

SECTION 02220
STRUCTURE EXCAVATION

02220.01 GENERAL

A. Description

1. Structure excavation shall include, but not necessarily be limited to excavation for bridges, drainage structures, retaining walls, and building foundations as shown on the Plans and in accordance with the Contract Documents.
2. All suitable materials removed in the excavation shall be used in the backfill of structures, in approach embankments, as indicated on the Plans, or as directed by the Engineer.

B. Related Work Included Elsewhere

1. Protection of the environment; Section 01500.
2. Clearing and grubbing; Section 02110.
3. Removal or abandonment of existing utilities and underground structures; Section 02150.
4. Removal of existing pavement, sidewalk, curb, and combination curb and gutter; Section 02160.
5. Removal of existing masonry; Section 02180.
6. Removal of existing buildings; Section 02190.
7. Borrow excavation; Section 02240.
8. Salvaging topsoil; Section 02811.

C. Quality Assurance

All materials from structure excavations that are to be incorporated into the work will be subject to test by the Engineer to determine its suitability for the portions of the work in which the material is to be placed. The tests may determine organic content, mechanical properties, bearing capacity, density, stability, or any other properties pertinent to the satisfactory completion of the work indicated.

D. Submittals

1. Test results and certificates of suitability by a licensed engineer shall be submitted to the County before any foundation concrete is poured or foundation piles driven.
2. Design calculations and details for cofferdams and other excavation support systems, sealed by a Registered Professional Engineer in the State of Maryland, shall be submitted to the County for comment prior to performing any excavations.

02220.02 MATERIALS**A. Materials Furnished by the County**

The County will not furnish any materials for structure excavation other than those materials that are available within the excavation limits of the project site as designated on the Plans by sections, grade lines, and/or contour lines.

B. Contractor's Options

Not applicable.

C. Detailed Material Requirements**1. Use of Excavated Material**

All suitable materials removed from the excavation shall be used as far as practicable in the formation of embankments, backfill, or at other places as directed. No excavated material shall be wasted or otherwise removed from the project site without permission of the Engineer. Boulders, logs, or any other unforeseen obstacles encountered shall be removed. As the material is excavated, it shall be separated into suitable or unsuitable material. The suitable material shall be placed in backfill or stored for future use. The unsuitable material shall be disposed of off-site in an approved disposal area.

2. Selected Backfill

Selected backfill for structure foundation shall be as specified in Section 02245.02.

02220.03 EXECUTION**A. General****1. Excavation Considerations**

The Contractor shall not excavate any area within the project site without permission from the Engineer. All excavation contiguous to existing pavements and structures

shall be sheeted, shored, braced and supported in a substantial manner to prevent settlement, movement or damage. No excavated material shall be deposited at any time so as to endanger the partly finished structure either by direct pressure or indirectly by overloading banks contiguous to the operation. Trenches or foundation pits for structures or structure footings shall be excavated to the lines and grades or elevations shown on the Plans or as directed by the Engineer. They shall be of sufficient size to permit the placing of the full width, depth and length of the structure or footing shown.

2. Adjustment of Footing

The Engineer reserves the right to change locations, elevations or shapes of footings as foundations are exposed. If suitable material is encountered at elevations above planned footing bottoms, the footing will be redesigned to make the most efficient use of the material; and by submitting a bid, the Contractor thereby agrees to changes which will most effectively make use of desirable foundations.

B. Foundations

1. Footing Foundations

- a. Footings for structures shall be on suitable foundations, and no concrete shall be poured or foundation piles driven until the foundations are certified as suitable by a licensed engineer obtained by the Contractor to inspect and test the foundation work.
- b. Faces of footings shall be placed against plumb-undisturbed material. If excavation will not stand plumb, the Contractor shall furnish and install sheeting as required. Sheeting for this purpose shall be left in place. All hard foundation material shall be cleaned of all loose material and cut to a firm surface, either level, stepped or serrated as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. When masonry is to rest on an excavated surface, special care shall be taken not to disturb the bottom of the excavation; and the final removal of the foundation material to grade shall not be made until just before the concrete is placed.
- c. If the Proposal contains an item for Subfoundation Investigation under Section 02011, the item shall be used to verify the character of the foundation if directed by the Engineer. Where foundation piles are used, the excavation of each pit shall be completed to the planned elevation before the piles are driven. After the driving is completed, all loose and displaced material shall be removed, leaving a smooth, solid bed to receive the concrete.

2. Tremie Seal for Foundation

In case of a foundation requiring a tremie seal, material forced above the planned elevation of the bottom of the seal by the driving of the foundation piles need not be

removed under ordinary conditions. However, if the underlying soil becomes displaced during the pouring of concrete for the foundation seal and a mud wave is formed thereby, the displaced material shall be removed in order to preserve the full foundation cross section indicated on the Plans.

3. Stability of Foundation

When the foundation, upon excavating to planned grade, completing driving piling, or dewatering cofferdams is not sufficiently stable to receive the concrete or other masonry intended, it shall be the responsibility of the Contractor to stabilize the foundation area or construct bottom form or use other positive and properly engineered solutions so that the concrete footing can be constructed in the dry and to its proper place.

C. Cofferdams

1. Submerged Areas and Cofferdams

Suitable and practically watertight cofferdams shall be used wherever water-bearing strata are encountered above the elevation of the bottom of the excavation. The Contractor shall submit drawings and appropriate design calculations prepared and sealed by a Registered Professional Engineer in the State of Maryland showing his proposed method of cofferdam construction and other pertinent features not shown in detail on the Plans. The drawings will be reviewed by the Engineer before construction is started, but the review shall not relieve the Contractor of any of his responsibility under the Contract for the successful completion of the facility. The Contractor's attention is directed to the provisions of Section GP-5.02.

2. Cofferdam Sheeting

Cofferdam sheeting for foundation construction shall in general be carried well below the bottom of the footings and shall be well braced. The interior dimensions of cofferdams or cribs shall be such as to give sufficient clearance for the construction of forms and the inspection of their exteriors and to permit pumping outside of the forms. Cofferdams or cribs, which are tilted or moved laterally during the process of sinking, shall be righted or enlarged so as to provide the necessary clearance, and all such work shall be at the expense of the Contractor.

3. Concrete Foundation Seal

When conditions are encountered which, in the opinion of the Engineer, render it impracticable to dewater the foundation before placing masonry, he may require the construction of a concrete foundation seal of the dimensions as may be necessary and of the thickness needed to resist any possible uplift. The foundation shall then be pumped out and the balance of the masonry placed in the dry. When weighted cribs are employed and the crib weight is utilized to overcome a part of the hydrostatic pressure acting against the bottom of the foundation seal, special anchorage such as

dowels or keys shall be provided to transfer the entire weight of the crib into the foundation seal. When a foundation seal is placed under water, the cofferdam shall be vented or ported at low water level as directed.

4. Concrete Protection by Cofferdams

Cofferdams shall be constructed so as to protect green concrete against damage from sudden rising of the stream and to prevent damage to the foundation by erosion. No timber or bracing shall be left in the cofferdams or cribs in a way as to extend into the substructure concrete, without written permission from the Engineer.

5. Pumping

All pumping from the interior of the foundation enclosure shall be done in a manner as to preclude the possibility of any portion of the concrete materials being carried away. No pumping will be permitted during the placing of concrete, or for a period of at least 24 hours thereafter, unless it is done from a suitable pump separated from the concrete work by a watertight wall. Pumping to dewater a sealed cofferdam shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure.

6. Removal of Cofferdams or Cribs

Unless otherwise provided, cofferdams or cribs with all sheeting and bracing involved therewith shall be removed by the Contractor after the completion of the substructure. The removal shall be affected in a manner as not to disturb or mar the finished masonry.

D. Backfilling

1. General

All excavated spaces resulting from structure excavation, not occupied by portions of the permanent work, shall be backfilled with approved material. This backfilling shall be carried to the surface of the surrounding ground or to the finished grades shown on the Plans. The top surface of the backfilled areas shall be neatly graded to prevent ponding of surface water.

2. Backfill Compaction

All backfilled volumes shall be built and compacted as described under the subsequent sections on Embankment and/or Tamped Fill. Note, however, that for backfills in old channels, outside of the cross section of the road; it will be acceptable if material is deposited in the old channel in layers not exceeding 2 feet in thickness; and compaction may be reduced to be equal to that caused by two passes over each layer of heavy compaction or earth moving equipment.

3. Backfilling Against Structures

Backfilling against various structures may be done at the following times:

- a. With brick masonry, backfilling may be done seven days after completion of the section. Refer to Section 04200.03 for cold weather protection.
- b. With cement concrete structures where the base width is approximately one-half of the height, backfilling may be done after all provisions for curing concrete, etc., have been complied with. On reinforced sections (any section not falling in above classification), backfilling may be done after all provisions have been complied with for curing concrete, etc., and when compression test specimens indicate that the concrete has attained a minimum compressive strength of 3000 psi.

In the case where backfilling may be made equally on each side of a single wall or part of a structure without producing stress in that section, backfilling may be done after all the provisions have been complied with for curing concrete.

4. Backfilling Around Piers

Fill placed around piers shall be deposited on both sides to approximately the same elevation at the same time. All backfilling adjacent to structures shall be deposited in horizontal layers where settlement would be detrimental. All backfill material shall be compacted as prescribed under Tamped Fill. Special care shall be taken to prevent any wedging action against the structure, and all slopes bounding or within the areas to be backfilled shall be stepped or serrated to prevent wedging action.

5. Backfill Bed

In backfilling abutments, retaining walls, or other structures, the bed for the backfill shall be so prepared and serrated and the backfill shall be so built up in horizontal layers that at all times there shall be a horizontal berm of uniformly compacted material behind the structure for a distance at least equal to the height of the abutment or wall remaining to be backfilled, except insofar as undisturbed material protrudes into this area. Each layer of this berm shall be compacted in accordance with Section 02260.03.

The use of drop pile hammers, loaded or unloaded clam shell or other similar unsuitable equipment for compacting backfill within the berm area mentioned above as well as the dropping of any heavy weight for that purpose is prohibited. Jetting of fills or other hydraulic methods involving or likely to involve liquid or semi-liquid pressure within the berm area is prohibited.

02220.04 METHOD OF MEASUREMENT**A. General**

1. Excavation will be measured on a volume basis.
2. Material Displaced in Concreting

The removal of material displaced by the placing of concrete will not be measured. The cost of its removal and disposal shall be included in the Contract price bid for other items.

3. Excavation Beyond Specified Limits

Additional excavation required below the elevation shown on the Plans and necessitated by the lowering or deepening of footings, or the placing of subfoundations or underpinning, will be measured as a part of its respective class; and the Contractor, by submitting the bid, agrees to perform said excavation at the unit price bid.

4. Excavation for Removal of Obstructions

Excavation necessary to expose and/or remove piles, grillages, sheeting, cribbing or masonry will not be measured if same occurs outside of limits of excavation. Where it is necessary to expose and/or remove obstruction as aforesaid and they occur within limits of excavation, the excavation will be measured as if the obstructions did not exist. Volumes of removed masonry will be deducted from excavation quantities when a separate item is included for Removal of Existing Masonry in the Proposal Form.

B. Class 3 Excavation

Class 3 Excavation shall include excavation for bridges; substructure units; retaining walls; etc.; and that part of excavation for pipe culverts; storm drainage, sanitary sewer, and water main repairs; headwalls; endwalls; underdrains; etc., which is not included in other Proposal items. All pay item excavation for structures will be included in this class except that when a groundwater line is shown on the Plans, only the excavation above this line will be included in this classification. Unless otherwise shown on the Plans or described in the Special Provisions, measurement for the pay item of excavation will extend to vertical planes 18 inches outside of the structure. The name structure is interpreted to be the footing or structural unit for which the excavation is made. If excavation does not reach the vertical planes, measurement will be made for material actually removed; and no measurement will be made for removing any water or liquids.

C. Class 3A Excavation

Class 3A Excavation shall include removal of unsuitable material when encountered at or below the subgrade of structural elevations. It shall also include increases or decreases in the limits or amounts of excavation resulting from changes in pipe grade, location, or foundation design.

D. Class 4 Excavation

Class 4 Excavation shall include excavation for bridges and other structures below the groundwater line shown on the Plans where said excavation is not incidental to other Proposal items. Unless otherwise shown on the Plans or described in the Special Provisions, measurement for the pay item for Class 4 Excavation will extend to vertical planes 18 inches outside of the structure within the horizontal limits described in the preceding sentence. If excavation does not reach the vertical planes, measurement will be made for material actually removed; and no measurement will be made for removing any water or liquids.

02220.05 BASIS OF PAYMENT**A. General**

1. Payments will be made at the unit prices bid. The bid prices shall include furnishing all labor, tools, equipment, and materials necessary to complete the work as shown and specified in strict accordance with the Contract Documents, and accepted by the Engineer.
2. The price bid for structure excavation shall include the following:
 - a. Removal of existing pavement, sidewalk, curb, and combination curb and gutter as specified in Section 02160.
 - b. Excavation support as specified in Section 02400.
 - c. Dewatering as specified in Section 02512.
3. Payment will be made for contingent items when ordered by the Engineer. Payment will be as specified in Sections 02951, 02952, 02953, 02954, 02955, 02956, and 02957.

B. Structure Excavation

1. Payment for structure excavation will be made per cubic yard for Class 3, Class 3A, or Class 4 Excavation. The price bid shall include all excavation, segregating into suitable and unsuitable material, hauling, storing, rehandling, depositing, backfilling, compacting, disposal of, etc., as well as construction of cribs, cofferdams, dewatering

devices (temporary pipes, flumes, etc.), and the removal thereof, unless otherwise specified or directed.

2. The price bid for structure excavation shall include removal of all materials encountered to permit the planned and/or revised construction. The same price is to prevail regardless of type of material removed. It shall include removal of all material, whether hard or soft, including the remains of old structures. Furthermore, no increase in any prices will be allowed even if hard materials are encountered which were not shown on the borings.
3. Where it is required that structure excavation is backfilled over old pavement and the old pavement must be scarified or broken, the cost thereof shall be included in Class 3 Excavation.