturer's instructions. |

3.1 INSTALLATION
(Cont'd)

- .5 Join successive strips of geotextile by sewing in accordance with manufacturer's instructions.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 4 h of placement.
- .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .9 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and Section 31 24 13 - Temporary Roadway Embankments.

3.2 CLEANING

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner in accordance with applicable federal, municipal and provincial regulations.

3.3 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

PART 1 - GENERAL

1.1 RELATED SECTIONS	.1	Section 31 32 19.01 - Geotextiles.
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PART 2 - PRODUCTS

2.1 STONE	.1	Hard, dense with relative density 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 Channel Rip-Rap .1 70% (min) of stone shall be between 200 and 450 mm diameter.
	.2	Rip-rap to be clean, inorganic, non ore-bearing, non-toxic material from a non-watercourse source. It shall be hard, resistant to weathering and angular in shape.
	.3	Where specified for stream beds, rip-rap shall be placed in lifts and washed following placement.

2.2 GEOTEXTILE FILTER	.1	Geotextile: in accordance with Section 31 32 19.01 - Geotextiles.
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PART 3 - EXECUTION

3.1 PLACING	.1	Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
	.2	Place geotextile on prepared surface in accordance with Section 31 32 19.01 - Geotextiles and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
	.3	Place rip-rap to thickness and details as indicated.

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3.1 PLACING
(Cont'd)

- .4 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
- .5 Hand placing:
 - .1 Use larger stones for lower courses and as headers for subsequent courses.
 - .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
 - .3 Finish surface evenly, free of large openings and neat in appearance.

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Section 31 09 16 - Pile Driving Templates.
- .2 Appendix A - Geotechnical Investigation Report.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittals.
 - .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
 - .3 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to Departmental Representative and await further instructions.
 - .4 Submit schedule of planned sequence of driving to Departmental Representative for review.
 - .5 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in Province of Nova Scotia.
 - .6 Equipment:
 - .1 Submit prior to pile installation for review by Departmental Representative, list and details of equipment for use in installation of piles.
 - .2 Impact hammers: submit manufacturer's written data as specified.
 - .7 Submit driveability analysis as specified, to Departmental Representative for approval of hammers.
 - .8 Quality assurance submittals:
 - .1 Test reports: submit certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics for specified performance.
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.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 in accordance with Section 01 61 00 - Material and Equipment and 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 Departmental Representative.

1.4 EXISTING CONDITIONS

- .1 Sub-surface investigation report is bound into specification Appendix A.
- .2 Notify Departmental Representative in writing if subsurface conditions at site differ from those indicated and await further instructions from Departmental Representative.

1.5 SCHEDULING

- .1 Drive piles in accordance with reviewed sequence.
- .2 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 Supply or fabricate full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.
- .2 Splice piles only with written approval of Departmental Representative.
 - .1 When permitted provide details for Departmental Representative review.
 - .2 Design details of splice to bear dated signature stamp of professional engineer registered or licensed in Province of Nova Scotia,

Canada.

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 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 operations.
 - .1 Make provision for access and support of piling equipment during performance of Work.
 - .3 Drive piles only when excavation has been completed.
 - .4 Drive piles within embankments only when
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embankment has been placed and compacted to at least bottom elevation of pile cap.

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 reviewed by Departmental Representative to ensure support to pile while being driven.
 - .2 Inclined leads to be used for battered piles.
 - .3 Lengths: provide sufficient length of leads to ensure that use of follower is unnecessary.
 - .4 Swing leads:
 - .1 Not permitted.
 - .2 Obtain approval from Departmental Representative prior to using swing leads.
 - .3 Firmly guy top and bottom to hold pile in position during driving operation.
 - .4 Method to be reviewed by Departmental Representative.
- .2 Followers:
 - .1 Obtain approval from Departmental Representative prior to using followers.
 - .2 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.
 - .3 Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.
 - .4 Drive applicable load test piles using similar follower.
- .3 Allowable design load capacity of pile at specified and factored load is as indicated.
- .4 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 removal of pile driving rig from site.

.5 Drive each pile to practical refusal, which may be taken as 15 blows per 25 mm penetration for the last 250 mm of penetration for the specified range of hammer energy.

.1 Determine required driving resistance from load test on a test pile as directed by Departmental Representative.

.2 Prior to final set drive piles without interruption for a sufficient interval to break or prevent development of freeze.

.6 Drive each pile to practical refusal.

.1 Do not overdrive to cause damage to piles.

.7 Drive each pile to pile tip minimum elevation as indicated.

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 Ensure no contact between pile and structure takes place when driving batter piles adjacent to existing structures.

.5 Do not drive batter piles until all vertical piles of the same abutment have been fully driven.

.6 Restrike already driven piles lifted during driving of adjacent piles to assure set.

.7 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.

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- .8 Cut off piles neatly and squarely at elevations as indicated to tolerance of plus or minus 150 mm.
 - .1 Provide sufficient length above cut-off elevation so that part damage during driving is cut off.
 - .2 Do not cut tendons or other reinforcement, which will be used to tie pile caps to pile.

- .9 Remove cut-off lengths from site on completion of work.

3.4 DRIVING TOLERANCES

- .1 Pile heads to be within 150 mm of locations as indicated.
- .2 Piles not to be more than 1.0 % of length out of vertical alignment (or out of batter), and not more than 100 mm.

3.5 OBSTRUCTIONS

- .1 Where obstructions are encountered that cause sudden unexpected change in penetration resistance or deviation from specified tolerances, remove obstruction.

3.6 REPAIR AND RESTORATION

- .1 Pull out rejected piles and replace with new piles.
- .2 Remove rejected pile and replace with new, and if necessary, longer pile.
- .3 Remove rejected pile and fill hole as directed by Departmental Representative.
- .4 If approved by Departmental Representative, leave rejected pile in place and cut off as directed by Departmental Representative.
 - .1 Leave rejected pile in place, place adjacent pile and modify pile cap as directed by Departmental Representative.
- .5 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

3.7 FIELD QUALITY
CONTROL

- .1 Pile Driving Analyzer:
 - .1 Use Pile Driving Analyzer and Wave Equation Analysis to determine and confirm driving criteria such as hammer size and variation in impact, suitability of driving cap and cushions and penetration resistance relative to set on piles before start of pile placement.
 - .2 Work to be performed by geotechnical engineer registered or licensed in Province of Nova Scotia, Canada.
 - .2 Testing agency appointed by Departmental Representative will use Pile Driving Analyzer and Wave Equation Analysis to confirm driving criteria. Included are: hammer size and variation in impact, suitability of driving cap and cushions, and penetration resistance relative to set for initial driving and restriking.
 - .1 Departmental Representative to select piles for testing.
 - .3 Prepare piles to be instrumented by drilling and tapping holes for installation of strain transducers and accelerometers, as directed by Departmental Representative.
 - .4 Provide assistance, as required, in instrumentation process during initial set-up and during test.
 - .1 Such assistance will include: attaching of test equipment leads to transducers and accelerometers when pile is positioned in leads prior to driving, replacing of transducers and accelerometers, if required, during driving.
 - .5 Make allowance for probable interruption in driving for:
 - .1 Changing/modifying hammer, cap, cushions, or other equipment;
 - .2 Replacing/adjusting of transducers and accelerometers;
 - .3 Assessing of monitored results.
 - .6 Replace/adjust hammer and modify cap, cushions, and other equipment, as directed by Departmental Representative.
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- .7 Confirm that final set has been achieved, when instructed by restriking instrumented piles minimum of 24 hours after determination of penetration resistance for initial set. If relaxation occurs, restrike all piles to refusal criteria. Repeat restrike cycle until refusal is maintained during restrike.
- .8 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 25 mm for last 250 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 during before and after driving of each pile.
 - .9 All measurement, observations and calculations associated with pile driving analyzer and wave equation analysis.
 - .2 Provide Departmental Representative with records.

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.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 01 33 00 - Submittal Procedures
 - .2 Section 03 20 00 - Concrete Reinforcing
 - .3 Section 03 30 00 - Cast in Place Concrete
 - .4 Section 31 09 16 - Pile Driving Templates
 - .5 Section 31 09 17 - Pile Tests
 - .6 Section 31 61 13 - Pile Foundations, General Requirements
- 1.2 REFERENCES
- .1 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-13/G40.21-13, 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 W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .4 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .5 CAN/CSA S6-14, Canadian Highway Bridge Design Code (CHBDC).
 - .6 CAN/CSA S16-14, Design of Steel Structures.
 - .7 CSA W59-13, Welded Steel Construction, (Metal Arc Welding).
- 1.3 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 and indicate: pile shoes, splice detail, pile cap details, tip reinforcement.
 - .1 Each drawing stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
 - .4 Quality Assurance: Test Reports:
 - .1 Prior to fabrication, and, if requested,
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provide Departmental Representative with two copies of steel producer's certificates in accordance with CSAG40.20/G40.21.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .5 Submit details of pile stock material to be used, as described in Section 2 - Products, for review by Departmental Representative.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle to prevent damage to products.

- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .3 Deliver new, undamaged materials to site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on H piling.

- .4 Storage and Protection:

.1 Store and handle H piling in accordance with manufacturer's written instructions to prevent permanent deflection, distortion or damage to piles.

.2 Support H piling on level blocks or racks spaced not more than 3 m apart and not more than 0.60 m from ends.

.3 Store H piling to facilitate required inspection activities and prevent corrosion prior to installation.

- .5 Waste Management and Disposal:

.1 Separate waste materials for disposal 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel HP360x152 piles as indicated to CSA G40.20/G40.21 - 350W.

- .2 Pile cap plate to CSA-G40.20/G40.21, Grade 350W.
- .3 Compatibly sized H pile driving shoes: to CSA-G40.20/G40.21, Grade 300W.
- .4 Splices: to CSA-G40.21/G40.21, Grade 350W
- .5 Welding electrodes: to CSA W48.
- .6 Welding and weld testing to CSA W59.
- .7 Cast-in-place concrete to Section 03 30 00 - Cast-in-place Concrete.

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.
- .2 Connect approved H pile driving shoe to H pile as per manufacturer's recommendations.

3.2 FABRICATION

- .1 Fabricate full length piles to eliminate splicing during installation wherever possible.
- .2 Do not splice piles unless otherwise approved in writing by Departmental Representative. If splices are approved, cost shall be incidental to pile installation.
 - .1 Use complete joint penetration groove welds. Test weld soundness to W59 Section 11, Statically Loaded Structures.
- .3 Submit details of planned use of pile material stock to Departmental Representative for approval prior to start of fabrication. Re-use cut-off lengths as directed by Departmental Representative.
- .4 Allowable tolerance on axial alignment to be 0.25% as measured by 3 m straight edge.
- .5 Allowable deviation from straight line over total length of fabricated pile to be 50 mm.
- .6 Install pile cap reinforcement, splices and driving shoes as indicated.

- .7 Repair defective welds as directed by Departmental Representative.
 - .1 Repairs: to CSA W59.
 - .2 Unauthorized weld repairs may be rejected.

3.3 INSTALLATION

- .1 Install piling in accordance with Section 31 61 13 - Pile Foundations, General Requirements.
- .2 Perform internal visual inspection of steel H piles, joints and cap prior to placing of concrete. Ensure enough pile cut-off length is provided such that the remaining pile has not been damaged during pile driving operations.
- .3 Assemble and install reinforcement cages for integral abutments as indicated.
- .4 Install driving shoes during shop fabrication.
- .5 Piles to be driven within ± 75 mm of theoretical position.

3.4 WELDING

- .1 Weld to CSA W59.
- .2 Welding certification of companies: to CSA W47.1.
- .3 Welding certification of companies welding steel reinforcing bars placed in reinforced concrete: in accordance with CSA W186.

END OF SECTION
