

SECTION 140
EXCAVATION FOR STRUCTURES
DESCRIPTION

140.20 General.

Excavation for foundations of bridges, culverts, pipe drains, masonry walls and other structures shall be made to the depth and lines indicated on the plans or established by the Engineer.

140.21 Bridge Excavation.

Bridge excavation shall include excavation required for construction of bridges, culverts having a clear square span of 2.44 meters or more, end walls and wingwalls that are part of these structures and major wall structures as designated in the Contract Documents.

The excavation shall include the removal and satisfactory disposal of materials including piles, sheeting and timbers encountered in these constructions.

In areas where unsuitable material is removed and backfilled under Item 123, Muck Excavation, the excavation of the backfill shall be included under bridge excavation.

All other material encountered in the above noted construction, except that classified as Class B Rock Excavation and Muck Excavation as defined in these specifications, will be classified as Earth Excavation.

140.22 Class A Trench Excavation.

Unless otherwise shown on the plans, Class A Trench Excavation shall include the removal and satisfactory disposal of all materials, except Class B Rock Excavation that are encountered in the construction or demolition of masonry culverts and other structures having a clear square span of less than 2.44 meters, masonry inlets, culvert ends, masonry walls, revetment, test pits, paved waterways, construction of drains for slope or subgrade stabilization and in the construction, widening, straightening or deepening of drainage ditches and water courses in connection with pipes or structures having a clear span of less than 2.44 meters.

Test pits to locate underground services shall be excavated where directed and will be classed as Class A Trench Excavation. The Contractor shall take special care during this excavation to avoid damage to any underground structures or utilities. When necessary the Contractor shall cooperate with representatives of public service companies in order to avoid damage to their structures by permitting them to erect suitable supports, props, shoring or other means of protection.

140.23 Class B Trench Excavation.

Class B Trench Excavation shall include the removal and satisfactory disposal of all materials, except Class B Rock Excavation, encountered in the construction of drainage and water pipes greater than the 1.5 meter maximum depth specified in Section 200.

Trench excavation for pipe laying in roadway cuts shall include only that portion of the trench which is below the roadway excavation except where the Engineer orders in writing, that the trench excavation and its backfill shall be completed before the roadway excavation is begun.

140.24 Channel Excavation.

Channel Excavation shall include the removal and satisfactory disposal of all materials other than those classified as Bridge Excavation, Trench Excavation, Muck Excavation or Rock Excavation when encountered in the excavation for streams or rivers or excavation on new locations for same in connection with drainage structures having a clear span of 2.44 meters or more.

140.25 Class B Rock Excavation.

This item shall include the removal and satisfactory disposal when encountered in the excavation for drainage structures, fences, highway guard posts, bounds, pipes, ducts, walls, open trenches and bridge structures of:

(A) Boulders measuring 1 cubic meter or more and all solid rock that requires blasting or breaking by hand power tools (such as jackhammers etc.) prior to removal.

(B) Masonry removed from the walls, covers and other portions of existing drainage structures, also plain and reinforced concrete pavements, and masonry removed from bridge substructures.

Removal operations shall be so prosecuted that no damage will be caused to adjacent structures or property.

140.26 Drainage Structures Abandoned or Removed.

The work shall consist of the removal and stacking of iron castings, the plugging of inlets and outlets and the filling of all drainage structures designated to be abandoned and the removal of all masonry and filling the cavity of the drainage structures designated to be removed.

CONSTRUCTION METHODS

140.60 General.

A. Sequence of Operations.

The Contractor shall prosecute his/her work so as to conform to the requirements of Subsection 120.60A.

B. Disposal of Excavated Materials.

The Contractor shall prosecute his/her work so as to conform to the requirements of Subsection 120.60B.

C. Cofferdams.

Cofferdams for foundation construction shall be carried to adequate depths and heights, shall be safely designed and as watertight as necessary for the proper performance of the work which must be done inside them. Sheet piling shall be driven to a sufficient depth below the proposed foundation grade to permit reasonable change in depth of the proposed foundation to a maximum of 750 millimeters except where solid rock is encountered. The interior dimensions shall be sufficient for the unobstructed and satisfactory completion of such construction work as pile driving, form building, inspection and pumping. Cofferdams which become tilted or are displaced during the process of building the substructure shall be righted, reset or enlarged as may be necessary to provide the necessary clearances and this shall be at the sole expense of the Contractor. Cofferdams shall be dewatered and the proposed masonry footings placed in the dry.

Cofferdams shall be constructed so as to protect masonry against damage from a sudden rising of water and to prevent damage to the foundation by erosion. No part of the cofferdam shall be left in such a way as to extend into the substructure masonry, without written permission of the Engineer.

Upon request, the Contractor shall submit plans to the Engineer for his/her information showing his/her proposed method of cofferdam construction prior to the start of such construction. The furnishing of such plans and methods shall not serve to relieve the Contractor of any of his/her responsibility for the safety of the work or the responsibility for the successful completion of the project.

Where the plans indicate construction of a tremie concrete seal below the footing or if in the Engineer's opinion a tremie seal is necessary, he/she may require the placing of underwater concrete of such dimensions as necessary to safely dewater the foundations and place the footing concrete in the dry.

All tremie concrete seals shall be placed as shown on the plans or as directed by the Engineer.

Before placing the underwater concrete, the inside walls of the cofferdam shall be thoroughly cleaned and the walls made sufficiently tight to reduce the velocity of water to less than 3 meters per minute. The elevation of the water inside the cofferdam shall be controlled during the placing and the curing of the concrete. Concrete shall not be placed in water having a temperature below 2 °C. No pumping of water shall be permitted while concrete is being placed nor until

the concrete has cured a minimum of 24 hours. Once concreting has started the tremie shall not be moved laterally through the deposited concrete. When necessary to move the tremie it shall be lifted out of the concrete and moved to the new position. Unless otherwise directed by the Engineer, spacing of the tremies shall be at the Contractor's option.

After each excavation is completed, the Contractor shall notify the Engineer and no construction shall be started until the Engineer has approved the depth of the excavation and the character of the foundation material.

Unless otherwise provided, all parts of the cofferdams shall be removed after the completion of the substructure, care being taken not to disturb or otherwise injure the finished masonry.

Sheet piling used in the construction of cofferdams may be left in place at the option of the Contractor, provided it is cut off at an elevation as may be directed by the Engineer, and the cutoff portions are removed from the site.

D. Excavation for Stepped Footings.

Where the footings for bridges are shown stepped, the Contractor shall sheet and shore the existing ground so that adjacent sections of the footings will rest on undisturbed ground according to the pattern shown on the plans. The sheeting shall be strong enough to support the earth along the designated lines, tight enough to restrain the fines in the concrete, and shall be left in place to the extent required to hold the concrete that is to be placed against it. Before the concrete is placed, the sheeting shall be cut so that none of the sheeting will extend into the concrete. Shoring and bracing shall be removed. If rock is encountered, it shall be stepped to the pattern shown and sheeting will not be required.

E. Water Control in Foundation Area.

When concrete for the foundations of a structure is to be placed in the dry, the Contractor shall use such equipment and perform his/her operations in such a manner that boiling or other disturbances of the ground in the foundation area will be prevented and shall keep the area being excavated dry by such means that will prevent the entering of water through or from the adjacent ground, if such entering water could affect the stability of the foundation material or the adjacent ground or the foundations.

No surface pumping will be allowed. Water shall be controlled by means of properly screened sumps or well points. If sumps are used, they shall be installed at strategic locations but not closer than 1.5 meters from the nearest edge of the footing.

The contractor shall provide temporary diversion channels, excavations, embankments, sheeting, drains, flumes, well point dewatering systems, pumps, or other effective procedures or structures together with all labor, materials and equipment necessary for dewatering the foundation areas. Such work shall be subject to the approval of the Engineer, but such approval will not relieve Contractor of responsibility for the adequacy of construction, maintenance, operation and safety of the water control system. Upon completion of the work all temporary embankments and structures shall be removed from the site. All temporary excavations shall be backfilled in accordance with the applicable provisions of Section 150 for forming embankments or as directed.

F. Shoring and Bracing of Trenches.

Shoring and bracing of trenches and other excavations shall be in accordance with the requirements of the Department of Labor and Industries Industrial Bulletin No. 12, Section 10, dated April 19, 1967, and subsequent amendments.

G. Excavation.

Trenches for pipes, structural pipes, arches, and pipe arches shall be excavated to the required line and grade and of sufficient width to permit thorough tamping of backfill material under the haunches. Soft or unsuitable material existing below the required bedding grade shall be removed as directed and replaced with sand, gravel, crushed stone or other suitable material and thoroughly compacted. Rock or boulders shall be removed below the bedding grade as specified in Subsection 140.25.

All materials excavated from pipe trenches and subdrain trenches and not used in the backfill of the trench will be used as part of the embankment, when deemed suitable for this purpose by the Engineer, and no deduction will be made from the in-place measurement of the embankment.

If cross pipes, conduits, drains or other unforeseen obstacles are encountered during the excavation, the proposed line and grade of the pipe may be altered, but only as directed by the Engineer.

When pipes, structural pipes, arches and pipe arches are to be installed in new embankments, the Contractor shall first construct and compact the embankment to an elevation at least 600 millimeters above the proposed flow line.

When culverts, storm drains or sewer pipes are to be installed in roadway areas on traveled ways, the edges of

the trench through the pavement shall be cut to a neat line, using an approved pavement breaker or power saw.

140.61 Channel Excavation.

The excavation shall be made and the bank sloped as shown on the plans or as directed.

Unless otherwise directed, the banks outside of the limits of a bridge structure shall be cut to a 1 vertical to 2 horizontal slope. Within the limits of the bridge structure, the banks shall be cut to the slope required for revetment.

No waste or surplus excavation shall be left within 1.5 meters from the edge of the ditch or channel. Any such surplus or waste material shall be spread in a thin, uniform layer. All ditches and channels constructed on the project shall be maintained to the required cross section and shall be kept free from debris until final acceptance.

140.62 Class B Rock Excavation.

If a rock is encountered in a location such that it may be used as a part of a base, footing, wing, or abutment of any structure, it shall not be removed. The surface of all rock or other hard material upon which masonry is to be placed shall be freed from all loose fragments, cleaned and cut to a firm surface. The surface shall be level, stepped or serrated, as directed by the Engineer.

All structures shall be founded on uniform bearing materials. If rock is encountered at portions of the bottom of the foundation for bridges, box culverts, structural plate pipe, structural plate pipe arches and end walls and wingwalls that are a part of these structures, the rock shall be removed to a minimum depth of 300 millimeters below the bottom of foundation for a depth of fill on the structure up to 8 meters. For fills over 8 meters the depth of excavation shall be increased 25 millimeters for every additional 600 millimeters of fill. The excavation shall be backfilled with gravel borrow and compacted. Payment for such excavation will be made under the item for Class B Rock Excavation. Where wingwalls are not integral with the bridge or culvert the overdepth excavation will not be required.

140.63 Drainage Structures Abandoned or Removed.

The present castings shall be carefully removed. They shall be satisfactorily stored and protected until they are required for use or until they are removed from the project by the owners.

Inlets and outlets of structures to be abandoned shall be plugged with brick masonry not less than 200 millimeters in thickness, conforming to Section 201. Upper portions of the masonry shall be removed to a depth of 900 millimeters below the finished grade at the location designated by the Engineer, and the structures shall be completely filled with selected excavated material placed in 150 millimeter layers and thoroughly compacted.

The existing masonry of structures to be removed shall be completely removed.

The cavity shall be completely filled with selected excavated materials placed in 150 millimeter layers and thoroughly compacted.

COMPENSATION

140.80 Method of Measurement.

All classes of excavation for structures will be measured in their original position by the cross section method except that where such measurement is impracticable the volume shall be measured by such other methods as the Engineer may determine. In calculating excavation for structures the sides of the excavation will be considered vertical.

Bridge Excavation shall be measured as follows:

Unless otherwise shown on the plan the quantity of excavation shall be computed within the following limits:

1. Horizontally to vertical planes 300 millimeters outside of and parallel to the neat lines of masonry bases or footings.

2. Horizontally to vertical planes 500 millimeters outside of and parallel to the inside walls of structural plate pipes and arches (spans 2.44 meters or more and without masonry footings) at their widest dimensions.
3. Horizontally to vertical limits of crushed stone or gravel borrow for bridge foundation as shown on the plans.
4. Vertically from the bottom of the earth excavation limits of proposed roadway and/or design slopes carried through the structure location or existing ground surface, whichever is lower, to the bottom of the required excavation as determined by the Engineer.

In areas where unsuitable material is removed and backfilled under Item 123, Muck Excavation, excavation of the backfill will be measured horizontally and vertically as above except the upper limit of excavation shall be 600 millimeters above the swamp or 600 millimeters above any water that is present, whichever is higher.

Where masonry is ordered removed from existing substructures, only the actual quantity ordered removed shall be measured for payment.

Excavation made outside the lines prescribed for payment will be considered as made for the Contractor's convenience and will not be included for payment under any item of excavation, nor will the refilling of any such area be included under any item of filling material.

Class A Trench Excavation shall be measured as follows:

For masonry culverts (having a clear square span of less than 2.44 meters), inlets and walls, a width of 300 millimeters outside the base of the masonry section shown on the plans and to the depth required. Trench excavation for walls in cuts shall include only that portion below the elevation of the subgrade adjacent to the wall. For walls where an embankment is proposed, trench excavation shall be only that portion between the existing ground and the bottom of the foundation. All other Class A Trench Excavation will be measured according to the amount of materials removed to the lines and grades shown on the plans or as directed.

Class B Trench Excavation shall be measured as follows:

For pipe culverts, drains and water pipes the depth of excavation shall be measured from the bottom of the pipe barrel to the bottom of the roadway excavation or existing ground, whichever is lower, as determined above the center line of the pipe, less 1.5 meters. The width of excavation shall be 1 meter greater than the rated inside diameter of the pipe up to a point 1.5 meters above the bottom of the pipe barrel and a width above that point equivalent to the base width plus an allowance for 1 to 1 slopes on the sides of the trench for the measured depth described above. The allowance for 1 to 1 slopes will be included regardless of the actual scope excavated or whether sheeting or shoring is used that is not included for payment under Section 950. The sides of the trench excavation will be considered vertical when sheeting is used and paid for separately under Section 950 and the width shall be 1 meter greater than the inside diameter of the pipe. If necessary to obtain a satisfactory foundation for pipe culverts, drains and water mains, trenches shall be excavated deeper than normally required for bedding the pipe and such excavation below the barrel of the pipe will be measured for payment under this item. The width of trench shall be 1 meter greater than the rated inside diameter of the pipe and the depth shall be the actual depth as directed by the Engineer.

Class B Rock Excavation shall be measured as follows:

Pay limit for rock excavation actually removed in all masonry culverts, walls and bridges, will be up to a limit of 300 millimeters outside of the foundation. This rock excavation in cuts shall include only that portion below the limits of payment of Roadway Earth Excavation or Class A Rock Excavation and in embankment only that portion below the surface of the existing ground.

Pay limit for rock actually excavated in pipe trenches will be made to a width of 600 millimeters greater than the rated inside diameter of the pipe barrel, providing rock extends to that width. The maximum depth of rock to be paid for shall be equal to the difference in depth between the top of the original rock in the trench and a line 300 millimeters below the bottom of the outside of the pipe barrel. No part of any rock remaining in the trench shall come within 150 millimeters of any portion of the pipe. Rock actually excavated in the construction of catch basins, manholes, and leaching basins will be calculated on a basis of

300 millimeters outside of the outer walls and 150 millimeters below the bottom of the structure. Rock excavation in subdrain trenches will be measured as specified above for pipe trenches.

Rock excavation in post and bound holes not already paid for in previous rock excavation shall be based on an area of 0.4 square meters multiplied by the depth of rock encountered in the post or bound hole required plus 150 millimeters.

Rock excavation in channel excavation will be measured as specified in Subsection 120.22.

The unit of measurement for drainage structure abandoned or removed will be each structure abandoned for each structure removed, complete.

140.81 Basis of Payment.

Excavation for structures will be paid for at the contract unit price per cubic meter under the item for the particular type of excavation encountered.

The unit price per cubic meter shall include all backfilling when the materials are obtained from excavation, all clearing and grubbing (except as may be otherwise provided on the plans or in the Specifications), all excavations for the structure formation of embankments, disposal of surplus material, and the furnishing of all equipment, tools, labor and work incidental thereto.

If cofferdams, sheeting, shoring, bracing, dewatering system or other method of control for excavation are not specific items in the Contract, no allowance in addition to the prices bid for any items in the Contract will be made for such controls, or for labor, equipment or materials required. If any change in depth of foundation greater than 600 millimeters or in other dimensions of the foundation is directed by the Engineer after the controls have been provided, and if such change is greater than can be accommodated by the controls as constructed by the Contractor with the approval of the Engineer, then any changes made as directed by the Engineer will be paid for in accordance with the Contract provisions for Extra Work. Excavation, borrow, concrete or other items of work done within the controlled area will be paid for only at the contract prices for these items unless the operations require different or additional equipment or labor in addition to or different from that required for the original design of the control. If such different or additional equipment or labor is required to perform the operation for the pay unit of an item the additional costs will be paid for under Extra Work. Where salvage of material is involved in the additional work, the value of the salvage shall be deducted from the additional payment.

Backfilling when not obtained from excavation will be paid for at the contract unit price for the kind of material used.

Bridge Excavation will be paid for at the contract unit price per cubic meter under Item 140, Bridge Excavation. Bridge excavation within a cofferdam and included in the Proposal as a separate pay item will be paid under Item 140.1, Bridge Excavation within Cofferdam. All other excavation encountered in the construction of bridges, culverts (spans 2.44 meters or more) and major wall structures, not otherwise defined in these specifications will be classified and paid for as Earth Excavation.

Class A Trench Excavation will be paid for at the contract unit price per cubic meter of Class A Trench Excavation except that where the depth is greater than 2.5 meters that excavation below the 2.5 meter depth will be paid for at a price per cubic meter equal to 1-1/2 times the price bid per cubic meter for Class A Trench Excavation with the exception that no addition to unit bid price will be allowed for excavation of open ditches that may exceed 2.5 meters in depth for excavation required for the construction of revetment regardless of the depth. Test pits exclusively for the purpose of locating existing underground structures and conduits where directed, regardless of depth, will be paid for at 3 times the contract unit price per cubic meter for Class A Trench Excavation.

Class B Trench Excavation will be paid for at the contract unit price per cubic meter for Class B Trench Excavation.

Channel excavation (except rock) will be paid for at the contract unit price per cubic meter of Channel Excavation which price shall include full compensation for all handling, stacking or rehandling of excavated material.

Where channel excavation is made adjacent to a bridge or other structure the limits of pavement for channel excavation begin at the outer limits of payment for excavation for bridge or other structure.

Excavation for the placing of riprap in channel excavation areas where required will be included under the item of Channel Excavation.

Rock excavation (except in channel excavation) will be paid for at the contract unit price per cubic meter of Class B Rock Excavation. Class B Rock excavated within a cofferdam (constructed of lumber, wood or steel sheeting) will be paid for at 3 times the contract unit price per cubic meter of Class B Rock Excavation.

Rock excavation in channel excavation will be paid for at the contract unit price per cubic meter of Class A Rock Excavation.

Drainage structures abandoned will be paid for at the contract unit price each under the item for Drainage Structures Abandoned.

Drainage structures removed will be paid for at the contract unit price each under the item for Drainage Structures Removed.

140.82 Payment Items.

140.	Bridge Excavation	Cubic Meter
140.1	Bride Excavation Within Cofferdam	Cubic Meter
141.	Class A Trench Excavation	Cubic Meter
142.	Class B Trench Excavation	Cubic Meter
143.	Channel Excavation	Cubic Meter
144.	Class B Rock Excavation	Cubic Meter
145.	Drainage Structure Abandoned	Each
146.	Drainage Structure Removed	Each
121.	Class A Rock Excavation	Cubic Meter
999.141	Extra Depth Class A Trench Excavation	Cubic Meter
999.143	Test Pit Excavation	Cubic Meter
999.144	Cofferdam Class B Rock Excavation	Cubic Meter

SECTION 148

DREDGING

DESCRIPTION

148.20 General.

Dredging shall consist of the removal and disposal of all materials within the limits shown on the plan, or as laid out in the field. Materials shall be removed to the depths shown on the plan. All dredging material will be classified as "Material, Dredged and Disposed", "Rock, Removed from Dredged Area and Disposed", and "Ledge, Removed from Dredged Area and Disposed".

The Contractor's attention is directed to the requirements of Section 7.00 concerning Prevention of Water Pollution and Erosion.

148.21 Material, Dredged and Disposed.

Material, Dredged and Disposed, shall consist of all material removed from the dredging area and placed in scows and disposed of where and as directed in the Special Provisions; not included are Rocks, Removed from Dredged Area and Disposed, and Ledge, Removed from Dredged Area and Disposed.

148.22 Material, Dredged and Disposed (Hydraulic Method).

Material, Dredged and Disposed (Hydraulic Method), shall consist of all material removed from the dredging area and disposed of by Hydraulic dredging methods where and as described in the Special Provisions; not included are Rocks, Removed from Dredged Area and Disposed, and Ledge, Removed from Dredged Area and Disposed.