
<u>SECTION NO.</u>	<u>TITLE</u>	<u>NO. OF PAGES</u>
001	Dewatering	2
002	Erosion and Sediment Control	3
003	Trench Excavation and Backfilling	5
004	Excavation, Fill, and Compaction	5
005	Compaction Control and Testing	1
006	Precast Concrete Box Culvert	4
007	Geotextiles	3
008	Riprap	3
009	Hydroseeding	2
010	Eel Ramp	2
011	Bevel Gear Lift	1
012	Concrete and Formwork	3
013	Concrete Reinforcement	3

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for dewatering procedures to stabilize ground and/or keep excavations dry during construction of works.

1.2 Related Work Specified Elsewhere

- | | | |
|----|-----------------------------------|-------------|
| .1 | Trench Excavation and Backfilling | Section 003 |
| .2 | Excavation, Fill & Compaction | Section 004 |
| .3 | Precast Concrete Box Culvert | Section 006 |

1.3 Submittals

- .1 Submit details of proposed dewatering systems for Engineer's review.

1.4 Protection

- .1 Take all necessary precautions to prevent uplift of any structure.
- .2 Protect all excavations against flooding and damage due to surface run-off.
- .3 Protect surrounding environment as dictated by the provincial watercourse alteration permit.

1.5 Payment

- .1 Payment for this work item shall be a lump sum price.
- .2 Items under this section are included in the Form of Tender under Dewatering.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Dewatering

- .1 Complete all activities (cofferdam, pumping, temporary diversion channel, etc.) in accordance with the conditions imposed by the provincial watercourse alteration permit and applicable environmental regulations.
- .2 All work operations are to be conducted in a manner to cause a minimum of siltation and disturbance to the adjacent and downstream areas.

- .3 The Contractor's dewatering plan should include measures to avoid excessive erosion of surrounding slopes during periods of heavy rainfall.
- .4 Provide all labour and materials necessary to keep excavations stable and free of water while work is in progress.
- .5 Provide stand-by equipment as necessary to ensure continued operation of dewatering system in case of breakdown of primary system.
- .6 The contractor is advised to provide a water management plan that accounts for the possibility of rising water levels in the adjacent lake due to heavy precipitation events.
- .7 Protection is to be provided to assure no deleterious substance is allowed to enter a watercourse.
- .8 The aquatic protection flow requirements specified in the Water Approval are to be maintained downstream of the work area during construction.

3.2 Disposal

- .1 Provisions for disposal of water to be subject to Engineer's review.

*****END OF SECTION 001*****

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for the supply, installation, maintenance and removal of a sediment control fence.
- .2 This Section includes any additional Erosion and Sediment Control measures required to satisfy any applicable environmental regulations.

1.2 Related Work Specified Elsewhere

- | | | |
|----|-----------------------------------|-------------|
| .1 | Trench Excavation and Backfilling | Section 003 |
| .2 | Excavation, Fill & Compaction | Section 004 |
| .3 | Hydroseeding | Section 009 |

1.3 Submittals

- .1 Submit to Engineer the specification sheet of the woven geotextile to be used for the sediment control fence.

1.4 Payment

- .1 Payment for work under this section shall be for the number of linear metres of sediment control fence acceptably supplied, installed, maintained and removed in accordance with this item.
- .2 Items under this section are included in the Form of Tender under Erosion and Sediment Control.
- .3 No extra payment will be made for measures ordered by the Engineer to replace damaged or improperly installed sections of sediment control fence.
- .4 No extra payment will be made for additional Erosion and Sediment Control measures required to satisfy applicable environmental regulations.

PART 2 - PRODUCTS

2.1 Sediment Control Fence

- .1 All materials shall be supplied by the Contractor.
- .2 The sediment control fence may be prefabricated or constructed on site from the specified individual components.
- .3 The fabric shall be a woven geotextile as specified below, or an equivalent material approved by the Engineer.

Property	Unit	ASTM	Minimum Requirement
Tearing Strength (Trapezoid Method)	N	D4533	200
Grab Tensile Strength (Both Directions)	N	D4632	400
Elongation at Break	%	D4632	25 max.
Apparent Opening Size	µm	D4751	840 max.
UV Degradation	% Ret.	D4355	70 min.
Permittivity	Sec ⁻¹	D4491	0.01 min.

- .4 Support posts are to be supplied as indicated in the Contract Documents.

PART 3 - EXECUTION

3.1 Construction

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.
- .2 The Contractor shall install sediment control fence to comply with applicable permits and regulations.
- .3 The sediment control fence shall be installed as indicated in Contract Documents and prefabricated sediment control fence shall be installed as per the manufacturer's instructions.
 - .1 In areas of potential sheet flow runoff where construction activity may cause the drainage runoff to transport sediment, and the Contract Documents do not provide for sediment control fences in these areas, the Contractor shall ensure sediment control fences are properly located for effective runoff control.
- .4 The Contractor shall maintain the sediment control fence in a functional condition continuously from the time of installation until the completion of the Contract or removal.
- .5 The Contractor shall inspect all sediment control fences after each rainfall and at least daily during periods of prolonged rainfall.
- .6 The Contractor shall immediately repair any damage to sediment control fences or parts thereof.
- .7 The Contractor shall remove retained sediment prior to it having accumulated to a level approximately but not exceeding one-half the height of the fence, and this sediment shall be disposed of at a location at least 30 metres away from any watercourse, and in such a manner the sediment will not be returned to the Work Area or the watercourse; or

- .1 Subject to the approval of the Engineer, the Contractor may install a second, back-up sediment control fence, at their own expense.

- .8 The Contractor shall remove all sediment control fence and the time of such removal shall be subject to the Engineer's approval but in all cases shall occur prior to the completion of the Contract.
 - .1 Sediment control fence removed shall become the property of the Contractor and shall be disposed of outside the Work Site.

 - .2 If the Engineer notifies the Contractor in writing, prior to the completion of the Contract, all or any part of the sediment fence is to remain in place, the Contractor shall be deemed to have completed their obligations for that portion of the sediment control fence under this item and the sediment control fence shall become the property of the Owner.

- .9 At the time of removal, the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30 metres from any watercourse, and in such a manner the sediment will not be returned to the Work Area or the watercourse and shall dress and seed the area of the removed fence and sedimentation, to the satisfaction of the Engineer.

*****END OF SECTION 002*****

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for excavating and backfilling trenches for installation of the precast concrete box culvert.

1.2 Related Work Specified Elsewhere

- .1 Dewatering Section 001
- .2 Compaction Control and Testing Section 005

1.3 Definitions

- .1 Trench
 - .1 As defined in Nova Scotia Occupational Health and Safety Act.
- .2 Earth Excavation:
 - .1 All excavation other than rock excavation including removal of frozen earth.
- .3 Additional Excavation:
 - .1 All excavation ordered in writing by the Engineer beyond that specified.
- .4 Excess Excavation:
 - .1 All excavation beyond that specified performed without written order of the Engineer.
- .5 Native Site Material:
 - .1 Any material obtained from excavating or grading under Contract.
- .6 Standard Proctor Density:
 - .1 As defined in ASTM D698.

1.4 Submittals

- .1 Submit to Engineer a copy of agreement for disposal site.
- .2 Submit to Engineer the grain size analysis and Standard Proctor laboratory results for all proposed backfill materials.

1.5 Cold Weather Work

- .1 Obtain written permission from the Engineer before starting excavation in frozen ground.

1.6 Disposal Sites

- .1 Disposal areas shall be at various locations on site as designated by the Engineer under the guidance of any environmental or access permitting.
- .2 Keep disposal site stable for dump materials in a manner not to cause nuisance, injury or inconvenience until property owner assumes responsibility under Terms of Agreement.

1.7 Stability of Trench

- .1 Employ such construction methods, plant, procedures and precautions as shall ensure that trenches are stable, free from disturbance and unless designated as sub-aqueous work, dry.
- .2 Such construction methods may include but are not limited to:
 - .1 Interlocking timber or steel sheeting and shoring.
 - .2 Groundwater control systems employing well points, deep wells or eductors.
 - .3 Surface water or free water control systems employing ditches, stone drains, pipes and/or pumps.
 - .4 Soil stabilization methods employing cement grouting, chemical grouting or chemical freezing.
- .3 Employ such construction methods, plant and materials as shall ensure that migration of fine soil material into pipe bedding or sub-bedding from adjacent ground shall not take place.
- .4 Do not use clear stone or other material with a high proportion of voids for bedding or sub-bedding unless specified or ordered in writing by the Engineer for specific locations.
- .5 Follow procedures for extracting sheeting, placing backfill and discontinuing groundwater control as shall ensure that backfill load is applied gradually and disturbance of pipeline or its foundation is avoided.

1.8 Payment

- .1 Payment for work under this section shall be for the number of cubic metres of acceptable excavation, backfill, and compaction required to install the precast concrete box culvert.
- .2 Items under this section are included in the Form of Tender under Trench Excavation and Backfilling.
- .3 No extra payment will be made for extra excavation needed on account of soil heaving at bottom of trench or collapse of trench walls.
- .4 No extra payment will be made for measures ordered by the Engineer to correct problems caused by excess excavation.

- .5 No extra payment will be made for haul on any part of site or for haul required in disposing of excavated material.
- .6 No payment will be made for hauling back to site excavated material suitable for backfill that has been removed from site.
- .7 No extra payment will be made for stockpiling or double handling of excavated materials.
- .8 No extra payment will be made for construction methods required to keep trench stable, free from disturbance or dry.
- .9 No extra payment will be made for crushed stone or other granular material used to facilitate drainage or dewatering during construction of pipeline or for extra excavation related thereto.
- .10 No extra payment will be made for removal and replacement of soil weakened or disturbed by unsuitable construction methods or procedures or by action of workers.

PART 2 - PRODUCTS

2.1 Backfill Materials

- .1 Native Site Material:
 - .1 Excavated material approved by the Engineer.
- .2 Imported Material:
 - .1 Material free from frozen lumps, cinders, ashes, refuse, vegetable or organic matter, rocks and boulders over 150 mm in any dimension, or other deleterious materials.
 - .2 Do not use any material until approval has been received from the Engineer.

PART 3 - EXECUTION

3.1 Dewatering

- .1 Dewater excavation to Section 001.

3.2 Removal of Frozen Ground

- .1 Do not use backhoe bucket or drop weight to break frozen ground.
- .2 Adopt method of removal of frozen ground that will not cause excessive noise, ground vibration or damage to adjacent structures and utilities.

3.3 Trenching

- .1 Excavate trenches to lines, grades, elevations and dimensions specified or as shown on the Drawings or as directed by the Engineer.
- .2 Excavate trenches so that width at bottom does not exceed width at top.
- .3 Notify Engineer if bottom of trench appears to be unsuitable for foundation. Excavate unsuitable material as directed or agreed to by the Engineer until satisfactory foundation is attained and backfill with approved granular material.
- .4 Stockpile excavated material suitable for trench backfill.
- .5 Separate materials that are unsuitable for backfill.
- .6 Perform corrective measures ordered by the Engineer to rectify deficiencies caused by excess excavation.
- .7 Do not use trenching box if soil conditions or method of use are such that disturbance of soil or bedding occur.
- .8 Remove and replace weakened or disturbed soil with approved granular material compacted to 98% maximum dry density in accordance with Standard Proctor Density (ASTM D698) where soil is disturbed or weakened by unsuitable construction methods or procedures which may include inadequate control of groundwater or free water or action of workers.
- .9 Any obstruction of watercourse or surface drainage to be completed under permit guidelines.

3.4 Working Mat

- .1 Place layer of granular material where necessary to protect trench bottom.
- .2 Place working mat layer immediately after excavation has been completed.
- .3 Do not encroach on bedding thickness under pipe.

3.5 Backfilling

- .1 Place backfill material in uniform layers not exceeding 200 mm in loose depth for full width of trench.
- .2 Compact each layer to 98% of maximum dry density in accordance with Standard Proctor Density (ASTM D698) before placing succeeding layer.
- .3 Place layers simultaneously on both sides of installed work to equalize loading if applicable.
- .4 Do not place backfill in freezing weather without written permission of the Engineer.

- .5 Compact using approved mechanical tamping devices, or by hand tamping to achieve specified compaction.

3.6 Disposal of Materials

- .1 Dispose of unsuitable and surplus excavated materials at approved disposal locations.
- .2 Transport materials in a manner that spillage is minimized.

3.7 Field Quality Control

- .1 Do testing to Section 005.
- .2 All excavations shall be inspected and approved by the Engineer prior to commencement of installation operations.

*****END OF SECTION 003*****

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for excavation, filling, placement and compaction defined by the typical cross sections shown on the Drawings.

1.2 Related Work Specified Elsewhere

- | | | |
|----|--------------------------------|-------------|
| .1 | Dewatering | Section 001 |
| .2 | Compaction Control and Testing | Section 005 |
| .3 | Geotextiles | Section 007 |
| .4 | Riprap | Section 008 |
| .5 | Hydroseeding | Section 009 |

1.3 Definitions

- .1 Earth Excavation:
 - .1 All excavation other than rock excavation including removal of frozen earth.
- .2 Additional Excavation:
 - .1 All excavation ordered in writing by the Engineer beyond that specified.
- .3 Excess Excavation:
 - .1 All excavation beyond that specified performed without written order of the Engineer.
- .4 Embankment:
 - .1 Material derived from usable excavation or imported and placed above original ground or stripped surface.
- .5 Native Site Material:
 - .1 Any material obtained from excavating or grading under Contract.
- .6 Standard Proctor Density:
 - .1 As defined in ASTM D698.

1.4 Submittals

- .1 Submit to Engineer a copy of agreement for disposal site required in 1.6.3.

- .2 Submit to Engineer a copy of agreement for borrow site subject to Engineer's approval.
- .3 Submit to Engineer the grain size analysis and Standard Proctor laboratory results for all proposed backfill materials.

1.5 Cold Weather Work

- .1 Obtain written permission from the Engineer before starting excavation in frozen ground.

1.6 Disposal Sites

- .1 Arrange with Engineer for disposal of surplus excavated materials on site, in accordance with environmental and access permitting.
- .2 Make arrangements for other disposal site if Owner cannot make use of surplus excavated materials and obtain all necessary permits.
- .3 Keep disposal area stable and dump materials in a manner not to cause nuisance, injury or inconvenience until property owner assumes responsibility under terms of agreement.

1.7 Site Conditions

- .1 Any damages to existing services and utilities by the Contractor during excavation operations shall be repaired and/or replaced to the entire satisfaction of the parties concerned at the Contractor's expense.
- .2 The Contractor is not to excavate outside of the slopes or below established grade unless directed by the Engineer.
- .3 Embankments are not to be constructed with frozen material and no fill is to be placed when the existing ground or fill surface is frozen.

1.8 Requirements of Regulatory Agencies

- .1 Adhere to Provincial and Federal environmental requirements.

1.9 Payment

- .1 Payment for work under this section shall be for the number of cubic metres of acceptable excavation, fill, and compaction required to carry out general site grading activities.
- .2 Items under this section are included in the Form of Tender under Common Excavation, Backfill, and Compaction.
- .3 No extra payment will be made for crushed stone or other granular material used to facilitate drainage during construction.

- .4 No extra payment will be made for removal and replacement of soil weakened or disturbed by unsuitable construction methods or procedures or by action of workers.

PART 2 - PRODUCTS

2.1 Backfill Materials

- .1 Dam Improvements Material
 - .1 Raise dam using native or imported material with a minimum of 55% passing the 0.075 mm sieve by weight.
- .2 Riprap
 - .1 Refer to Section 008 for riprap specifications.

PART 3 - EXECUTION

3.1 Removal of Frozen Ground

- .1 Do not use backhoe bucket or drop weight to break frozen ground.
- .2 Adopt method of removal of frozen ground that will not cause excessive noise, ground vibration or damage to adjacent structures and utilities.

3.2 Excavation

- .1 Excavate to lines, elevations and dimensions specified or as shown on Drawings or as directed by the Engineer.
- .2 All deposits of materials containing frost heave and unsuitable materials shall be removed below subgrade to the lengths, widths and depths are directed by the Engineer and such unsuitable materials shall be replaced with material approved by the Engineer, placed in 200 mm layers or less, and compacted as specified in 3.6.
- .3 Whenever the proposed subgrade elevation is in cut, the earth grade surface shall be compacted, as specified in 3.6, to a depth of 200 mm.
- .4 Earth cuts and embankment fill materials may require moisture content adjustment during excavation, placing and compaction, as required, either to aid compaction or reduce dust nuisance, or both.
- .5 Construct side ditches to depths and widths indicated or directed by the Engineer to permit ready flow of surface water.
- .6 Maintain and keep ditches open and free from debris until final acceptance of work. Install siltation prevention measures as required and directed.

3.3 Fill

- .1 Prior to placing any fill material on a slope, the slope shall be graded to make smooth and uniform.
- .2 Where indicated or directed by the Engineer, scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces. Obtain prior approval of method to be used.
- .3 Place fill materials from the bottom of slope and work to the top of the slope.
- .4 Do not place material which is frozen or place material on frozen surfaces.
- .5 Backfill material must be approved by the Engineer before it is incorporated into the work.
- .6 Do not place backfill material on a wet, muddy or rutted subgrade.
- .7 With material containing less than 25 per cent by volume of stone or rock fragments larger than 100 mm.
 - .1 Place and compact to full width in uniform layers not exceeding 200 mm loose thickness.
 - .2 Compact to a density of not less than 98% Standard Proctor Density in accordance with ASTM D698.
- .8 Embankments constructed primarily of rock shall be placed in successive uniform loose layers not exceeding in depth the approximate average size of the larger rock. The rock shall not be dumped in place, but shall be distributed by suitable means within the embankment such that the interstices around the rock are filled with fine material.
- .9 Prior to placing material, properly shape subgrade to the satisfaction of the Engineer so as to be firm and able to support the construction equipment without unacceptable displacement.
- .10 Place backfill material to the lines and grades indicated on the Drawings, as specified herein.

3.4 Finishing

- .1 Remove soft or other unstable material that will not compact properly and fill resulting depressions with approved material.
- .2 Shape and compact the surface to within 300 mm of design elevations but not uniformly high or low.
- .3 Finish back and side slopes of common material to a neat condition, true to line and grade.

- .1 Hand finish slopes that cannot be finished satisfactorily by machine.
- .4 Finish back and side slopes of rock material to a neat and safe condition, true to line and grade.

3.5 Maintenance

- .1 Maintain finished surfaces in a condition conforming to this Section until acceptance.

3.6 Compaction

- .1 Materials shall be placed in horizontal layers by approved equipment, for full width of excavation and embankment fills, and compacted to a minimum of 98 percent of the Maximum Standard Proctor Dry Density as determined by ASTM D698.
- .2 Materials shall be moistened or dried as required for maximum density and thoroughly compacted by mechanical vibrators capable of producing required compaction.
HAULING AND PLACING EQUIPMENT WILL NOT BE ACCEPTED IN LIEU OF
COMPACTING EQUIPMENT.

3.7 Unauthorized Over-Excavation

- .1 Should the Contractor (unless ordered by the Engineer) excavate below the required subbase elevation, they shall be required to backfill such excavations with subbase material approved by the Engineer, placed in 200 mm layers or less, and, hauling, handling, placing or compaction of such backfill material compacted as specified in 3.6, for which no payment will be made.

3.8 Disposal of Material

- .1 Excavated material shall be disposed of on site at a location designated by the Engineer.

3.9 Field Quality Control

- .1 Inspection and testing to Section 005.
- .2 Inform Engineer so as to provide sufficient notice to permit inspection of the subgrade level prior to placing backfill.

END OF SECTION 004

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for compaction control and testing throughout progress of work.

1.2 Related Work Specified Elsewhere

- .1 Trench Excavation and Backfilling Section 003
- .2 Excavation, Fill & Compaction Section 004

1.3 Definitions

- .1 Standard Proctor Density as defined in ASTM D698

1.4 Payment

- .1 There will be no separate payment for items in this section.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Material

- .1 Testing of material to be performed by an independent testing agency paid by the Owner.
- .2 Supply representative samples of materials for gradation and proctor tests.
- .3 Provide labour to obtain and handle samples at work site or at source of materials.

3.2 Compaction Testing

- .1 Compaction tests of placed material, to be performed by independent testing agency provided by the Owner.
- .2 Testing to be performed throughout progress of work to determine adequacy of compaction.
- .3 Contractor to provide timely notice and cooperate with inspection staff during testing.
- .4 Compaction of all backfill materials is to be completed to 98% of the maximum dry density and within 2% of the optimum moisture content, as determined by the Standard Proctor Density test.

END OF SECTION 005

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for the supply and installation of precast concrete box culvert sections.

1.2 Related Work Specified Elsewhere

- | | | |
|----|-----------------------------------|-------------|
| .1 | Dewatering | Section 001 |
| .2 | Trench Excavation and Backfilling | Section 003 |

1.3 Submittals

- .1 The Contractor shall submit shop drawings for the precast concrete box culvert, containing but not limited to the following information:
 - .1 General layout showing all box culvert sections and appurtenances;
 - .2 Length and weight (mass) of individual sections;
 - .3 Joint details (including gap, gasket, connection plates and waterproofing);
 - .4 Proposed construction joints (if sections not cast monolithically);
 - .5 Location and type of inserts and lift devices (including location where rebar and/or mesh will be cut for lifting anchors);
 - .6 Location of reinforcing steel;
 - .7 Bar schedules for all reinforcing steel;
 - .8 Itemized supply list;
 - .9 Detail showing year of fabrication embedded on the culvert;
 - .10 Concrete design strength, age of test, form removal strength and shipping strength;
 - .11 Two sets of design calculations; and
 - .12 Location of manufacturing plant.
- .2 The Contractor shall submit shop drawings for the stoplogs and hand railing containing but not limited to the following information:
 - .1 Materials supplied and location of manufacturing facility(s); and
 - .2 Connection details.
- .3 The Contractor shall submit shop drawings for the cutoff liner containing the following information:
 - .1 Materials supplied and location of manufacturing facility;
 - .1 Installation details; and
 - .2 Material specifications.
- .4 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification that the materials to be supplied for the fabrication meet the specified requirements.

- .5 The Contractor shall submit, upon request, the proposed source of the supply of the backfill material from within the Work Site.
- .6 If the source of the supply of the backfill material is located outside the Work Site, the Contractor shall submit the proposed source, in writing, for the approval of the Engineer, at least 14 Days in advance of obtaining backfill material from the proposed source.

1.4 Payment

- .1 Payment for this work item shall be a lump sum price.
- .2 Items under this section are included in the Form of Tender under Precast Concrete Box Culvert.
- .3 The supply and installation of hand railings, stoplogs, and cutoff liner, as specified in the Contract Documents, shall be included in the payment for work under this section.

PART 2 - PRODUCTS

2.1 Precast Concrete Box Culvert

- .1 All materials shall be supplied by the Contractor.
- .2 Concrete shall meet the requirements of CSA A23.1 and CSA A23.2.
 - .1 Exposure Class shall be C-XL.
 - .2 Air content shall be 5 to 8%.
- .3 Interior water-tight joint seal shall be Rub'r-Nek, size per joint seal manufacturer's written recommendations, or approved equivalent.
- .4 Exterior joint wrap shall be 300 mm wide Conwrap, ConSeal CS-212 or approved equivalent, with primers recommended by the manufacturer.
- .5 The calcium nitrite corrosion inhibitor shall conform to the following:
 - .1 The dosage rate shall be 15 L/m³.
 - .2 The corrosion inhibiting calcium nitrite admixture shall contain between 30% to 36% calcium nitrite by weight of solution.
 - .3 The calcium nitrite shall be added at the concrete ready mix plant and verification shall be provided to the Engineer for the quantity of the calcium nitrite added to each batch of concrete.
 - .1 Acceptable verification shall include, but is not necessarily limited to, printouts from computerized batch plants or printouts from computerized admixture dispensing units.
 - .2 Verification shall be provided on the delivery slip.

- .6 Dowels for attachment of cut-off walls to box Culverts shall be 25 M deformed reinforcing steel bars.
- .7 Reinforcing steel shall be rebar conforming to 304.2 and/or welded deformed steel wire fabric conforming to ASTM A1064.
 - .1 Welding of reinforcing steel, including tack welding, is prohibited unless otherwise indicated on the Contract Documents.
- .8 Baffles and pads shall be supplied as part of the precast concrete box culvert sections.
 - .1 Reinforcement shall be placed in both faces of baffles, pads, and cut-off walls.
 - .1 The maximum spacing of reinforcing steel for baffles, pads, and cut-off walls shall be 300 mm.
 - .2 The concrete for precast baffles, pads, and cut-off walls shall have an air content of 5 to 8%.
- .9 Non-shrink grout shall conform to ASTM C1107.
- .10 Reinforcing supports shall be made of plastic, stainless steel, or galvanized steel with a minimum of 25 mm of cover.

2.2 Stoplogs

- .1 Stoplogs shall consist of water-proofed dimensional lumber.
- .2 Stoplogs shall be safe for use in aquatic environments.

2.3 Cutoff Liner

- .1 Cutoff liner shall be 60 mil PVC liner or equivalent approved by the Engineer.

PART 3 - EXECUTION

3.1 Precast Concrete Box Culvert

- .1 All aspects of precast concrete work shall comply with CSA A23.1 and CSA A23.4 and shall be to the satisfaction of the Engineer.
- .2 Manufacture of the box Culvert sections shall not commence until the Shop Drawings have been reviewed by the Engineer.
 - .1 The Engineer's written notice of review of the Shop Drawings shall in no way relieve the manufacturer of the responsibility for correctness of dimensions, size of components and details of fabrication.
- .3 Precast concrete box Culvert sections shall be erected in the sequence indicated on the manufacturer's shop drawings.

- .1 Deviation from the manufacturer's shop drawings shall not be permitted without the written authorization of the Engineer.
- .4 Culvert sections shall be joined in a straight line using industry methods, with the bell end up grade. Each Culvert section shall be set into place and positioned together as recommended by the manufacturer of the lifting device.
 - .1 After final alignment of each box Culvert section by overhead means, homing shall be performed by jacking or winching with "come-alongs" attached to the inner anchors while the box Culvert section is still suspended.
 - .2 Boxes that are subsequently moved after the gasket joint seal has been compressed, will require re-installation with a replacement gasket.
 - .9 The maximum joint gap between any two box Culvert sections shall be 20 mm uniformly across the joint with the sections in straight alignment.
 - .1 Sections set to a joint gap greater than 20 mm shall be removed and reset to the specified gap.
 - .2 Sections which cannot be reset shall be rejected.
- .5 After satisfactory placement of the Culvert sections, all anchor pockets shall be filled with non-shrink grout.
- .6 Joint seal and exterior wrap material and appurtenances shall be installed in accordance with the manufacturer's specifications.
 - .1 Joint seal shall be placed around the entire joint.
- .7 Backfill shall be carried out in accordance with Section 003 and as specified in the Contract Documents.
- .8 No backfill shall be placed in the excavation until the excavation has been approved by the Engineer, including but not limited to the dimensions of excavation and the character of foundation materials.

3.2 Hand Railing

- .1 Hand railing shall be constructed to conform with all applicable safety regulations.

*** END OF SECTION 006***

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for supplying and installing geotextiles to be used in the work.

1.2 Related Work Specified Elsewhere

- | | | |
|----|-------------------------------|-------------|
| .1 | Excavation, Fill & Compaction | Section 004 |
| .2 | Riprap | Section 008 |

1.3 Samples

- .1 Submit to the Engineer samples at least three (3) weeks prior to commencing work a minimum of 1 m² of each type of geotextile material to be used along with the technical data.

1.4 Mill Certificates

- .1 Submit to the Engineer copies of mill test data and certificate at least 3 weeks prior to start of work.

1.5 Delivery & Storage

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

1.6 Payment

- .1 Payment for work under this section shall be in square metres for the type of geotextile acceptably placed. There will be no additional payment for required overlaps or repairs.
- .2 Items under this section are included in the Form of Tender under Geotextiles.

PART 2 - PRODUCTS

2.1 Materials

- .1 The geotextiles shall be of non-woven needle punched construction comprising synthetic, non-biodegradable fibres. Fibres used in the manufacture of geotextiles and the threads used in joining geotextiles by sewing shall consist of long chain synthetic polymers composed of at least 85% by weight polyolefins, polyesters or polyamides. They shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvages.

Property	Unit	ASTM	Minimum Requirement
Tearing Strength (Trapezoid Method)	N	D4533	500
Grab Tensile Strength (Both Directions)	N	D4632	1200
Elongation at Break	%	D4632	50
Apparent Opening Size	µm	D4751	50 - 250
Permittivity	Sec ⁻¹	D4491	1.00 - 2.50

- .3 Acceptance of geotextile material shall be based on ASTM D4759.

PART 3 - EXECUTION

3.1 Delivery & Storage

- .1 Each individual roll of geotextile shall be wrapped and covered to protect the fabric from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, debris and rodents.
- .2 Use equipment that does not contact the material itself during loading, unloading and handling. Slings or other lifting devices should provide adequate support without damaging the material. Off-load in a minimum of steps directly to the storage or installation area.
- .3 Store all rolls of geotextile on smooth, flat surfaces raised above the ground that provide continuous support to the rolls. Maintain additional protective cover if rolls are to be stored in excess of 30 days.

3.2 Installation

- .1 Where fabric seams are not sewn, overlaps shall be 600 mm in roll length, and 900 mm at roll end. Care shall be taken to ensure there are no wrinkles at overlaps.
- .2 When placing fabric which incorporates a sewn seam, the seam shall be placed "thread up" to facilitate inspection and repair.
- .3 Sewn seams shall be constructed using a "J" or a "Prayer" configuration with 5 to 8 stitches per 25 millimeters. Stitches shall be such that they will have an elongation at break equal to or greater than the geotextile when tested in the plane of the seam. Ultimate grab strength perpendicular to the seam shall be equal to or exceed 90% of the grab tensile strength of the geotextile.
- .4 Welding will not be permitted unless it can be clearly demonstrated that a continuous weld can be achieved having an elongation at break equal to or greater than the original geotextile.

- .5 Thread for sewn seams shall have an equal or better resistance to chemical and biological degradation as that of the geotextile. For inspection purposes, the thread used shall be of a colour that will contrast with the original geotextile. Threads comprising of any organic fibres or nylon will not be accepted.
- .6 Connect non-woven geotextile to back face of weir wall using Flex Seal liquid rubber sealant coating, or equivalent approved by the Engineer.

3.3 Protection

- .1 Do not permit passage of any vehicle directly on the geotextile at any time.
- .2 Maximum drop height for fill directly onto the geotextile shall not exceed 1 metre.
- .3 Great care should be taken so as not to damage geotextiles during filling operations. Any damaged geotextile shall be repaired according to the manufacturer's recommendations.

3.4 Repairs

- .1 Repair seams which open or fabric tears during fill placement by removing fill and resetting the fabric. Additional geotextile shall be placed over the area, extending beyond the perimeter of the fault a distance corresponding to the lapping requirements. Where practical, the repair fabric should be pinned or stapled into place at intervals equal to or less than one eighth the perimeter of the damage or 2 metres, whichever is the lesser.

*****END OF SECTION 007*****

PART 1 - GENERAL

1.1 Description

- .1 This section specifies requirements for supplying and constructing stone riprap slopes.

1.2 Related Work Specified Elsewhere

- .1 Excavation, Fill & Compaction Section 004
- .2 Geotextile Section 007

1.3 Submittals

- .1 Submit details of proposed riprap material for Engineer's review prior to placement.
- .2 Submit details of proposed pitrun gravel material for use in Type II Mixed for Engineer's review prior to placement.

1.4 Payment

- .1 Payment for this work shall be in cubic metres of riprap acceptably placed to the lines and grades shown or as directed by the Engineer.
- .2 Items under this section are included in the Form of Tender under Riprap.
- .2 Cost of the provision of materials, labour, and equipment to test the riprap to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the specified gradation, otherwise the Owner shall bear the cost of the test.

PART 2 - PRODUCTS

2.1 Riprap Materials

- .1 Maximum L.A. Abrasion (ASTM C131 or C535) Loss of 35%.
- .2 Maximum soundness sodium sulphate (ASTM C88) not less than 15%.
- .3 Riprap Type I shall meet the following grading limits:

Mass kg	Diameter mm	Finer by Mass %
300	600	100
200	530	70 - 90
100	420	40 - 55
10	190	0 - 15

- .4 Riprap Type II Mixed shall meet the following grading limits:

Mass kg	Diameter mm	Finer by Mass %
750	820	100
500	710	70 - 90
250	570	40 - 55
25	260	0 - 15

- .1 Riprap Type II Mixed shall be thoroughly mixed with a pitrun gravel subbase which shall conform to the following gradation limitations:

ASTM Sieve Size	Finer by Mass %
125 mm	100
100 mm	95 - 100
75 mm	82 - 100
50 mm	62 - 100
37.5 mm	52 - 100
19 mm	30 - 90
9.5 mm	22 - 79
4.75 mm	16 - 66
2.36 mm	12 - 55
1.18 mm	9 - 44
300 µm	4 - 25
75 µm	0 - 7

- .2 The Contractor shall produce a consistent mixed homogeneous blended supply of the specified mixture at the proportion of approximately 20% by weight to the riprap material indicated.

- .5 Riprap shall consist of clean, hard, sound, durable rock having density of not less than 2.6 t/m³ and angular surfaces such that the rocks interlock when placed.

PART 3 - EXECUTION

3.1 Placing

- .1 Place riprap to required length, thickness and depth specified or as directed by Engineer.
- .2 Provide adequate foundation upon which bottom of riprap will rest. The area shall be clear of all driftwood, debris, snow, ice and other objectionable materials.
- .3 Excavate a trench at toe of slope to dimensions required where riprap is to be placed on slopes.
- .4 Fine grade area to be rip rapped to a uniform and even surface. Fill depressions with suitable material and compacted to provide firm bed.

- .5 Place stones in approved manner to secure regular surface and stable mass. Place larger stones at bottom of slopes.

- .6 Placement:
 - .1 Use larger stones for lower courses as headers for subsequent courses.
 - .2 Stagger vertical joints and fill voids with rock spalls.
 - .3 Finish surface even, free of large openings, and neat in appearance.

***** END OF SECTION 008*****

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for the supply and application of hydroseeding.

1.2 Related Work Specified Elsewhere

- .1 Excavation, Fill & Compaction Section 004

1.3 Submittals

- .1 Submit information and details of hydroseeding mixture and application methods to Engineer prior to placement.

1.4 Payment

- .1 Payment for this work shall be in square metres of hydroseed acceptably placed to the lines shown or as directed by the Engineer.
- .2 Items under this section are included in the Form of Tender under Hydroseeding.

PART 2 - PRODUCTS

2.1 Hydroseeding Mixture

- .1 Seed mix shall consist of the Nova Scotia Highway Seed Mix which includes the following species:
 - .1 40% Creeping Red Fescue
 - .2 15% Timothy
 - .3 15% Tall Fescue
 - .4 10% Kentucky Blue Grass
 - .5 10% Alsike Clover
 - .6 5% Red Top
 - .7 5% Perennial Rye
- .2 An equivalent mix of perennial grasses and legumes may be used as approved by the Engineer.
- .3 Seed shall be kept dry and protected from sunlight, heat, or other detrimental conditions.

PART 3 - EXECUTION

3.1 Placing

- .1 The application rate for the seed mix shall be a minimum of 100 kg/ha.
- .2 Water shall be free of any impurities which would inhibit seed germination or seedling growth.
- .3 Hydroseeding shall be carried out as soon as possible after the completion of the surface preparation.
- .4 Hydroseeding will not be permitted on hardened or crusted soil. Final dressing of slopes shall include removal of deleterious materials and loosening of the top 50 mm of soil.
- .5 Scarifications shall be parallel to the contour of the slope with a minimum indentation (high to low) of 25 mm and at a maximum spacing of 150 mm.
- .6 Hydroseeding shall not be performed under windy conditions, or during periods of rainfall or severe drought, on areas covered by standing water, or under other adverse conditions as determined by the Engineer.
- .7 The seed mixture shall be thoroughly mixed with water in a hydroseeding tank capable of continually agitating the mixture during the operation to ensure that a homogeneous slurry is produced. The hydroseed mix shall be prepared on site and applied immediately. It shall not be left in the tank for longer than 6 hours before being used.
- .8 Binder shall be used for all hydroseeding work.
- .9 The mixture shall be applied uniformly onto prepared surfaces from a hydroseeder which shall be capable of spraying the extremities of slopes or other areas of exposed ground, whether through the towergun nozzle or extension hose.

*****END OF SECTION 009*****

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for the supply, fabrication, and installation of the custom eel ramp system.
 - .1 Eel ramp system includes all components to be installed within the existing precast box culvert spillway.

1.2 Related Work Specified Elsewhere

- .1 Gear Lift Section 011

1.3 Submittals

- .1 Submit shop drawings to Engineer, including but not limited to the following, prior to carrying out eel ramp fabrication:
 - .1 Fabrication sequencing;
 - .2 Itemized materials list and supplier location(s); and
 - .3 Connection details.

1.5 Payment

- .1 Payment for this work item shall be a lump sum price.
- .2 Items under this section are included in the Form of Tender under Eel Ramp.

PART 2 - PRODUCTS

2.1 General

- .1 All components of the eel ramp shall be safe for use in an aquatic environment.

2.1 Structural Steel

- .1 Use stainless steel conforming to Contract Documents or equivalent approved by the Engineer.

2.2 Peg Board Substrate

- .1 Use AECOM MIL01 juvenile substrate or equivalent approved by the Engineer.

2.3 Artificial Turf Substrate

- .1 Use 13 mm eco-grass turf surface or equivalent approved by the Engineer.

2.4 Ramp Liner

- .1 Use 60 mil TPO reinforced membrane or equivalent approved by the Engineer.

2.5 Neoprene Seal

- .1 Use 50 mm by 75 mm solid neoprene block or equivalent approved by the Engineer.

PART 3 - EXECUTION

3.1 Construction

- .1 Contractor shall assemble eel ramp according to the plan submitted to the Engineer.

*****END OF SECTION 010*****

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for the installation of a bevel gear lift and accompanying lift rods.

1.2 Related Work Specified Elsewhere

- .1 Eel Ramp Section 010

1.3 Payment

- .1 Payment for work under this section shall be lump sum for the installation of the bevel gear lift and accompanying lift rods.
 - .1 Owner will supply the bevel gear lift and accompanying lift rods to the contractor no less than seven (7) days prior to installation.
- .2 Any damage to the bevel gear lift and/or accompanying lift rods because of mishandling or mistreatment by the Contractor shall be repaired or replaced at the expense of the Contractor.

PART 2 - PRODUCTS

2.1 Bevel Gear Lift

- .1 Mueller bevel gear lift and accompanying lift rods to be supplied by the Owner.

PART 3 - EXECUTION

3.1 Construction

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

END OF SECTION 011

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for cast-in-place concrete to be used during construction of the concrete spillway structure.

1.2 Related Work Specified Elsewhere

- .1 Concrete Reinforcement Section 013

1.3 Submittals

- .1 Submit information and details of construction of spillway for the Engineer's review, prior to proceeding
- .2 Provide certification indicating the concrete supplier is certified in accordance with the Atlantic Provinces Ready Mix Concrete Association Program or equivalent.
- .3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA A23.1.
- .4 Provide mix designs in compliance with CSA A23.1 to provide concrete of quality, yield and strength as specified. Mix designs to be prepared and stamped by an engineer licensed to practice in Nova Scotia.

1.4 Payment

- .1 There will be no separate payment for items in this section.

PART 2 - PRODUCTS

2.1 Materials

- .1 Concrete:
 - .1 The Contractor shall be responsible for the concrete mix design.
 - .2 Proportion normal density concrete in accordance with CSA A23.1, Alternate 1, to produce concrete with minimum 28-day compressive strength of 35 MPa.
 - .3 Concrete Exposure Class: C-1
 - .4 Maximum Water-Cement Ratio: 0.40
 - .5 Nominal Maximum Size of Coarse Aggregate: 19 mm
 - .6 Air Content: 5% to 8%

- .7 Slump as required for proper placement and consolidation.
- .8 Mix design to incorporate a mid-range plasticizer to achieve slump at plant. Super plasticizer to be used to achieve workability and slump on site if required. Water will not be added on site without the written approval of the Engineer.
- .2 Concrete Reinforcement: as per Section 004.
- .3 Formwork:
 - .1 Form Ties: Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
 - .2 Formwork Materials: Use plywood and wood formwork materials to CSA-O121, CSA-O86, and CSA-O153. For exposed to view flat surfaces use medium density overlay plywood, minimum 19 mm thick.
 - .3 Form Release Agent: Chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, preventing concrete from sticking to forms.

PART 3 - EXECUTION

3.1 Formwork

- .1 Formwork to be fabricated and erected in accordance with CAN/CSA-S269.1, producing finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1.
- .2 Formwork and supporting bracing members shall be designed such that they will not deflect noticeably under the weight or pressure of the concrete and other loadings incidental to construction. The maximum deflection of facing materials in concrete surfaces exposed to view shall be $L/360$ of the span between supporting members.
- .3 A non-staining form release agent shall be applied to all forms where the finished concrete surface will be exposed.
- .4 Align form joints and make watertight. Keep form joints to a minimum.
- .5 External corners of all exposed concrete members to be rounded to 6 mm radius unless specified otherwise in Drawings. Clean formwork in accordance with CSA A23.1 prior to placement of concrete.
- .6 Formwork to be left in place a minimum of three (3) days after placing concrete. All exposed surfaces are to be kept continuously wet for the remainder of the curing period.

- .7 Remove formwork when concrete has reached 75% of design strength or minimum period noted in Section 3.1.6. All exposed surfaces are to be kept continuously wet for the remainder of the curing period.

3.2 Cast-in-place Concrete

- .1 All concrete work (cold weather concreting, placement, formwork, finishes, curing, etc.) shall comply in all respects to CSA Standard A23.1, A23.2, and A23.3, unless otherwise indicated.
- .2 All clearances shall be 75 mm perpendicular to face of concrete, unless otherwise noted.
- .3 Construction traffic shall not be permitted on any part of newly poured concrete until curing period has ended and concrete has attained a minimum compressive strength of 28 MPa. This is also valid for the launch of the superstructure.
- .4 All exposed concrete surfaces shall be continuously moist cured for a minimum 7 consecutive days after placement in accordance with CSA A23.1.
- .5 Finish concrete in accordance with CSA A23.1. Formed surfaces to be smooth form finish. Exposed surfaces to be trowel finish.

3.3 Field Quality Control

- .1 Inspection and testing of concrete and concrete materials shall be carried out in accordance with CSA A23.1.
- .2 Concrete testing to be performed by independent testing agency provided by the Owner.
- .3 Contractor to provide timely notice and cooperate with inspection staff during testing.
- .4 Inspection or testing by Engineer will not augment or replace Contractor's quality, nor relieve the Contractor of its contractual responsibilities.

END OF SECTION 012

PART 1 - GENERAL

1.1 Description

- .1 This Section specifies requirements for concrete reinforcement to be used during construction of the concrete spillway.

1.2 Related Work Specified Elsewhere

- .1 Concrete and Formwork Section 012

1.3 Submittals

- .1 Submit reinforcement shop drawings compliant and in accordance with Reinforcing Steel Manual of Standard Practice (Reinforcing Steel Institute of Canada) prior to start of work for review by Engineer. Shop drawings to indicate the following:
 - .1 Bar bending details.
 - .2 Lists and quantities of reinforcement.
 - .3 Sizes, spacing and locations of reinforcement with identifying code marks to permit correct placement without reference to structural drawings.
 - .4 Detail lap lengths and bar development lengths to CSA-A23.3. Provide Class B tension lap splices unless otherwise indicated.
- .2 Supply certified copy of mill test report of reinforcing steel, including physical and chemical analysis. This must be available a minimum of two (2) weeks prior to commencing reinforcing work.

1.4 Substitutes

- .1 Substituting different size reinforcement only permitted if approved by the Engineer.

1.5 Payment

- .1 There will be no separate payment for items in this section.

PART 2 - PRODUCTS

2.1 Materials

- .1 Reinforcing Steel: Carbon steel, deformed bars to CAN/CSA-G30.18, Grade 400W.
- .2 Cold-drawn annealed steel wire ties to CSA-G30.3.

- .3 Chairs, bolsters, bar supports, spacers to CSA-A23.1. Non-metallic where within 40 mm of exposed concrete surfaces.
- .4 Bar coupler to be able to develop at least 125% of the specified yield strength of the reinforcing. Bar couplers with protective plug, such as BPI Barsplicer flanged coupler system or an approved equivalent, shall be used.

2.2 Fabrication

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.
- .2 Welding of reinforcement shall not be permitted.

2.3 Storage and Handling

- .1 Reinforcing steel shall be handled and stored in such a manner that it is kept free of dirt, mud and water.
- .2 Clean reinforcing steel of excess rust and previously deposited concrete prior to placing concrete.

PART 3 - EXECUTION

3.1 Field Bending

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

3.2 Placing Reinforcement

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1.
- .2 Prior to placing concrete, obtain Engineer's approval of reinforcing material and placement.
- .3 Install, support and space reinforcement in alignment to position and clearances indicated and secure to supports.
- .4 Remove and replace reinforcement that is visibly damaged or cracked.
- .5 Do not cut reinforcement, before or after concrete is placed, to permit incorporation of other work.

- .6 Do not relocate reinforcement without approval.
- .7 Clean reinforcement before placing concrete.

*****END OF SECTION 013*****