SECTION 0205

EARTHWORK

0205.0100 GENERAL

0205.0101 Description of Work. The work under this Section shall consist of performing all operations necessary to excavate all materials regardless of character and subsurface conditions from the site or adjacent thereto; to excavate drainage and irrigation ditches and channels; to excavate all materials necessary for the construction of structures; to place backfill for structures, pipe, and other facilities; to backfill holes, pits, and other depressions within the right-of-way or easement; and to remove and replace unsuitable material. All work shall be in conformance with the lines, grades, thicknesses, and typical sections designated on the project plans, specified in the special specifications, directed by the Engineer, and specified herein. Trench Excavation Backfill for pipe is detailed in Section 0209.

0205.0300 EXECUTION

0205.0301 General. Operations shall be conducted such that existing roadway facilities, utilities, railroad tracks, and other non-roadway facilities will not be damaged. The Contractor—at his/her expense—shall furnish and install sheet piling, shoring, or whatever materials necessary to adequately support material underlying such facilities, or to support the facilities themselves, and shall maintain such supports until no longer needed. Temporary pavements, facilities, utilities, and installations shall also be protected until no longer required. When temporary supports and other protective means are no longer required, the Contractor shall remove and dispose of them at his/her expense.

When hauling is done over roadways or streets, the loads shall comply with legal load requirements, all material shall be removed from shelf areas of vehicles in order to eliminate spilling of material, and loads shall be watered and covered to eliminate dust. All roadway or streets used for hauling must be returned to original condition prior to final acceptance of the project.

The Contractor shall furnish and apply water for dust control, compaction purposes, and such other purposes as the project requires. The Contractor is also responsible for obtaining the proper water use permit for dust control.

All excavation shall be finished to a smooth and uniform surface, be in reasonably close conformity with the grade established, and in close conformity with the lines, grades, and dimensions shown on the project plans or established by the Engineer.

All suitable material removed from excavated areas may be used instead of construction fill or borrow for backfill of trenches, and in other designated areas if approved by the Engineer.

The Contractor shall provide and maintain earthwork operations to ensure satisfactory surface drainage at all times. Ditches and other drainage facilities necessary to remove ponded water

shall be constructed as soon as practical to have the work area dry during progression of work. All existing culverts and drainage systems shall be maintained in satisfactory operating condition throughout the course of work. If it is necessary to interrupt existing surface drainage, sewers, culverts, or under-drainage, then temporary drainage facilities shall be provided until permanent drainage work is complete.

0205.0302 Structure Excavation and Structure Backfill.

(A) Description. Structure excavation shall consist of:

(1) Excavation or removal of all materials necessary for the construction of concrete structures, or other specific items designated on the project plans or in the special specifications as structure excavation

(2) Control and removal of water

(3) Construction or installation of all facilities necessary to accomplish the work

(4) Subsequent removal of such facilities, except when designated on the project plans or specified in the special specifications to remain in place

Structure backfill shall consist of furnishing, placing, and compacting backfill material around structures to the required elevations designated on the project plans, specified in the special specifications, directed by the Engineer, and as specified herein.

(B) Construction Elements.

(1) Excavation. The required excavation shall be performed in reasonably close conformity with the lines, grades, and cross-sections established by the Engineer or shown on the plans.

The sides of excavations may be sloped as required by soil conditions to stabilize the sides for safe working conditions. Such excavation shall be limited to the amount deemed necessary by the Contractor for safety in accordance with OSHA.

When structures are to rest on an excavated surface other than rock, care shall be taken to protect the surface from water and not disturb the bottom of the excavation. If suitable material in the bottom of the excavation is disturbed or removed for the Contractor's convenience, the foundation shall be restored by the Contractor at his/her expense to a condition at least equal to the undisturbed foundation as determined by the Engineer. When the Engineer determines undisturbed original material at the planned grade of the excavation to be unsuitable, such material shall be removed to the limits directed by the Engineer, and the resulting excavation backfilled with structure backfill material.

When structures are to rest upon rock, the rock shall be fully uncovered, and the surface thereof shall be removed to a depth sufficient to expose sound rock. The rock shall be roughly leveled or cut to steps, and shall be roughened. Seams in the rock shall be grouted under pressure or treated as directed by the Engineer, and the cost thereof will be paid for in accordance with requirements of Subsection 0103.0200 of the standard contract conditions.

Where rock—in either ledge or boulder formation—or other unyielding material is encountered in one portion of excavation for a structure, and a yielding material is encountered in an adjacent area of the excavation for the same structure, such unyielding materials shall be removed to a minimum depth of 2 feet below grade and replaced with structure backfill.

Excavated material not suitable for, or not used as structure backfill, shall be used either for the construction of fill or disposed of, in accordance with the applicable requirements of Subsection 0205.0302(C)(2).

Suitable materials from structure excavation shall be used in fill areas or for other purposes shown on the project plans or specified in the special specifications, unless otherwise designated for disposal.

Prior to placement of concrete or masonry, the area excavated shall be inspected and approved by the Engineer.

(2) Backfill.

(a) Placement of Backfill. All earth material that has loosened or collapsed into the excavation from the adjacent ground, as well as all trash, forms, and loose rock, shall be removed from the excavation before backfill is placed.

Backfill material shall not be placed against minor cast-in-place concrete structures until the concrete has attained a minimum compressive strength of 2,000 pounds per square inch, and in no case less than 72 hours.

Unless otherwise shown on the plans or designated in the special specifications, minor structures—such as vaults furnished as precast structures—shall be placed on a layer of structure backfill at least 6 inches in depth. The layer shall have been shaped to fit the bottom surface of the precast unit and compacted to a density of not less than 100 percent of the maximum density as determined in accordance with the requirements of Arizona Test Methods 225, 226, 227, 230 or 231, and 232. At the time the unit is placed, the moisture content of the layer shall be at or near the optimum moisture as determined in accordance with the requirements of Arizona Test Method 225 or 226. After the unit has been initially set in place and checked for line and grade, it shall be removed and any defects in its bearing

area shall be corrected by trimming and by placing and compacting similarly moistened structure backfill. The process of removal, correction, and replacement shall continue until the imprint of the unit on the bearing area indicates essentially uniform contact, and the unit is in reasonable conformity with the lines and grades shown on the project plans or as determined by the Engineer.

Where a structure is located within a paved area, all material above subgrade elevation shall conform to the requirements of the typical pavement section at the same elevations.

Backfill compacted by pneumatic or mechanical tamping devices shall be placed in layers not more than 8 inches in depth before compaction.

(b) Compaction of Backfill. Backfill material shall be compacted to at least 95 percent of the maximum density as determined in accordance with the requirements of Arizona Test Methods 225, 226, 227, 230 or 231, and 232.

Backfill material may be compacted by either mechanical or pneumatic tamping devices, or backfill material may be placed as a slurry. Compaction equipment or methods that may cause excessive displacement shall not be used.

If backfill is placed as a slurry, the Contractor shall excavate holes in the compacted slurry to the depths and at the locations designated by the Engineer. These holes shall be of such size as to allow the required density tests. Upon completion of the tests, the Contractor shall refill the excavated areas and compact the material to the required density in a manner approved by the Engineer. Unless otherwise approved by the Engineer, the slurry shall be compacted with internal vibrators.

When backfill material is placed around pipes, layers shall be deposited to progressively bury the pipe to equal depths on both sides. When backfill is placed against concrete structures, all material shall be placed and compacted in front of the structure prior to placing fill behind the structure to a higher elevation.

Where sheeting has been used for the excavation and incremental removal of the sheeting is not specified in the plans or special specifications, sheeting shall be pulled when the trench has been backfilled to the maximum unsupported trench depth allowed by OSHA.

C) Materials. Structure backfill material shall be selected from either excavation or a source selected by the Contractor. It shall be screened and shall not contain chunks of clay, stones larger than 3 inches in diameter, or other objectionable material.

Structure backfill material shall conform to the following gradation and plasticity requirements:

Table 0205-1
Structure Backfill

Sieve Size	Percent Passing
3 inch	100
3/4 inch	60 – 100
No. 8	35 – 80
No. 200	*
* The total sum of the percent passing the No. 200 sieve and the plasticity index (P.I.) shall not exceed 25.	

As an alternative to the material requirements of structure backfill, the Engineer may allow material conforming to the following requirements to be used in a slurry mixture in situations where the slurry will be confined by free-draining soils:

Table 0205-2
Slurry Mixture

Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90 – 100
No. 8	35 – 80
No. 200	0 – 8

The plasticity index shall not exceed 8 when tested in accordance with the requirements of ASTM D424. The Engineer may allow a slurry mixture meeting the requirements of the PAG Standard Specifications for Public Improvements.

(1) Unsuitable Material. Unsuitable material below the natural ground surface in fill areas, and below the finished elevation in excavation areas, shall be excavated and disposed of as directed by the Engineer.

When unsuitable material is removed and disposed of, the resulting space shall be filled with material suitable for the planned use.

(2) Surplus Material. Unless otherwise indicated on the project plans or specified in the special specifications, surplus excavated material shall be removed from the job site and disposed of by the Contractor in a manner approved by the Engineer and in accordance with the requirements found in Section 0103 of the standard contract conditions.

Shortages of material caused by the Contractor's disposal of any material before fill quantities are satisfied shall be replaced at his/her expense.

Milled asphalt will not be allowed for backfill in the water line trench.