SECTION 902

EXCAVATION FOR FOUNDATIONS, UNWATERING, AND EXTRA BACKFILL FOR STRUCTURES

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902.06.04 Over Excavation

902.01 EXCAVATION FOR FOUNDATIONS

902.01.01 General

Excavation shall include the removal of all material necessary for the construction of foundations, substructures and the backfilling of the same in accordance with the plans or as directed by the Owner's Representative.

All rock or other hard foundations shall have all loose or soft material removed to present a clean firm surface. All loose and compressible material shall be removed from the excavation to the satisfaction of the Department's Geotechnical Engineer. Then, mass concrete shall be placed to the foundation elevation to create a level surface.

When a footing is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation. This shall include excavation by hand where so required or the use of excavator attachments which do not project below the final footing elevation. Alternatively, for footings excavated in the dry where the soil at or below the foundation elevation is disturbed as a result of construction operations; the foundation soil must be re-compacted to yield a bearing capacity equal to or greater than that specified for the footing as accepted by the Department's Geotechnical Engineer.

In soft conditions, the final removal of material to foundation level shall not be made until the Contractor is ready to proceed with the construction of the footing. When material at the founding elevation is Other Material and has been over excavated, the elevation shall be re-established by replacing with Select Material Compacted - Rock and compacting it to the bearing capacity indicated on the contract drawings as accepted by the Department's Geotechnical Engineer. When the founding material is Solid Rock and has been over excavated, the foundation elevation shall be re-established to the original elevation with mass concrete and shall fill the entire volume of the over excavation.

Footing elevation shall be considered as approximate only and may be ordered to be changed by the Owner's Representative on evaluation of conditions as the excavation proceeds.

Unless otherwise specified no excavation shall be made outside of that required for constructing substructure and the natural stream bed adjacent to the structure shall not be disturbed without permission from the Owner's Representative. The Contractor shall ensure that the channel is brought back to its original condition unless otherwise authorized.

After each excavation is completed, the Contractor shall notify the Owner's Representative and no concrete or other backfill shall be placed until the depths of excavation and the nature of the foundation material has been affirmed by the Department as satisfactory.

Materials excavated as excavation for foundations will be used for backfill if the material is deemed suitable by the Owner's Representative. Any costs associated with this are incidental.

Suitable excavated material beyond the requirements for backfilling the excavation will be incorporated into fill construction in accordance with Section 204 "Grading of Fill" and will include hauling up to 1km. Excavation for foundation materials not required or unsuitable for backfilling excavation or for fill construction will become the property of the Contractor. No overhaul will be paid for the removal and disposal of these materials. The use and classification of all excavation foundation materials will be as directed by the Owner's Representative.

902.01.02 Classification

Excavation shall be measured and classified as solid rock and other material. Provided that whenever the classes of material excavated cannot be separately measured on an accurate basis, the material will be classified on a percentage basis.

1) Solid Rock - shall include all rock in masses or ledges in their original or stratified bed or position and all boulders and detached pieces of rock exceeding 0.50 cubic metres.

2) Other Material - shall include all solid material other than solid rock as defined above including boulders less than 0.50 cubic metres.

902.02 PROTECTION OF EXCAVATIONS

All substructure work shall be adequately shored, braced or otherwise adequately protected in a rigid fashion in accordance with Section 907.

Where the stability, safety or function of an existing roadway, railway or other works can be impaired by an excavation or temporary slope, the Contractor shall provide such protection as may be required including sheeting, shoring and driving of piles where necessary to prevent damage to such works.

Where any excavation may endanger physical facilities, public safety or that of workers, or the face of the excavation is less than 2 metres from the edge of travelled lane or asphaltic pavement, whichever is nearest, or the excavation is more than 1 metre deep, the Contractor shall submit scaled drawings detailing the method of protection, physical dimensions and grades of sub sheeting, shoring, bracing and piling. These drawings shall be prepared, signed and stamped by a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador.

All work must conform to the latest revision of the Occupational Health and Safety Act, including all amendments.

Unless otherwise specified, any materials used for protection shall remain the property of the Contractor and shall be removed from the job site when no longer required.

902.03 UNWATERING

902.03.01 General

The term "unwatering" shall mean the removal of all water that would impede the construction of the permanent structure by any means including but not limited to temporary water-tight structures and pumps.

The term “settling pond” refers to any open air, water containment structure used to manage the suspended solids or to control the discharge rate of pumped or flowing water. Other terms such as, but not limited to, dewatering basin, unwatering basin, retention ponds, etc must meet the requirements of “settling ponds”.

902.03.02 Unwatering Methods and Materials

The Contractor shall carry out all work necessary to prevent disturbance to the foundation and unless otherwise specified, all concrete shall be placed in the dry.

Any damage to the permanent structure due to any failure of the temporary structure used in the unwatering operations shall be remedied at the expense of the Contractor to the satisfaction of the Department, even to the extent of removal and reconstruction of said permanent structure.

Unwatering for bridge foundations shall include the supply of all equipment, materials and labour for the construction of the necessary water-tight temporary structures, their pumping out and subsequent removal.

Loose fill shall not be used to construct any unwatering structures unless accepted by the Owner's Representative. All fill shall be contained in sandbags or another method to allow for minimal disruption when removed from the water.

Effluent from an unwatering operation shall not be disposed of directly into a watercourse or water body. Effluent shall be discharged to a vegetated area which will cause the water to flow through a minimum of 50m of established vegetation between the discharge and watercourse. As vegetation becomes inundated with sediment, the Contractor shall relocate the discharge point into new vegetated areas as required to prevent sediment reaching a watercourse.

If appropriate vegetated areas are not available, the Contractor shall use a settling pond or other means of sedimentation removal before being returned to a watercourse.

If for any reason, all water cannot be removed from the excavation so as to permit concrete to be placed in the dry, the Owner's Representative may authorize, upon receipt of a written request from the Contractor, the placing of a concrete seal by means of a tremie pipe or similar method. When a concrete seal is authorized, the Contractor shall supply, at their own expense, all equipment, materials and labour necessary for this tremie concrete and no extra payment will be made.

Unless otherwise specified, all temporary unwatering and support structures shall remain the property of the Contractor and shall be removed from the job site when no longer required.

All earth or rock fill used in unwatering shall be removed from the watercourse upon completion of dewatering. Contractors shall incorporate necessary measures to limit sedimentation of the watercourse during this removal.

902.03.03 Turbidity Limits, Measurements, and Reductions in Payments

During all in-water or near water activities, including but not limited to, the construction, operation, and removal of unwatering systems, the upstream and downstream turbidity shall be monitored and measured. During construction, turbidity shall not increase more than 10 NTUs between the upstream and downstream measurements without prior approval by the Owner's Representative. Exceedance of turbidity limits will result in a reduction of payment as per Section 902.06.02.

Measurement of turbidity will be by the turbidity tube method or Department accepted alternative. Upstream measurements shall occur a minimum of 50 m from the project site,

downstream measurements shall occur a minimum of 25 m from the project site, or as requested by the Owner's Representative. Upstream sampling shall capture a representative sample of water not impacted by construction activities while downstream sampling shall capture the highest turbidity due to construction run-off.

Turbidity measurement systems shall be provided by the Contractor and available on-site at all times. Failure to have turbidity measuring instruments on-site while unwatering systems are being constructed, installed, or operational, regardless of whether a turbidity event has occurred or not, will result in a reduction in payment as per Section 902.06.02 being applied.

902.03.04 Unwatering Plan

The Contractor shall submit a dewatering plan for review by the Owner's Representative. No unwatering activities shall commence until the Department reviews the Contractor's unwatering plan. Contractors shall allow for 10 business days for the Department to review and comment on the unwatering plan. The unwatering plan, including drawings and specifications, shall be stamped by a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador.

Unwatering plans shall conform to the requirements below, the Environmental Protection Plan, if one is needed, and the Department reviewed Contractor Environmental Mitigation Plan. Additionally, the Contractor shall abide by restrictions of the Federal Department of Fisheries and Oceans for any in-stream or near stream activity.

The engineered unwatering plan shall contain the following:

a) Drawings indicating the positioning of any water retaining/controlling structures in sufficient detail to allow for proper field positioning and construction;
b) Cross-section(s) of any water retaining structure(s);
c) The estimated infiltration rate of water into excavations;
d) Locations of: planned discharge points for pumps, settling ponds, turbidity curtains, unwatering bags, etc; in sufficient detail to allow for proper field positioning
e) Required equipment redundancies in the event of equipment failures; and
f) Design calculations used to confirm the design provided is fit for purpose.

Drawings shall clearly show the locations for items listed above. While site modifications may be required, drawings shall not specify "to be determined on site" for initial field positioning, unless the Engineer of Record provides a clear list of restrictions/requirements regarding the positioning of the item.

The Contractor is responsible for the cost of, and shall complete, any in-situ or laboratory tests that are required to determine water infiltration rates or any other information required to design or verify the unwatering plan.

If settling ponds are to be used engineered, stamped drawings of the settling ponds shall be provided. These drawings shall indicate the dimension of the structures, the maximum allowable incoming flow, and the estimated detention period of the water contained in the pond. The required amount of time for suspended solids to be settled shall be determined by the Engineer of Record for the pond but shall not result in an increase in turbidity from background levels of greater than 10 NTUs (Nephelometric Turbidity Units).

If unwatering bags, turbidity curtains, or other manufactured products are to be used, the manufacturer and model shall be indicated on the stamped drawings and product data sheets shall be submitted with the unwatering drawings. If exact products have not yet been selected when drawings are produced, then performance criteria for these products shall be provided.

Contractors shall submit copies of the design calculations used to complete the unwatering plan. Failure to provide this information when requested will result in non-approval of the unwatering plan and no payment will be made on any unwatering activity undertaken until approval is given. No extension to the completion date will be given for failure to provide the requested information.

The Department reserves the right to request the Engineer of Record for the unwatering plan or a representative nominated by the Engineer of Record to visit the site and confirm in writing to the Department that the construction of the unwatering is in accordance with the assumptions and intent of their design. Any costs or delays associated with this are to be borne by the Contractor.

Acceptance of the unwatering plan by the Department does not remove the liability of the Contractor for any costs or consequences resulting from the implementation or failure of the unwatering plan.

902.04 EXTRA BACKFILL

902.04.01 General

All backfilling and compaction work shall be conducted frost free and in the dry and under controlled conditions as accepted by the Owner’s Representative.

The use of large vibratory compactors of the type used in roadway projects is prohibited between wing walls and adjacent to wing wall legs and abutments as determined by the Owner's Representative.

902.04.02 Select Material Compacted - Granular

The grubbing and excavation of all unsuitable material, and unwatering operations shall be completed before any material is placed.

The quality of select material compacted shall be non-frost-susceptible free-draining granular material complying with the Department Transportation and Infrastructure specifications for Select Granular Base Course, Granular "A", Section 315, with the following exception:

The percentage of crushed materials is to be a minimum of 70%. This will be determined by examining the fraction retained on the 4.76 mm sieve and dividing the weight of the crushed particles by the total weight retained on the 4.76 mm sieve. Only pieces having one or more freshly fractured faces will be counted as crushed material. Pieces with only small chips removed will not be considered as crushed.

Other physical and gradation requirements shall be in accordance with Section 315.02 of the Department's specification for the select Granular Base Course.

French drains comprised of washed well-graded stone including filter fabric and perforated pipe if indicated shall be placed at weep holes and wherever else required on the contract drawings.

The limits for placing select material compacted shall be as defined on the contract drawings or in the tender documents. Where select material is to be placed below abutment or pier footings, the limits shall be defined as that extending 1.0 metre beyond all sides and ends of the footing(s) and extending to the original ground elevation or bottom of excavation whichever is more pertinent from the bottom of the footing elevation at a side slope of 1.5H:1V(minimum). The limits of placing shall be staked on the ground before placing operations begin.

Select Material Compacted - Granular placed below abutment and pier footings, behind abutments, retaining walls, wing walls, type "C" curb and gutter and similar structural components shall be placed in horizontal layers having a maximum loose thickness of 250 mm before compaction. Where permission is given in writing by the Engineer of Record or so indicated on the contract drawings, the maximum lift thickness can be

increased to 500 mm where select material is being placed in non-structural applications. The backfill can be spread with a bull dozer and after each layer is spread, a vibratory compactor must be used as directed by the Owner's Representative.

The Contractor shall compact the backfill behind abutments to a minimum of 95% of the maximum Standard Proctor Dry Density and to a minimum of 100% of the maximum Standard Proctor Dry Density below all footings, as per ASTM D698 "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort". When directed by the Owner's Representative, water may be added to assist the compaction effort but the amount of water added should not bring the moisture content above the optimum for the compactive effort used.

The Contractor shall provide the Owner's Representative with sufficient notice to perform Proctor and density testing. Acceptance shall be determined based upon samples taken from the point of final acceptance. The bottom layer must be spread, thoroughly compacted and tested before the next layer is placed.

No backfill shall be placed below a footing, against an abutment, wing wall or retaining wall until permission has been obtained from the Owner's Representative.

Backfilling around arches, rigid frames, abutments and piers shall proceed simultaneously and evenly on both sides so as to avoid differential surface elevation in excess of 500 mm. Backfill in these locations shall be fully enclosed with geotextile filter fabric.

902.04.03 Select Material Compacted – Rock

The grubbing and excavation of all unsuitable material, and unwatering operations shall be completed before any material is placed.

Select Rock Backfill shall be used as backfill under the footings or to create rock mattresses under footings, as backfill behind abutments, or as indicated on the project drawings.

Any softened or disturbed soil must be removed from excavation bases prior to setting of foundations or placement of structural fill and replaced with Select Material Compacted – Rock to achieve the proper grade lines.

The quality of select material compacted shall be non-frost-susceptible free-draining granular material complying with all the requirements of Section 204 and all requirements of 'Supply Rock Fill in Place', under the same section except that the material will meet

the gradation outlined below, have a maximum dimension of 150 mm, will be durable, well graded, and will contain no more than 5% fines (smaller than 75 micrometers).

Select Material Compacted - Rock will meet the following gradation requirements:

150mm	100% passing by dry weight
75mm	65-100%
4.76mm	20-55%
1.2mm	10-35%
0.3mm	5-20%
0.075mm	2-5%

The fill will be placed in horizontal layers having a maximum loose lift thickness of 300 mm and each layer will be thoroughly compacted.

French drains comprised of washed well-graded stone including filter fabric and perforated pipe if indicated shall be placed at weep holes and wherever else required on the contract drawings.

The Contractor shall provide the Owner's Representative with sufficient notice to inspect the material before, during, and after placement. The bottom layer must be spread, thoroughly compacted and tested before the next layer is placed.

No backfill shall be placed below a footing, against an abutment, wing wall or retaining wall until permission has been obtained from the Owner's Representative.

Backfilling around arches, rigid frames, abutments and piers shall proceed simultaneously and evenly on both sides so as to avoid differential surface elevation in excess of 500 mm. Backfill in these locations shall be fully enclosed with geotextile filter fabric.

902.04.04 Compacted Ordinary Fill

All material and placing shall be in accordance with Section 204. However, location of the source will be the responsibility of the Contractor.

902.05 MEASUREMENT FOR PAYMENT

902.05.01 Excavation for Foundations

"Solid Rock" and "Other Material" shall be measured in cubic metres in the original position of material excavated in conformity with the plans or as directed by the Owner's Representative. Ordinarily no volume shall be included in the measurement for payment

which is outside the volume bounded by vertical planes parallel to and beyond the neat lines of the footings (or structural mattress if present) unless such excavation is indicated on the contract drawings or specifically requested by the Owner's Representative. The volume measured shall not include water or other liquids but shall include mud.

For construction sites not involving the removal of an existing structure, the top limit for payment volume is original ground or new road subgrade elevation. Material removed above road subgrade elevation will be paid under Section 206. The bottom limit is the completed bottom of footing or rock mattress, if present.

For projects that involve the removal of an existing structure, after the removal of the structure, the excavation site shall be surveyed, and the survey results provided to the Owner's Representative, prior to any further excavation. The site shall be surveyed again once the Contractor has reached the footing elevations and the site is ready construction of the substructure. Further construction shall not proceed until the Owner's Representative has been provided with the results of the second survey. Payment for "Excavation for Foundations" shall be the volume calculated as the difference between the two surveys. If either survey is not completed, payment shall be the quantity indicated in the Unit Price Table with no consideration given for additional quantities.

In the event that rock and soil are to be excavated on the same site, the Contractor shall remove all soil required to access the foundations to the satisfaction of the Owner's Representative. The site shall then be surveyed to determine the payment quantity for "Other Material." Rock excavation may then proceed. The payment quantity for "Solid Rock" shall be calculated and agreed upon by the Owner's Representative and the Contractor in writing prior to continuing the work. In the event that agreement on the quantities cannot be reached, a third survey to determine the quantity of rock excavated will be completed at the Contractor's expense.

Surveys shall be completed in accordance with Section 926.

The volume of boulders in excavation shall be determined on the basis of the three maximum rectilinear dimensions.

902.05.02 Unwatering

The measurement for "Unwatering" shall be lump sum.

902.05.03 Extra Backfill

"Select Material Compacted – Granular", "Select Material Compacted – Rock", and "Compacted Ordinary Fill" shall be paid by the number of cubic metres in place, to the nearest one decimal place, and the volume measured shall be that between the theoretical or final grades and the original grades or lines as shown on the drawings, or as indicated herein.

902.06 BASIS OF PAYMENT

902.06.01 Excavation for Foundations

Payment at the contract price for "Solid Rock" and "Other Material", in the Unit Price Table shall be full compensation for all labour, services, surveying, equipment and materials for all excavation required, determination of quantities, protection of excavation, protection of adjacent works, stockpiling of excavated material for backfilling, hauling of excavated material up to 1km, placing and compaction of excavated material and disposal of any surplus or unsuitable excavated material.

Where the Owner's Representative requires Excavation for Foundation material be hauled in excess of 1km, additional payment for overhaul will be made in accordance with Section 215.

902.06.02 Unwatering

Payment at the contract price for the item "Unwatering" in the Unit Price Table shall be full compensation for all labour, engineering services, geotechnical investigation, equipment, and material to do the work according to the specifications.

Failure to comply with the turbidity limits or to have turbidity measuring systems readily available as per Section 902.03.03 will result in a reduction in payment equal to the Liquidated Damages Daily Rate, specified in GC 46. The liquidated damages rate shall be applied for each 24 hour period in which the turbidity limits in the watercourse are exceeded or the specified measuring systems are not available on site.

902.06.03 Extra Backfill

902.06.03.01 Select Material Compacted - Granular

Payment at the contract price for "Select Material Compacted – Granular" in the Unit Price Table shall be full compensation for all labour, equipment, plant and material involved in the cost of locating, obtaining approval, providing a pit or quarry, sampling, clearing, grubbing, producing, loading, hauling, placing of granular backfill to the structure, the granular material at weep hole drains, french drains, perforated subdrain, weeping tile

and filter fabric where so indicated on the contract drawings, for compacting the material and all other work required to place, spread and ensure compaction of the material according to the specifications including the payment of royalties.

902.06.03.02 Select Material Compacted - Rock

Payment at the contract price for “Extra Backfill Select Material Compacted – Rock” in the Unit Price Table shall be full compensation for all labour, equipment, plant and material involved in the cost of locating, obtaining approval, providing a pit or quarry, sampling, clearing, grubbing, producing, loading, hauling, placing of backfill to the structure, the granular material at any weep hole drains, french drains, perforated subdrain, weeping tile and filter fabric where so indicated on the contract drawings, for compacting the material and all other work required to place, spread and ensure compaction of the material according to the specifications including the payment of royalties.

902.06.03.03 Compacted Ordinary Fill

Payment at the contract price for “Extra Backfill Compacted Ordinary Fill” in the Unit Price Table shall be full compensation for all labour, equipment and material, locating, obtaining approvals, clearing, grubbing, hauling, loading, placing and compacting the fill and all other work necessary to comply with specifications in Section 204.

902.06.04 Over Excavation

Payment will not be made for over excavating due either to the Contractor's method of operation or their negligence. Neither will compensation be provided for the cost of remedial measures required by the Owner’s Representative as a result of over excavation by the Contractor.