

TECHNICAL SPECIFICATIONS
FOR
GRADING

1. Description

This work shall consist of excavating and grading the roadway, borrow pits, waterways, ditches, intersections, and other specified items, within the project limits; excavation of unsuitable material from roadbed and beneath embankment areas; excavating select material found in the roadway which is ordered for specific use in the construction; the construction and removal of detours authorized by the Engineer; trimming, shaping and dressing of all slopes; preparation of the roadbed; and disposing of all excavated materials all in accordance with the Specifications and in reasonably close conformity with the lines, grades, and typical cross-sections indicated on the Plans or established by the Engineer. It shall include the constructing of roadway embankments and the placing and compacting of approved material in the project area.

2. Classification

(a) Excavation (Unclassified)

All excavation performed under this section, including portland cement concrete located above subgrade elevation, other than Borrow Excavation, Channel Excavation and Undercutting will be considered Unclassified Excavation regardless of the nature of the material excavated.

(b) Common Excavation

Common Excavation shall consist of the removal and satisfactory placement of material classified as loam, sand, clay, loose chert, loose gravel, cemented chert, cemented gravel, gravel, soft shale, soft slate, and all pavements except those using portland cement as a bonding agent, decomposed rock, loose rock boulders, slabs or fragments of rock of less than $\frac{1}{2}$ cubic yard in volume and all other material not otherwise classified in these Specifications.

This item shall also consist of the removal and satisfactory disposal of unsatisfactory materials below grade in cut sections, from areas upon which embankments are to be placed, and undercutting for pipe and box culverts where required. Common Excavation does not include the stripping, stockpiling and placing of topsoil, nor does it include step benching in preparation of embankment areas on hillsides.

(c) Rock Excavation

Rock Excavation shall consist of the removal and satisfactory disposal of non-degradable rock which, in place, rings under the hammer or which cannot be economically excavated by the proper use of a power shovel or without the use of explosives; and any boulder, slab or fragment of rock having a volume of 2 cubic yard or more.

(d) Borrow Excavation

Borrow Excavation shall consist of material required for the construction of embankments or other portions of the work, and shall be obtained from approved sources outside the right-of-way limits, unless otherwise designated in the Plans. This item shall consist of the satisfactory removal and placement of the approved material.

(e) Channel Excavation

This item shall consist of the removal and satisfactory disposal of all material, regardless of its nature or the manner in which it may be removed, that is excavated for channel changes in widening, deepening and straightening existing channels or constructing new channels, which have a width at the bottom of more than fourteen feet as indicated on the Plans. All other similar excavation with a bottom width fourteen feet or less, as shown on the Plans, shall be paid for as Common and Rock excavation.

3. Construction Requirements

(a) General

- 1) Prior to the beginning of grading, all necessary Clearing and Grubbing, Removal of Structures and Obstructions, and placement of Erosion Control in that area shall have been completed.
- 2) All suitable materials removed from the excavation shall be used in the construction of the embankments, intersecting road approaches and at such other places as indicated or directed.
- 3) The material to be used in excavations shall be removed in such a manner that the slopes may be neatly trimmed to the slope lines given, when being dressed. Cuts may be widened or the slopes varied during the progress of the construction, according to the stability of the material excavated or the necessity of securing additional material, and without additional compensation.
- 4) Excavation material shall not be wasted, deposited, or disposed of outside of the construction lines unless directed, in writing, by the Engineer.
- 5) Only excess or unsuitable material will be considered for disposal outside the construction limits. The material that cannot be used to widen or flatten the slopes, or other locations, and for such purposes as may be directed by the Engineer, shall be disposed of by the Contractor to the satisfaction of the Engineer. The site of disposal shall be approved by the Engineer. All applicable permits for the disposal of material shall be obtained by the Contractor.
- 6) Old roadways shall be obliterated by the grading operation in a manner that will incorporate the old roadway into the new roadway and the surroundings in a pleasing appearance from the new roadway.

- 7) The Contractor shall be responsible until final acceptance for the stability of all embankments and cut slopes made under the contract and shall replace at his own expense any portion which, in the opinion of the Engineer, has become displaced or damaged due to carelessness or negligent work by the Contractor or by normal rainfall and weathering.
- 8) Final clearing up shall be performed in accordance with the provisions set out in the Conditions of the Contract.

(b) Rock Excavation

Rock, including boulders, shall be removed to a depth of not less than 12 inches below subgrade and the cavities thus formed shall be backfilled with suitable material and compacted. All loose rock on the cut slopes shall be removed immediately.

(c) Borrow Excavation

- 1) The Contractor shall notify the Engineer 14 days in advance of the opening of any borrow pit so that the borrow material can be tested and cross-sections taken.
- 2) If the Contractor places more borrow than is required and thereby causes a waste of excavation, the amount of such waste will be deducted from the borrow volume.
- 3) The borrow pit shall be excavated in such a manner as to be self-draining whenever possible and have a neat appearance. The pit shall be covered with topsoil and seeded in accordance with the Specifications for Seeding and Topsoil, but no direct payment will be made for these items as they shall be included in prices bid for other items of construction.
- 4) All local, state, and federal laws must be complied with for any borrow pits that are not self-draining.

(d) Undercutting

- 1) Unsuitable or unsatisfactory materials shall be removed to a depth not less than 2 feet below subgrade in cut sections and areas upon which embankments are to be placed. Undercutting for pipes and box culverts may also be required. These areas are to be refilled with suitable material and properly compacted.
- 2) The Contractor shall conduct his operation in such a manner as to allow the Engineer to take necessary cross-sections.
- 3) This unsuitable material can be used to flatten or widen slopes or for such purposes as the Engineer may direct. Excess material shall be disposed of by the Contractor to the satisfaction of the Engineer.

(e) Embankments

- 1) Preparation of Embankment Areas
 - a. All depression and holes below ground surface, whether caused by grubbing or otherwise, shall be filled with suitable matter and properly compacted.

- b. The original ground surface, or the surface of embankment layers, shall not be frozen and shall be free from quantities of ice and mud when the subsequent layer is placed thereon.
- c. Backfilling around a structure, or any unit thereof, shall have been completed and thoroughly compacted to ground surface before any embankment materials are placed thereon.
- d. When embankment is to be placed and compacted on hillsides or when new embankment is to be compacted against existing embankments or when embankment is built in phases, the slopes that are steeper than 4:1 when measured at right angles to the roadway shall be continuously benched over those areas where it is required as the work is brought up in layers. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each successive cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut shall be recompacted along with the new embankment material at the Contractor's expense.
- e. Where embankments are three feet or less in height, the entire surface upon which the embankment is to be placed shall have all vegetation and unsuitable material removed and replaced with suitable material, be thoroughly plowed and scarified, have all cleavage planes destroyed, and be recompacted.
- f. Every portion of existing pavement upon which an embankment is to be constructed at an elevation higher than two feet below subgrade shall be removed and paid for as described in Section 2 (e & f) of Removal of Structures and Obstructions.

Every portion of existing pavement upon which an embankment is to be constructed more than two feet below subgrade shall be broken as described in same sections as above.

2) Embankment Materials

- a. Unsuitable or perishable materials such as brush, hedge, stumps, roots, logs, rubbish heavy vegetation, etc. shall not be incorporated, buried or embedded in the embankment.
- b. All rock shall be broken into sizes not to exceed one foot in maximum direction and have enough common excavation to fill all voids between the rocks.
- c. Stones or rock four inches or greater in their greatest dimension will not be allowed in the top one foot of any embankment.

3) Formation of Embankments

- a. Embankments shall be formed of suitable materials placed in successive level layers of not more than eight (8) inches in compacted depth, unless otherwise stipulated, for the full width of the cross-section. Each layer shall be thoroughly rolled and compacted by the use of compacting equipment that will produce the required compaction of 95% of maximum density. At all times the contractor shall keep the embankment in such form as to insure proper surface drainage.
- b. When the embankment material consists of rock fragments of such size that the material cannot be placed in layers of the thickness prescribed without crushing or further breaking down the pieces resulting from excavation methods, such material may be placed in the embankment in layers not exceeding in thickness the approximate average size of the larger rocks. Each layer shall be leveled and smoothed with suitable leveling equipment and by distribution of spalls and finer fragments of earth. The lifts shall not be constructed above an elevation 2 feet below the finished subgrade. At no time shall any layer exceed two feet in depth.
- c. The top six inches in both cut and fill sections shall be compacted to a density equal to 100% of maximum density.
- d. The moisture content of the material being compacted shall meet both the following conditions: (1) The moisture content shall be within

the range of values at which 95 percent of the maximum density can be obtained as indicated by the moisture-density relationship curve and (2) the moisture content shall not exceed the optimum moisture content to the extent that the material pumps under loads applied by the construction equipment. Where 100 percent of maximum density is required, the moisture content of the material being compacted shall meet condition 3(d)2 above and shall not vary from the optimum moisture content by more than plus or minus three percentage points.
- e. Determination of optimum moisture and maximum density will be made by the Engineer in accordance with the "Standard Method of Test for Moisture Density Relationship of Soils Using a 5.5 Pound Rammer and a 12-inch Drop," AASHTO Designation: T 99, Method C. The determination of the density of the soil in place will be in accordance with an approved AASHTO method.
- f. Embankment materials shall not be placed within 50 feet of any structure until the structure has sufficiently cured in the opinion of the Engineer. The backfill material used within 50 feet shall be as free of rock as possible and carefully selected to the satisfaction of the Engineer. Special precautions shall be used to prevent any damage to the structure.

- g. Each layer of embankment formation shall be compacted to the required density before the formation of the next layer is begun.

(f) Shaping and Dressing

- 1) The roadbed shoulders, ditches, channels, borrow pits, and slopes shall be shaped within close conformity to the specified lines, grades, and cross-sections.
- 2) Rock Cuts shall be scaled of all loose fragments and left in a neat safe and workmanlike condition.
- 3) The Contractor shall clean the entire right-of-way of all rubbish, brush, sediment, etc. and dispose of the excess material.

(g) Subgrade Preparation

- 1) The subgrade shall be prepared to the lines and grades staked by the Engineer and to the cross-sectional shape as indicated on the plans or as directed.
- 2) The finished subgrade shall be compacted to a minimum density of 100% of the maximum density as specified in subsection referring to Formation of Embankments.
- 3) All soft, yielding material which will not compact readily shall be reworked or removed and replaced, and the replacement material shall be compacted to the specified density.
- 4) The subgrade shall be graded in a manner that will provide ready drainage of water from the subgrade. Ditches and drains shall be maintained to provide proper drainage during construction.
- 5) The Contractor shall protect the subgrade from damage. Only hauling essential to the construction of the project will be allowed. Any ruts or rough places that develop will be reshaped and recompacted.
- 6) The subgrade will be checked after rolling and adjusted to conform to the lines, grades and cross-section as indicated or directed. After conforming to the proper lines, grades, and cross-sections, being free of dust and loose material, and of a uniform bearing the subgrade will be approved at least 500 feet in advance of the placing of materials, except when the distance is reduced due to unusual circumstances by the Engineer.

4. Method of Measurement

(a) General

- 1) All excavation shall be computed by the cubic yard.
- 2) The volume of all accepted excavation shall be measured by cross-sectioning the area excavated and computed by the average-end-area method.
- 3) Initial cross-sections will be taken during design if necessary as determined by the Engineer, and final cross-sections will be taken after topsoil has been placed. Top soil will be deducted from the final cross sections to determine the volume of road and drainage excavation.

- 4) Additional measurements will be taken to determine the volume of materials, removed and satisfactorily disposed of, whose volume cannot be secured by cross-section methods.
- 5) The volume of all materials will be measured and computed for only one pay item, unless material which has been deposited as specified, must be removed and disposed of again to conform to a change of the plans, or as directed. The volume of such material shall be reclassified and remeasured for its proper class of excavation.
- 6) Where excavation of different classifications overlap, the following order of measurement and computation for payment is designated as a contract provision, namely:
 - Excavation included in lump sum items shall supersede all other excavations.
 - Excavation (unclassified) shall supersede common excavation, rock excavation and channel excavation.
 - Common excavation and solid rock excavation shall supersede channel excavation.
- 7) Hauling of excavation and borrow materials shall be considered incidental to this construction and the costs thereof shall be included in the unit price bid for excavation items.
- 8) Embankment construction, sloping, shaping, dressing, subgrade preparation, disposal of excess, or unsuitable material, final clearing up, etc., and completing all incidentals connected therewith will not be paid for directly but will be considered to be contingent items, payment for which is included in the contract price for excavation items.
- 9) Excavation (unclassified) and common excavation shall be measured by initial cross-sections. The method of measurement will be the average end-area method (utilizing the initial cross-section and the design cut and fill slopes and roadway template).

(b) Rock Excavation

- 1) Measurements of solid rock will be taken to include only 12 inches below grade, unless the Contractor is directed, in writing, by the Engineer to excavate the rock to a depth greater than 12 inches.
- 2) Measurements will include over-breakage from the back slopes beyond 12 inches if it is not attributable to Contractor's carelessness.

(c) Borrow Excavation

- 1) Initial cross-sections will be taken after the borrow pit is cleared and grubbed, cleared of topsoil and unsuitable material, and smoothed in a manner to make cross-sectioning possible. Final cross-sections will be taken after all material is removed and before topsoil is replaced.
- 2) Topsoil shall be replaced and the pit seeded as instructed without any direct payment and the cost thereof shall be included in the unit price for borrow excavation.

(d) Undercutting

- 1) The volume of unsuitable or unsatisfactory material actually excavated, removed, and disposed of will be measured by the most feasible method and included in the volume of common excavation computed.
- 2) Topsoil undercut from proposed embankment areas will not be measured as common excavation unless the depth of undercut exceeds six (6) inches. All undercut exceeding six (6) inches shall be paid as Common Excavation.

(e) Embankments

- 1) Embankments will not be measured. The construction of embankments is the responsibility of the Contractor as specified.
- 2) Excavation of embankment will not be measured for payment unless specified by the Engineer.

(f) Channel Excavation

- 1) Channel excavation will be measured only for material indicated, or directed, to be removed in construction of a channel.
- 2) If channel excavation is not listed in the Bid Schedule excavation (unclassified), common excavation and/or rock excavation will be measured and computed as applicable.

5. Basis of Payment

(a) The accepted quantities of the items listed below will be paid for at the Contract Unit Price per cubic yard, complete in place, and shall be full compensation for all work, materials, including water, labor and other incidentals required to complete the work in accordance with the Plans and Specifications.

(b) Payment will be made under the following bid items as set forth in the Bid Schedule:

Excavation (Unclassified)	- per cubic yard
Common Excavation	- per cubic yard
Rock Excavation	- per cubic yard
Borrow Excavation	- per cubic yard
Channel Excavation	- per cubic yard

(c) Embankments, shaping and dressing, subgrade preparation, and water will not be paid for directly as the cost of these items is to be included in the pay items for grading as listed in the Bid Schedule.