

SECTION 02220

EXCAVATION, BACKFILLING, AND COMPACTION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work included under this Section consists of furnishing all labor, materials, equipment and incidentals necessary to perform all excavation, removal of unsuitable material, backfill, fill and grading required to complete the work shown on the Drawings and specified herein. The work shall include, but not necessarily be limited to, all excavation and trenching; all backfilling; embankment and grading; ditch grading; and all related work such as sheeting, bracing, dewatering, all earthwork and all other requirements shown on the drawings and specified herein.
- B. Definitions:
 - 1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
 - 2. Optimum Moisture Content: The optimum moisture content shall be determined by ASTM D 698 (latest) specified to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.
 - 3. Rock Excavation: Excavation of any hard-natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
 - 4. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-8 in accordance with AASHTO Designation M 145.
- C. Plan for Earthwork:
 - 1. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract according to the General Conditions.
 - 2. The Contractor shall utilize on-site soil borrow which meets the requirements of these specifications, drawings and contract documents for this project.
 - 3. The work of this section shall include, but not necessarily be limited to excavating, hauling, backfilling, compaction, and grading of soil. The work will pertain all or in part to the construction of landfill entrance road, stormwater pond excavation, pipes, drainage ditches, and disposal of surplus materials. Contractor shall conform to the dimension lines, grades and sections specified on the Drawings.
 - 4. The Contractor will furnish transportation if the offsite borrow source is not contiguous to the landfill property.
- D. Trench Safety Act: The Contractor shall comply with all of the requirements of the Florida Trench Safety Act (Chapter 90-96, CS/CB 2626, Laws of Florida). The Contractor shall acknowledge that included in various items of his bid proposal and in the total bid price are costs for complying with the provisions of the Act. Additionally, the Contractor is required to break out the costs for complying with the Florida Trench Safety Act.

1.02 RELATED WORK

- A. Section 02100 – Site Preparation
Section 02270 – Temporary Erosion Control
Section 02502 – Toe Drain
Section 02720 – Geotextile
Section 02740 – Composite Drainage Net
Section 02776 – Linear Low Density Polyethylene Geomembrane
Section 02930 - Sodding

1.03 APPLICABLE PUBLICATIONS

- A. All publications and standard specifications referred to herein are the latest or current issue of that publication or specification as of the specification date.

1.04 QUALITY ASSURANCE

- A. All earthwork and related installations shall be performed in accordance with the requirements of these Specifications.
- B. Costs for pre-qualification testing of materials including onsite/offsite materials shall be paid by the County.

1.05 FEDERAL AND STATE REGULATORY REQUIREMENTS

- A. All trench excavations which exceed 5 feet in depth shall comply with the applicable trench safety standards as stated in the OSHA excavation safety standards 29 CFR S.1926.650 Subpart P as regulated and administered by the Florida Department of Labor and Employment Security as the "Florida Trench Safety Act."

1.06 JOB CONDITIONS

- A. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the elevations or in the depth of removal of unsuitable material from that indicated in the soils report, an adjustment will be made in the contract price, as provided in the General and Special Conditions.

1.07 PROTECTION

- A. Pre-Construction Survey:
 - 1. Prior to commencing excavation, backfill or dewatering, the Engineer and Contractor shall jointly conduct a survey of any existing structures which, in the opinion of the Engineer, may be subject to settlement or distress resulting from excavation or dewatering operations.
- B. The Contractor shall install and maintain all erosion control features (i.e., silt fences around all areas downslope of soil disturbance, and wetland boundaries). Other areas which may require erosion protection or silt fences shall be identified by the Engineer during construction. Silt fences shall not be removed until the contained areas are covered with sod (exterior of containment berms) or other sufficient erosion control measures such as erosion matting, seeding/mulching and the Engineer determines that soils are adequately stable (not eroding).

1.08 SUBMITTALS

- A. Submit to the Engineer for review the proposed methods of construction, including dewatering, excavation, filling, compaction and backfilling for the various portions of the work. Review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General:
1. All fill material from on and off-site sources shall be subject to review by the Engineer
 2. All fill material shall be unfrozen and free of organic material, roots, trash, or other objectionable material. Excess or unsuitable material as designated by the Engineer shall be removed from the job site by the Contractor.
- B. Clean Common Fill Material:
1. Clean common fill shall be sand not containing stones, rock, concrete, clods, or other rubble larger than 1/4 inch in diameter. It shall have physical properties which allow it to be easily spread and compacted. Material shall be free of solid waste and degradable organic material, as determined by the Engineer.
 2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the contract drawings and specifications or as directed by the Engineer.
 3. Materials excessively wet or dry are unsuitable. Allow such material to dry, or moisten, to bring material within plus 3 percent of optimum moisture content range for specified compaction.
 4. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.
- C. Structural Fill: Structural fill shall be well graded sand to gravelly sand having the following gradation:

<u>U.S. Sieve Size</u>	<u>Percent Passing By Weight</u>
1 - inch	100
No. 4	75-100
No. 40	15-80
No. 100	0-30
No. 200	0-10

Any soil material which does not meet the above requirement must be classified either SW, SP, SM, or SC, according to the Unified Soil Classification System, and must be evaluated and approved for use by a Florida registered Professional Engineer with primary expertise in geotechnical engineering. The Engineer must state any additional construction requirements to be performed in order for the soil to perform the project design requirements as structural fill.

- D. Class I Soils¹: Manufactured angular, granular material, 1/4 to 1/2 inches (6 to 12 mm) in size, including materials having significance such as crushed stone or rock, broken coral, or crushed shells. Sieve analysis for crushed stone is given below separately.

1. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

<u>U.S. Sieve Size</u>	<u>Percent Passing By Weight</u>
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

- E. Class II Soils²:

1. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
3. SW: Well-graded sands and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
4. SP: Poorly graded sands and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

- F. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 – EXECUTION

3.01 FIELD QUALITY CONTROL

- A. The minimum frequency of quality control testing is as provided in these specifications or as set during construction by the County. Frequency of testing for field Quality Control shall be the same as defined for conformance testing.
- B. Sampling locations may be selected by the Engineer. If necessary, the location of routine in-place moisture content and dry density test shall be determined using a non-biased sampling plan.
- C. An increased testing frequency shall be used at the discretion of the Engineer when visual observations of construction performance indicate a potential problem.
- D. All perforations resulting from testing the subgrade or embankment shall be filled by the Contractor with soil compacted to the satisfaction of the Engineer.

¹ Soils defined as Class I soils are not defined in ASTM D2487.

² In accordance with ASTM D2487, less than 5 percent pass No. 200 sieve.

- E. If a defective area is discovered in the earthwork, the Engineer will determine the extent and nature of the defect and notify the Contractor. If the defect is indicated by an unsatisfactory test result, the Engineer shall determine the extent of the defective area by additional tests, observations, a review of record, or other means. The Contractor shall be responsible for the cost of these additional tests. If the defect is related to material, and/or adverse site conditions, such as overly wet soils or surface desiccation, the Engineer shall define the limits and nature of the defect.
- F. After determining the extent and nature of a defect, the Contractor shall correct the deficiency to the satisfaction of the Engineer. The cost of corrective actions shall be borne by the Contractor.
- G. Additional testing shall be performed to verify that the defect has been corrected before any additional work is performed by the Contractor in the area of the deficiency. The Contractor shall be responsible for the cost of these additional tests.

3.02 PROTECTION

- A. Sheeting and Bracing:
 - 1. Furnish, put in place, and maintain sheeting and bracing as required to support the sides of excavations, to prevent movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the County is of the opinion that sufficient or proper supports have not been provided, he may order additional supports be installed at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids beside the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the County.
 - 2. The Contractor shall construct sheeting outside the neat lines of the foundation unless deemed desired otherwise for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall withstand all pressure to which the structure or trench will be subjected. Any deformation shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.
 - 3. Where sheeting and bracing are required to support the sides of excavations for structures, the Contractor shall engage a Professional Geotechnical Engineer registered in the State of Florida to design the sheeting and bracing. The sheeting and bracing installed shall conform with the design, and certification of this shall be provided by the Professional Geotechnical Engineer.
 - 4. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.
 - 5. The Contractor shall leave in place to be embedded in the backfill, all sheeting and bracing not shown on the Drawings but which the County directs him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The County may direct that timber used for sheeting and bracing be cut off at any specified elevation.

6. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction, or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted for that purpose, or otherwise directed by the County.
7. The right of the County to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
8. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall submit to the Engineer for review a plan for dewatering systems prior to commencing work. The installed dewatering system shall be in conformity with the overall construction plan. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the bottom of the excavation and to preserve the integrity of adjacent structures.
3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
4. The Contractor shall take all additional precautions to prevent buoyant uplift of any structure during construction.
5. The conveying of dewatering liquids off site will not be allowed unless approval by the proper regulatory agencies is obtained. Dewatering liquids should be routed into the facility's stormwater management system, or other onsite storage area if approved by the County and Engineer. The Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the County.
6. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
7. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system shall be removed by the Contractor.
8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

3.03 EXCAVATION

A. Excavating for Landfill Soil Liner Subgrade, and Structures and Utilities:

1. Excavation work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms.
2. The landfill site shall be graded to drain as shown on the plans and will require the Contractor to excavate some portions of the site and to fill others. The Contractor shall provide a surveyor to determine excavation or fill required in the landfill area to meet the lines and grades presented on the plans.
3. Excavation shall be made to such dimensions as will give suitable room for bracing and supporting, for pumping and draining, and for all other work required.
 - a. Excavation for precast or prefabricated structures shall be carried to an elevation of 2 feet lower than the proposed outside bottom of the structure to provide space for the structural backfill material.
 - b. Excavation for structures constructed or cast-in-place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction.
4. Immediately document the location, elevation, size, material type, and function of all new subsurface installations and utilities encountered during the course of construction.
5. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the work.
6. Encounters with subsurface obstructions shall be hand excavated unless otherwise approved by County.
7. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of the proposed road and structures as a result of inadequate dewatering or other construction methods, shall be removed and replaced with Class I soils for pipes and structures, as required by the Engineer at the Contractor's expense. Placement and compaction of the replacement material shall conform to the requirements contained herein.
8. The bottom of excavations shall be rendered firm and dry before placing any soil, structure or pipe. Excavated material not suitable for backfill shall be removed from the work and stockpiled as directed by the County. The bedding schedule for pipes shall be as shown in Table 02220-B.
9. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.
10. All soil, structure and pipe locations and elevations as required herein must be permanently documented by the Contractor on the Record Drawings prior to the Engineer's approval of the Application for Payment for that work.
11. All pavements shall be cut prior to removal, with saws or approved power tools.
12. All trenches opened during the day shall be closed at the end of the workday or safely secured.

3.04 REFUSE SURFACE GRADING AND REFUSE EXCAVATION

- A. The topography shown on the Drawings was surveyed by County surveying staff on 2/11/2022. Before start of any waste excavations and initial grading for this project, the Contractor shall perform a special purpose survey of the disturbed area of the project site. The Contractor shall submit a Digital Terrain Model (DTM) format of the survey and calculated quantities to the Engineer to verify the Contractor's quantities.
- B. The Contractor shall allow for settlements during construction, compactions, and the thickness of the fill layers above the refuse for the final cover system. The Contractor is to move the refuse from the cut areas to the fill areas within the project limits or within the landfill boundary as designated by the County. The Contractor shall smooth the graded surface and remove any sharp points before the placement of leveling course fill layer.
- C. The Contractor shall sequence refuse surface grading and refuse excavation operations so that large excavated areas would not stay open and unprotected against rain storms and washouts. The Contractor shall protect the refuse grading areas and shall not leave solid waste exposed overnight per the County's Operation Plan. The Contractor shall coordinate transporting and placement of excess solid waste in the Class I landfill with the County.
- D. It is advised that excavation may encounter materials normally disposed in Class I landfill, however, other waste such as concrete debris, trees, and stumps could be encountered during excavation. The Contractor shall be responsible to complete all excavations necessary for this project regardless of the type, nature, or condition of materials encountered. The Contractor shall perform excavations of every type of material encountered and remove all excess materials within the limits of the project, to the lines, grades and elevations shown, required, or as specified.
- E. After grading, the refuse surface shall be compacted with at least three passes using the Contractor's heavy equipment. All compaction shall be conducted parallel to the slope from the toe of the slope.
- F. Excavation for minor reconstructing of ditches and channels shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. All waste materials in the sides and bottom of ditches and channels shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate the ditches below the grades shown. Excess open ditch excavation shall be backfilled with granular fill to existing grade at Contractor's sole expense.
- G. Excavation shall be made to the grades on the Drawings and to such widths as will give suitable room for construction of the structures, for bracing and supporting, pumping and draining. The bottom of the excavations shall be rendered firm and dry and in all respects acceptable to the Engineer.
- H. Any underlying lines, conduits, evidence of previous work, or natural condition discovered during the excavation that may affect the integrity of any foundation shall immediately be brought to the attention of the Engineer.
- I. An imaginary 45-degree line extending downward and outward from the bottom corner of any existing foundation shall not intercept any intended excavation for adjacent foundations or utilities, unless authorized by the Engineer.

3.05 DRAINAGE

- A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed liner subgrade foundation condition or structure subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.
- B. All water pumped or drained from the excavated area shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.
- C. No construction, including pipe laying, shall be allowed in water. Groundwater shall be maintained at least 12 inches below excavation except in borrow areas. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.
- D. The Contractor will be required at his expense to excavate below grade and refill with approved fill material if the County determines that adequate drainage has not been provided.

3.06 UNDERCUT

- A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due to the Contractor's excavation methods, refill to normal grade with fill at Contractor's cost. Fill material and compaction method shall be as directed by the Engineer.

3.07 STABILIZATION

- A. Subgrades for structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact.
- B. Subgrades for structures or trench bottoms which are otherwise solid, but which become mucky on top due to construction operations, shall be reinforced with one or more layers of crushed rock or gravel. Not more than 1/2-inch depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon. The finished elevation of stabilized subgrades for structures shall not be above subgrade elevations shown on the Drawings.
- C. All stabilization work shall be performed by and at the expense of the Contractor.

3.08 FILL AND COMPACTION

- A. Materials:
 - 1. To the maximum extent available, excess earth obtained from subgrade, structure, and trench excavation shall be used for the construction of fills and embankments.
 - 2. Materials used as backfill shall be free from rocks or stones larger than 2 inches in their greatest dimension; brush, stumps, logs, roots, debris, and organic or other deleterious materials; and must be acceptable to the Engineer.

B. Placement and Compaction:

1. Degree of compaction: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in AASHTO T180. Field verification will be obtained by the test procedure presented in AASHTO T191. The term "maximum density" shall mean the maximum density determined under AASHTO T180.
2. Backfill materials shall be placed in approximately horizontal layers not to exceed 8 inches in uncompacted thickness. Material deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled before compaction.
3. Each layer of material being compacted shall have the best practicable uniform moisture content to ensure satisfactory compaction. The Contractor will be required to add water and harrow, disc, blade, or otherwise work the material in each layer to ensure uniform moisture content and adequate compaction. Each layer shall be thoroughly compacted by rolling or other method acceptable to the Engineer to the percent of maximum density at optimum moisture content as described in Table 02220-A and as determined by AASHTO T180, (latest).
4. Whenever a trench passes through a backfill or embankment, material shall be placed and compacted to an elevation 12 inches above the top of the pipe before the trench is excavated.

C. Compact and backfill excavations and construct embankments according to the schedule listed in Table 02220-A. Backfill schedule for pipes is listed in Table 02220-B. (AASHTO T180, (latest)).

D. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

E. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.

Table 02220-A
COMPACTION AND BACKFILL SCHEDULE

Area	Material	Compaction
Perimeter road berms embankments, containment berms, and drainage conveyance berms not over the liner system	Common Fill (Para. 2.01 B)	8 inch lifts, compacted to 95% relative compaction. Fill should not be placed over any in-placed soils until those layers have been compacted to 95% relative compaction.
Beneath all structures, and foundations (minimum 2-foot depth)	Structural Fill (Para. 2.01 C)	8 inch lifts, compacted to 95% relative compaction. Fill should not be placed over any in-placed soils until those layers have been compacted to 95% relative compaction.
Beneath pavements not over liner system (minimum 2-foot depth and minimum distance of 2 feet outside the edge of pavement)	Structural Fill (Para. 2.01 C)	8 inch lifts, compacted to 98% relative compaction. Fill should not be placed over any in-placed soils until those layers have been compacted to 98% relative compaction.
Liner Subgrade/Leveling Course	Protective Cover Soil (Para. 2.01 G)	<u>12-inch lifts, compacted to 90% Standard Proctor on slopes less than 6:1. On slopes steeper than 6:1, place in 12-inch lifts to 90% Standard Proctor.</u>
Protective Cover Soil	Protective Cover Soil (Para. 2.01 G)	<u>Compacted to 90% Standard Proctor on slopes less than 6:1. On slopes steeper than 6:1, place in 12-inch lifts to 90% Standard Proctor.</u>
From cleared existing surface to subgrade for paved and gravel roadway surfaces	Common Fill (Para. 2.01 B)	12-inch lifts, compacted to 95% relative compaction.
Disturbed area requiring seeding and mulching	Topsoil	See Section 02922.
Landfill Mound	Solid Waste (Para. 2.01 H)	<u>12-inch lifts, compacted to 90% Standard Proctor on slopes less than 6:1. On slopes steeper than 6:1, place in 12-inch lifts to 90% Standard Proctor.</u>

Table 02220-B

**BACKFILL SCHEDULE FOR GRAVITY
AND PRESSURE PIPING (Non-Perforated)**

Pipe <u>Material</u>	Pipe <u>Size</u>	Trench <u>Condition</u>	Bedding <u>Material</u>	PIPE ENVELOPE		<u>Material</u>	<u>Depth</u>	<u>Others</u>
				PRIMARY ZONE				
HDPE, PVC and other Plastic Pipe	>□6"	Normal ^a	Class II or Common Fill	Class II or Common Fill	0.7 O.D.	Class II or Common Fill	0.3 O.D.+12"	
		Special ^b	Class I	Class II or Common Fill	0.7 O.D.	Class II or Common Fill	0.3 O.D.+12"	
R.C.P.	<48"	Normal ^a	Class II or Common Fill	Class II or Common Fill	0.5 O.D.	Common Fill	-	
		Special ^b	Class I	Class II or Common Fill	0.5 O.D.	Common Fill	-	

^a Dry soils.

^b Saturated soils.

^c Outside Diameter of pipe = O.D.

Notes:

1. No special bedding shall be required in case of suitable undisturbed earth type trench bottom.
2. Bedding thickness shall be 12 inches unless specified otherwise.
3. The backfill shall be placed and compacted in 6-inch lifts for pipe envelope and in 12-inch lifts from secondary zone to grade. Common fill shall be used as final backfill material.
4. It is intended that additional excavation be conducted to remove unsuitable material below bedding level which prevents bedding compaction as required herein and replaces such materials with suitable materials. Over excavation, geotextile fabric, gravel blanket, granular fill and other acceptable stabilization method shall be placed within 4 feet of the bedding level or within 10 feet of the existing ground (whichever is greater depth) at no additional cost to the County. Construction required beyond these limits shall be executed in accordance with the General Conditions. When indicated on the Drawings, the Contractor shall remove unsuitable material below bedding level to the limits indicated and replace with coarse sand or other acceptable stabilization method up to the bedding level without any additional cost to the County.

- F. Embankments shall be constructed true to lines, grades, and cross sections shown on the plans or ordered by the County. Embankments shall be placed in successive layers of not more than 12 inches in thickness, loose measure, for the full width of the embankment. As far as practicable, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.
- G. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to the Engineer. Approval will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The Engineer's approval will be in writing.
- H. Foundation Preparation
 - 1. Backfilled areas shall be compacted in 8-inch layers to a density of not less than the percent of Modified Proctor maximum dry density as described in Table 02220-A for a depth of not less than 2-feet below the bottom of the foundations or concrete slabs to be not less than that depth indicated in Table 02220-A. Any unsuitable foundation material shall be removed and replaced with suitable material.
 - 2. Slabs On Grade: Subgrades for concrete slabs shall be removed, backfilled, and compacted to the required grade. The top 2-feet of concrete slab subgrade in cut sections and all fill material shall be compacted in 8-inch layers to a density of not less than the percent of Modified Proctor maximum dry density as described in Table 02220-A.

3.09 TRENCH EXCAVATION

- A. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. Four hundred (400) feet shall be the maximum length of open trench on any line under construction. All trench excavation shall be open cut from the surface.
 - 1. Alignment, Grade, and Minimum Cover: The alignment and grade or elevation of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.
 - 2. Where pipe grades or elevations are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe of 42 inches where in paved or graded streets where surface grades are definitely established and 36 inches in other locations. Greater pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation.
- B. Limiting Trench Widths:
 - 1. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment. However, minimum permissible sidewall clearances between the installed pipe and each trench wall, expressed in inches, shall be as follows:

<u>Pipe Size</u>	<u>Minimum Sidewall Clearance</u>
60	24
54	21
48	19
36 or smaller	12

2. Stipulated minimum sidewall clearances are not minimum average clearances but are minimum clear distances which will be required.
3. Cutting trench banks on slopes to reduce earth load to prevent sliding and caving will be permitted only in areas where the increased trench width will not interface with surface features or encroach on right-of-way limits. Slopes shall not extend lower than 1 foot above the top of the pipe.

C. Mechanical Excavation:

1. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, and other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.
2. Mechanical equipment used for trench excavation shall be of the type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, that uniform trench widths and vertical sidewalls are obtained at least from an elevation one foot above the top of the installed pipe to the bottom of the trench, and that trench alignment is such that pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

D. Pavement Cutting:

1. Cuts in concrete pavement, asphalt pavement, and asphalt base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with asphalt or concrete saw in a manner which will provide a clean groove for the full depth of pavement along each side of the trench and along the perimeter of cuts for structures.
2. Asphalt pavement and asphalt base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the centerline of the trench.
3. Pavement removed for connections to existing lines or structures shall not be greater than necessary for the installation as determined by the Engineer.

E. Artificial Foundations in Trenches: Whenever so ordered by the Engineer, the Contractor shall excavate to such depth below grade as the Engineer may direct and the trench bottom shall be brought to grade with such material as the Engineer may order installed. All piling, concrete, or other foundations made necessary by unstable soil shall be installed as directed by the Engineer. Compensation for extra excavation and piling, concrete, or other foundations, except where provided by contract unit prices, shall be made in accordance with the contract provisions for extra work.

- F. Bell Holes: Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

3.10 TESTS

- A. All tests required for preliminary review of materials shall be made by the County. Moisture-density (Proctor) tests and relative in place density tests on the materials, and all in-place field density tests, shall be made at the expense of the County.
- B. The frequency for testing the density of placed material will be at a minimum rate of two tests per acre per lift, or as necessary.
- C. Re-tests for failures will be at the cost of the Contractor.

3.11 DRAINAGE MAINTENANCE

- A. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or water courses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the trafficway to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other water courses crossed by the line of trench shall be removed immediately after backfilling is completed and the original sections, grades, and contours of ditches or water courses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3.12 FINAL GRADING

- A. After other outside work has been finished and backfilling completed and settled, all areas on the site of the work which are to be graded shall be brought to grade with the tolerance of ± 0.1 feet at the indicated elevations, slopes, and contours where seeding or sodding is not required or, where sodding is required within 2 inches of finished grade. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to hand work. All surfaces shall be graded to secure effective drainage. Unless otherwise shown, a slope of at least one percent shall be provided.
- B. Grading and surfacing shall be completed to the satisfaction of the Engineer.

3.13 EXCESS EXCAVATED MATERIALS

- A. Insofar as needed, suitable excavated materials shall be used in fills and embankments shown on the Drawings. All suitable excess excavated material shall be placed outside the limits of construction, in an area approved by the County.
- B. The Contractor shall segregate different types of excavated materials (i.e., sands, clayey sands, clay) in the stockpile area. All debris, junk (such as broken pipe, or other discarded construction material), stones, logs, stumps, roots, and other unsuitable materials may be disposed of by the Contractor in the landfill, if approved by the County.
- C. The Contractor shall slope and compact the stockpile with a light roller type vehicle to maintain stability.
- D. The Contractor shall maintain proper soil and erosion control measures.

3.14 SETTLEMENT

- A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.
- B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or County.

END OF SECTION

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