SECTION 02120
VIDEO TAPING

PART 1 – GENERAL

1.01 SCOPE

A. The work covered by this section consists of furnishing all labor, equipment, and material required to provide a video tape record of all easement areas before construction begins in each area. One copy of the video tape(s) shall be presented to the Owner for their records.

B. The purpose of the video tape(s) is to aid the Owner in determining the extent of construction damage to property in easement areas.

PART 2 – PRODUCTS

2.01 VIDEO TAPE

A. The video tape shall be a standard VHS video cassette similar or equal to those produced by Sony, Fuji, or Scotchbrand.

PART 3 – EXECUTION

A. Contractor shall use a quality video camera with sound available. The camera must have zoom capabilities, date record, and produce a clear, concise color picture of the easement area.

B. Before construction begins, Contractor shall video record each easement by walking along the sewer alignment, recording all topographic features (i.e. trees, sheds, gardens, pools, fences, shrubs, buildings, walls, etc.) on line and also to the left and right of the centerline. The limits shall be determined by the Contractor and the Engineer as the area estimated to be disturbed by the construction.

C. Contractor shall add sound to the video tape by denoting the line number, date and time, and stations at manholes or names and addresses or property owners.

D. Contractor shall especially record and denote areas of existing damage prior to the construction (i.e. existing cracks in walls).

END OF SECTION

SECTION 02220
EARTHWORK

PART 1 - GENERAL

1.01 SCOPE

A. This specification section includes earthwork and related operations, including, but not limited to, clearing and grubbing the construction site, dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation, and disposal of all excavated and unsuitable material, construction of fills and embankments, backfilling around structures and pipe, backfilling all trenches and pits, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading, and any other similar, incidental, or appurtenant earthwork operation which may be necessary to properly complete the work.

B. The Contractor shall provide all services, labor, materials and equipment required for all earthwork and related operations necessary or convenient to the Contractor for furnishing a complete work as shown on the Drawings or specified in these Contract Documents.

1.02 GENERAL

A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonable, accurate information about the existing elevations. They are not precise, and the Contractor should satisfy himself as to the exact quantities of excavation and fill required.

B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.

C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained by the Contractor in good condition at all times until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.

D. If soil borings are available for the area of this work, they will be on file at the Owner's address where they will be made available for review. This information is made available to the Contractor for such use as he may choose to make of it in the preparation of his Bid, but the Owner gives no guarantee, either expressed or implied, that it represents a true or complete cross-section of all of the material to be encountered performing the excavation and earthwork on this project.

E. Earthwork within the rights-of-way of the State Department of Transportation, the County Road Department, and the City shall be done in accordance with requirements and provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these Specifications.

F. The Contractor shall control grading in a manner to prevent water running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Material for backfill or for protection of excavation in public roads from surface drainage shall be neatly placed and kept shaped so as to cause the least possible interference with public travel. Free access must be provided to all fire hydrants, watergates, meters, and private drives.

G. No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof.

H. Tests for compaction and density shall be conducted by the Engineer or by an independent testing laboratory selected by him. Costs of compaction tests performed by an independent testing laboratory shall be paid for directly by the Owner and not as a part of this Contract. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests. The cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents shall be paid by the Contractor.

I. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles Mechanized Equipment, and Marine Operations, and shall be conducted in a manner acceptable to the Engineer.

J. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and flood plains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. The Contractor shall be responsible for providing all services, labor, equipment, and materials necessary or convenient to him for completing the work within the time specified in these Contract Documents.

PART 2 - EXECUTION

2.01 INITIAL SITE PREPARATION

A. Preparatory to beginning of construction operations, the Contractor shall remove from the site all vegetative growth, trees, brush, stumps, roots, debris, and any of other objectionable matter, including fences, buildings, and other structures shown on the Drawings in the construction areas which are designated for removal or which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or would form obstructions therein.

B. Stumps and roots shall be grubbed and removed to a depth noT less than 5 feet below grade. All holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with compacted layers of crushed rock or earth backfill conforming to the requirements specified here for backfill. Organic material from clearing operations shall not be incorporated in excavation backfill or embankment material.

C. The Contractor shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, buildings, and other structures which are located in the construction area but not within designated clearing limits as shown on the Drawings or within the limits of embankments, excavations, or proposed structures. The Contractor shall be responsible for the repair and/or replacement of any of the aforementioned items damaged by his operation or construction activities.

D. The Contractor shall remove and dispose of all excess material resulting from clearing or site preparation operations. The Contractor shall dispose of such materials in a manner acceptable to the Engineer and at an approved location where such materials can be lawfully disposed.

2.02 DEWATERING

A. The Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. Dewatering shall be accomplished by methods which will ensure a dryexcavation and preservation of the final lines and grades of the bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches provided such ditches are kept open and free-draining at all times. The actual dewatering methods used shall be acceptable to the Engineer.

B. Unless specifically authorized by the Engineer, no concrete or mortar shall be placed in water nor shall water be allowed to rise over newly-placed concrete or mortar for at least 24 hours after placement. No concrete structure shall be exposed to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Water shall not be allowed to rise above bedding during pipe laying operations. The Contractor shall exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Dewatering operations shall commence when ground or surface water is first encountered and shall be continuous until such times as water can safely be allowed to rise in accordance with the provisions of this section. Excavations shall be protected from the entrance of surface water to the extent possible by the use of dikes and/or covers.

C. Standby pumping equipment shall be on the job site. A minimum of one standby unit (a minimum of one for each ten in the event well points are used) shall be available for immediate installation should any pumping unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the work. Drawings or diagrams on proposed well point or deep well dewatering systems shall be submitted to the Engineer for review.

D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with crushed rock at no cost to the Owner.

E. The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property. Conveyance of the water shall be such as to not interfere with traffic flow or treatment facilities operation. No water shall be drained into work built or under construction without prior consent of the Engineer. The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

F. Sedimentation and desilting basins shall be provided as necessary or when directed by the Engineer to prevent the entrance of excessive or injurious amounts of sand and silt from surface runoff or dewatering operations into storm drains or receiving waters. The system used for desanding or desilting the water shall be a baffled structure and shall provide not less han five minutes detention time and shall be designed to have a "flow-through" velocity not exceeding 0.2 feet per second at the anticipated peak flow. The method of desanding or desilting and the point of disposal shall be subject to the approval of the Engineer.

G. Water shall be disposed of in such a manner as not to be a menace to the public health and in accordance with applicable Environmental Protection Agency, Corps of Engineers, and State Water Quality Control Division standards and permits, and the Storm Water Division of the Department of Public Works, City of Chattanooga, Tennessee.

2.03 SHEETING, SHORING, AND BRACING

A. The sides of all excavations shall be sufficiently sheeted, shored, and braced as necessary to prevent slides, cave-ins, settlement or movement of the banks, to maintain the excavation clear of all obstructions, and to provide safe working conditions. Wood or steel sheeting of approved design and type shall be used in wet, saturated or flowing ground. All sheeting, shoring, and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and to maintain shape and position under all circumstances.

B. The responsibility for correctly assessing the need for sheeting and analyzing the stresses induced shall be the total responsibility of the Contractor. Since the Engineer does not dictate or determine the Contractor's sequence or limits of excavation, the Engineer assumes no responsibility for sheeting and shoring. The Contractor must employ or otherwise provide for adequate professional structural and geotechnical engineering supervision to assess the need for sheeting and shoring and design same. Results of sheeting and shoring analysis and design shall be submitted to the Engineer on request.

C. Excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys shall be sheeted, shored, and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition. Any damage to structures or pavements occurring through settlements, water or earth pressures, slides, caves, or other causes; due to failure or lack of sheeting or bracing, or due to improper bracing; or occurring through negligence or fault of the Contractor in any other manner shall be repaired by the Contractor at his own expense.

D. Sheeting, shoring, or bracing materials shall not be left in place unless otherwise specified or shown on the Drawings or ordered by the Engineer in writing. Such materials shall be removed in such manner that no danger or damage will occur to new or existing structures or property, public or private, and so that cave-ins or slides will not take place. Trench sheeting shall be left in place until backfill has been brought to a level 12 inches above the top of the pipe. It shall then be cut off and the upper portion removed. Sheeting for structures shall be left in place until backfill has been brought to a level of 12 inches above the top of the bottom footing. It shall then be cut off and the upper portion removed.

E. All holes and voids left in the work by the removal of sheeting, shoring, or bracing shall be filled and thoroughly compacted.

2.04 EXCAVATION

A. GENERAL

1. Excavation shall include the removal of all material from an area necessary for the construction of a pipeline, structure, basin, flume, or building. Excavations shall provide adequate working space and clearances for the work to be performed therein.

2. Except where otherwise shown on the Drawings, specified herein, or authorized by the Engineer, all material excavated below the bottom of concrete walls, footings, and foundations shall be replaced, by and at the expense of the Contractor, with Class B Concrete to the lines and grades shown on the Drawings.

3. Where quicksand, soft clay, spongy, swampy, or other materials unsuitable or subgrade or foundation purposes are encountered below the excavation limits, they shall be removed and disposed of to the level of suitable material. Areas so excavated shall be backfilled with Class B Concrete or with compacted layers of crushed rock, sand, or other approved material conforming to the requirements specified herein for backfill to the lines and grades shown on the Drawings.

4. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrian and vehicular traffic of such excavations. Lights shall also be placed along excavations from sunset each day to sunrise of the next day until the excavations are backfilled. All excavations shall be barricaded in such a manner to prevent persons from falling or walking into any excavation.

B. ROCK EXCAVATION

1. Rock encountered in the process of excavation for structures shall be uncovered and stripped of all loose materials over the entire limits of excavation. Rock encountered for removal in a trench section shall be uncovered for a distance of not less than 50 feet.

2. Rock and large boulders in trenches shall be excavated over the horizontal limits of excavation and to depths as shown on the Drawings.

3. The space below grade for pipe lines shall then be backfilled to the proper grade with compacted layers of crushed rock or sand conforming to the

requirements specified herein for backfill. Where pipe sewers are constructed on concrete cradles, rock shall be excavated to the bottom of the cradle as shown on the Drawings.

4. Rock under structures shall be excavated to lines and grades shown on the Drawings. Unless specified otherwise, where rock excavation has been carried below grade, the contractor shall backfill to grade with Class B concrete at his own expense.

5. Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, the portion of the foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class B Concrete.

6. Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of 12 inches below grade and the space below grade shall be backfilled to the proper grade with compacted layers of crushed rock conforming to the requirements specified herein for backfill.

7. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws and regulations governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired to the satisfaction of the Owner by the Contractor at his own expense.

8. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before the construction of any structure is started in the vicinity.

C. BORROW EXCAVATION

1. Wherever the backfill of excavated areas or the placement of embankments or other fills requires specified material not available at the site or material in excess of suitable material available from the authorized excavations, such material shall be obtained from other sources. This may require the opening of borrow pits at points not immediately accessible from the work. In such cases the Contractor shall make suitable arrangements with the property owner and shall pay all costs incident to the borrowed material including royalties, if any, for the use of the material. Before a borrow pit is opened, the quality and suitability of the material to be obtained there from shall be approved by the Engineer.

2. Borrow pits shall be cleared, grubbed and finish graded in accordance with the requirements specified herein.

D. ROADWAY EXCAVATION

Roadway excavation shall consist of excavation for roadways and parking areas in conformity with lines, grades, cross sections, and dimensions shown on the Drawings. After shaping to line, grade, and cross section, the subgrade shall be rolled until compacted to a depth of at least 6 inches to 100 percent of the maximum density at optimum water content as determined by AASHTO T 99, Method A. This operation shall include any reshaping and wetting required to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.

E. TRENCH EXCAVATION

1. Trench excavation shall consist of the removal of materials necessary for the construction of water, sewer, and other pipelines and all appurtenant facilities including manholes, inlets, outlets, headwalls, collars, concrete saddles, piers and pipe protection called for on the Drawings.

2. Excavation for pipelines shall be made in open cut unless shown otherwise on the drawings. Trenches shall be cut true to the lines and grades shown on the Drawings or established by the Engineer on the ground. The banks of trenches shall be cut in vertical, parallel planes equidistant from the pipe centerline. From an elevation 12 inches above the top of the pipe to the bottom of the trench, the horizontal distance between vertical planes for different sizes of pipe shall not exceed those shown on the Drawings. When sheeting is used, the width of the trench shall be considered as the distance between the inside faces of the sheeting. The bottom of the trench shall be cut carefully to the required grade of the pipe except where bedding materials or cradles are shown, in which case the excavation shall extend to the bottom of the bedding or cradles as shown on the Drawings. Minimum pipe cover shall be as shown on the Drawings or specified in these Contract Documents.

3. The use of a motor-powered trenching machine will be permitted but full responsibility for the preservation, replacement, and/or repair of damage to any existing utility services and private property shall rest with the Contractor.

4. Bell holes for bell and spigot pipe and/or mechanical joint pipe shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of all joints in the pipe. Bell holes shall not be excavated more than 10joints ahead of pipe laying. 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.

5. Excavation for manholes, outlets, collars, saddles, piers, and other pipeline structures shall conform to the additional requirements specified herein for structural excavation.

6. Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.

7. Unless otherwise specified herein or shown on the Drawings, wherever pipe trenches are excavated below the elevation shown on the Drawings, the Contractor, at his own expense, shall fill the void thus made to the proper grade with Class B Concrete or with compacted layers of crushed rock or sand conforming to the requirements specified herein for backfill.

8. In all cases where materials are deposited along open trenches they shall be placed so that no damage will result to the work and/or adjacent property in case of rain or other surface wash.

F. STRUCTURAL EXCAVATION

1. Structural excavation shall consist of the removal of all materials necessary for the construction of structures, including tanks, foundations, footings, wetwells, dry wells, box culverts, flumes, channels, buildings, and other miscellaneous structures.

2. The bottom of structural excavations shall be true to the lines and grades shown on the Drawings. Faces of excavations shall not be undercut for extended footings.

Except as provided herein for excavation of unsuitable material or rock, where the excavation is carried below the grade elevation shown on the Drawings, the Contractor shall backfill the void thus made to the proper grade with Class B concrete at his own expense.

2.05 BACKFILLING

A. MATERIALS

Materials for backfilling shall conform to the following requirements:

1. SELECT EARTH BACKFILL

   Fine, sound, loose earth containing optimum moisture content for compaction to 90 percent of maximum density, free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete less than 2 inches in maximum dimension except that the maximum particle size shall be 3/4 inch when used with PVC, other flexible thermoplastic pipe, or extremely brittle pipe.

2. COMMON EARTH BACKFILL

   Sound, loose earth containing optimum moisture content for compaction to 90 percent of maximum density, free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete and pavement less than 6 inches in maximum dimension. Such backfill shall be placed a minimum of one foot above top of pipe.

3. SAND

   Natural or imported sand conforming to ASTM D1073.

4. CRUSHED ROCK

   Crushed rock conforming to Class A aggregate as specified in Section 903.05 and Section 903.22, Size 7 of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction.

5. CLASS B CONCRETE

   Class B concrete as specified in the Section entitled "Cast-In-Place Concrete" of these Specifications.

B. GENERAL

1. Unless otherwise specified herein, earth backfill shall be compacted to not less than 90 percent of the maximum density at optimum water content as determined by AASHTO T-99, Method A. Crushed stone and sand shall be compacted or consolidated to not less than 83 percent of the solid volume density as determined from the bulk specific gravity by AASHTO T-84 AND T-85 and the dry weight of the aggregate.

2. Material that is too dry for adequate compaction shall receive a prior admix of sufficient water to secure optimum moisture content. Material having excessive water content shall not be placed at any time.

3. Unless otherwise specified herein backfill material required to be compacted shall be placed in horizontal layers not to exceed 6 inches in thickness (before compaction) and compacted in place by ramming, tamping, or rolling. Compaction shall be accomplished by power driven tools and machinery wherever possible. Compaction and consolidation of sand and crushed rock backfill shall be accomplished using vibrating equipment in a manner acceptable to the Engineer.

C. BACKFILLING TRENCHES

1. The backfilling of sewer, water, and other pipeline trenches shall be started immediately after the construction of same has been inspected and approved by the Engineer. Select backfill or bedding material if specified shall be placed in the trench under and on each side of the pipe in 6-inch layers for the full width of the trench and thoroughly and uniformly compacted by ramming and/or tamping to a minimum of 90% of the maximum density determined as specified herein. Select earth backfilling shall start above the class of pipe bedding as specified or shown the Drawings. Sufficient select earth backfill shall be placed around the pipe and compacted to provide a cover of not less than 12 inches over the top of the pipe. Mechanical compactors or tampers shall not be used within 12 inches of pipe. Compaction in this area shall be accomplished by hand methods. Sand or specified crushed stone bedding material shall be substituted for select earth backfill when the pipe is bituminous coated steel pipe or wrapped steel pipe or when crushed stone trench backfill is required. Backfilling shall proceed simultaneously on both sides of the pipe to prevent lateral displacement.

2. Caution shall be used during backfill operations for PVC or other flexible thermoplastic pipe (non-pressure or sewer pipe) to prevent pipe deformation. PVC or other flexible thermoplastic pipe (sewer pipe) shall not be subjected to roller or wheel loads until a minimum of 36 inches of backfill has been placed over the top of the pipe and a hydrohammer shall NOT be used until a minimum depth of 48 inches backfill has been placed over the top of the pipe.

3. Backfilling of PVC pressure pipe or other flexible thermoplastic pipe (water pipe) shall be as described in Paragraph 1 above.

4. In streets, alleys, across sidewalks and driveways, paved areas, and at any other places subject to vehicular traffic

or other superimposed loads, crushed rock backfill shall be placed and compacted in 6-inch layers from the level of 12 inches above the top of the pipe upward for the full depth of the trench, except for the top 48 inches of backfill, which shall be compacted pugmill mix. Crushed rock shall be clean, uniform-sized stone placed in lifts of 6 inches maximum and compacted by use of a hydrohammer or approved vibratory compactor for the full depth of the trench, except for the top 48 inches of crushed rock backfill, which shall be compacted pugmill mix.

5. Trenches under concrete slabs and footings of structures shall be completely backfilled with compacted sand or crushed rock or filled with Class B concrete as shown on the Drawings.

6. In all other areas not affected by superimposed loads, common earth backfill may be placed from a level of 12 inches above the top of pipe upward for the full depth of the trench without compaction. At these places, backfill shall be neatly rounded over the trench to sufficient height to allow for settlement to grade after consolidation. In no event, however, will storm water be allowed to pond due to the backfilled trench.

7. All backfilling shall be done in such a manner that the pipe or structure over or against which it is being placed will not be disturbed or injured. Any pipe or structure injured, damaged, or moved from its proper line or grade during backfilling operations shall be removed and repaired to the satisfaction of the Engineer and then rebackfilled.

D. BACKFILLING AROUND STRUCTURES

1. Backfilling around structures shall consist of common earth backfill placed in 6-inch layers and compacted by tamping to a minimum of 90% of the maximum density determined as specified herein for the full depth of the excavation from the bottom to the finished grade. No backfill shall be placed against concrete structures until the concrete has reached its specified 28-day compressive strength. Where practical, compaction of structural backfill shall be accomplished by power-driven tamping equipment.

2. Where crushed rock mats under slabs and foundations are called for on the Drawings, the Contractor shall excavate below grade to the depth of the crushed rock mat as shown on the Drawings and shall install a compacted crushed rock bed. This shall be finished to a true line or plane and even with the subgrade of

the concrete foundations, piers, footings or slabs. Before placing any crushed rock, all loose earth or debris shall be removed. This crushed rock mat shall extend 12 inches beyond all slabs and foundations or to edges of sheet piling.

3. Crushed rock mats, 12 inches or less in thickness shall be constructed of compacted layers of crushed rock conforming to Section 903.22, Size Number 67 (3/4-inch to No. 4), of the Tennessee Department of Transportation, Standard Specifications for Road and Bridge Construction.

4. Crushed rock mats of thickness greater than 12 inches shall have the top 12 inches constructed of compacted layers of crushed rock as specified above. That portion below the top 12 inches shall be constructed of compacted layers of crushed rock conforming to Section 903.05, Class A, with a modified gradation of 6 inches to dust as received from the crusher.

5. Unless otherwise shown on the Drawings, the use of earth backfill to support footings, foundations, and structures shall not be permitted.

2.06 FILLS AND EMBANKMENTS

A. Fills and embankments shall consist of all earth fills except backfills in trenches or around structures. Unless special material is specified or shown on the Drawings, material for fills and embankments shall consist of excavated material from structures or of a mixture of such excavated materials and materials borrowed from other sources by the Contractor. All material used for fills and embankments shall be free from wood, vegetable matter, debris, soft or spongy earth or clay, large rock, or other objectionable material and shall be acceptable to the Engineer.

B. Material shall be placed in the fill or embankment in successive layers 6 inches or less in thickness before compaction, each layer being approximately horizontal and extending to the full limit of the required cross section and shall be compacted at optimum water content over the entire surface to not less than 95% of the maximum density as determined by AASHTO T-99, Method A. The process shall be repeated for each layer of material until the fill or embankment conforms to the plan lines, grades, and cross-sections. The degree of compaction and moisture content required, the method of tamping, and the equipment used shall be approved by the Engineer.

C. The area over which the fill or embankment is to be constructed shall first be cleared of all vegetation, debris, and other objectionable material and, if the ground is in a loose, uncompacted condition, it shall be compacted to a maximum density determined as specified herein.

D. No material shall be placed beyond the sloping lines of embankment unless so ordered by the Engineer. Material allowed to be placed beyond the lines of embankment shown on the Drawings will be compacted as required above unless otherwise authorized by the Engineer.

E. Material for embankments or roadway fills shall be placed in 6-inch maximum lifts and shall be compacted by rolling with power rollers weighing not less than 10 tons, with sheeps foot rollers, with vibrating rollers, or with pneumatic tire rollers, as required to accomplish the work. While and as each layer is deposited, water shall be applied in sufficient amount to ensure optimum moisture to secure the compaction specified.

F. The use of truck, carryalls, scrapers, tractors, or other heavy hauling equipment shall not be considered as rolling in lieu of rollers, but the traffic of such hauling equipment shall be distributed over the fill in such a manner as to make the use of the compaction afforded thereby as an addition to compaction by the use of rollers.

G. Wherever a trench passes through a fill or embankment, the fill or embankment material shall be placed and compacted to an elevation 12 inches above the top of the pipe before the excavation of the trench begins.

H. On subgrades for all roadbeds, the density for the top 6 inches of the finished subgrade shall be equal to not less than 100% of the maximum density as determine by AASHTO T-99, Method A. When field tests show failure to meet the density requirement, the subgrade shall be loosened by disking, harrowing or other approved methods to a depth of not less than 6 inches, then reshaped and recompacted as indicated in this paragraph.

2.07 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

A. All materials removed by excavation, which are suitable for the purpose, shall be used to the extent possible for backfilling pipe trenches, foundation, and footings and for making embankment fills or for such other purposes as may be shown on the Drawings. All materials not used for such purposes shall be considered as waste materials and the disposal thereof shall be made by the Contractor in a manner and at locations subject to the approval of the Engineer.

B. Waste materials shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with sufficient and adequate openings to permit surface drainage of adjacent lands.

C. Unsuitable materials, consisting of wood, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material so designated by the Engineer shall be removed from the work site and disposed of by the Contractor in a

manner and at a location approved by the Engineer.

D. No unsuitable or waste material shall be dumped on private property unless written permission is furnished by the Owner of the property and unless a dumping permit is issued from the local jurisdiction.

2.08 FINAL GRADING

A. After other earthwork operations have been completed, the sites of all structures, roads, and embankments shall be graded within the limits and to the elevations shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond the required limits. The finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from the use of hand tools. If the Contractor is able to obtain the required degree of evenness by means of mechanical equipment he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished to slopes shown on the Drawings unless otherwise approved by the Engineer.

B. Unless otherwise specified or shown on the Drawings, all finished ground surfaces shall be graded and dressed to present a surface varying not more than plus or minus 0.10 foot as regards local humps or depressions and shall be acceptable to the Engineer.

2.09 TOPSOIL

A. All areas to be sprigged or planted with trees, shrubs, or grass as shown on the plans shall be prepared by grading to a smooth, even surface to a level 4 inches or other specified depth below the elevation of the finished grade shown on the Drawings. It shall then be brought to a neat and finished grade by the addition of 4 inches or other specified depth of approved topsoil as specified or directed in Section 02485.

B. Topsoil removed from the construction area may be stockpiled and reused or topsoil may be obtained from approved borrow areas. If obtained from borrow areas, the Contractor shall make suitable arrangements with the property owner and shall pay all costs incident to the borrowed material including royalties.

2.10 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within one (1) year after final acceptance of the work by the Owner.

B. The Contractor shall make, or cause to be made, all repairs or replacement made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

2.11 PREVENTION OF BLASTING DAMAGE

A. GENERAL

The Contractor shall be responsible for all property damage and personal injury caused by blasting for excavation work on this project. This includes events in which flying debris, air blast, or ground vibrations cause personal injury or property damage.

B. PREVENTING DAMAGE BY FLY-ROCK

A qualified Explosive Engineer and experienced Powder Foreman shall be available to direct and supervise the design of the blasting work. This shall consist of selecting the correct burden, spacing and stemming dimensions for the explosives used and the rock being blasted. This includes, but is not limited to, controlling water in the blast hole and using the proper stemming. The objective is to select the optimum blast dimensions which ensure that just enough explosive is available to break the rock, and that there is no excess explosive to propel the rock fragments beyond safe limits.

Blasting mats and/or backfill materials shall be used for each "shot" to help confine the limits of fly-rock in populated areas.

Traffic and access to blasting areas shall be closed off and blasting signals audible for 2,000 feet shall be sounded in time for all workers and nearby residents to get under cover. Also, residents immediately adjacent to a blast should be notified personally before any blast occurs.

C. PREVENTING DAMAGE BY AIR BLAST

Design measures shall be taken to reduce or control air blast to levels below which actual damage will not occur. Microphones to which a metering device is attached to record over pressure levels shall be used to monitor air results of all blasts. These records shall be filed and maintained throughout the construction of the project.

The use of detonating cord on the surface shall be avoided.

The use of sufficient burden, spacing and stemming to prevent the premature release of explosive gases shall be required for all blasting in closely populated areas.

The specific gravity of stemming material shall always be equal to or greater than that of the rock, and its length equal to 0.7 of the burden. The shape of the stemming material shall be coarse and angular.

There should be no top priming of any holes.

Decking shall be used to bridge limestone cavities or other weak areas in any hole.

In closely populated areas, all blast shall be designed to limit the peak particle velocity to less than two (2) inches per second.

D. PREVENTING DAMAGE BY GROUND VIBRATIONS

The Explosive Engineer and Powder Foreman shall design each "shot" to obtain the desired fragmentation without providing extra explosives which could be used to produce ground vibrations. In closely populated areas where old residential or auxiliary structures in poor condition exists, the two (2) inches per second peak particle velocity limit shall be lowered. Monitoring of these structures with seismographs shall be required and the data filed and maintained for the duration of the project.

Delay intervals such as millisecond caps or millisecond connectors shall be used to reduce the vibration effects of large blasts to the range of smaller charges at reduced peak particle velocity.

Tight confined shots that require increased powder charges shall not be attempted.

Excessive sub-drilling shall not be permitted.

In decking charges where small weights of powder are used, the inert material between decks shall be one (1) to two (2) feet thick.

The use of sensitive explosives such as straight dynamite shall not be permitted.

In drilling blast holes with cavities, the driller shall measure the depth and size of each cavity encountered. This log shall be used by the Powder Foreman in loading the explosive in the rock parts and filling with the stemming material in cavity parts.

Delay pattern shall be designed to provide maximum amount of free faces which reduces the amount of energy-transfer in ground vibrations.

Where potential settlement of a structure is involved, a pre-split line shall be required to help reduce the peak particle velocity beneath the structure to be protected.

SECTION 02242
CLAY OR FLOWABLE MORTAR FILL FOR CUTOFF WALLS

PART 1 - GENERAL

1.01 SCOPE

The work covered by this section includes furnishing all labor, equipment, and materials to forma cutoff consisting of flowable mortar fill or clay material at the location shown on the Drawings or as directed by the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS FOR FLOWABLE MORTAR FILL

A. Materials used in this construction shall meet the following requirements:

Material	Specification
Portland Cement Type 1	AASHTO M 85
Fly Ash, Class C or Class F	AASHTO M 295
Water Potable	
Chemical Additives	AASHTO M 194

B. Fine aggregate shall be well graded from coarse to fine and when tested by means of laboratory sieves, shall conform to the following requirements:

Sieve Size	Total Percent Passing by Weight
3/4-inch	100
No. 4	95-100
No. 16	50-90
No. 50	10-30
No. 200	0-10

2.02 PROPORTIONING FOR FLOWABLE MORTAR FILL

A. Flowable mortar shall be proportioned as follows:

Material	Per Cubic Yard
Portland Cement, Type 1	100 lbs. (maximum)
Fly Ash, Class C or F	250 lbs. (minimum)
Fine Aggregate	2,800 lbs.
Water	60 gals. (approximate)

B. The above proportions may be adjusted by the Engineer to obtain the consistency required for satisfactory flow. Consistency shall be determined as follows:

Place an open-ended cylinder (pipe) 3 inches in diameter by 6 inches in heights in an upright position on a smooth, level surface. Fill the cylinder with a representative sample of the flowable mortar proposed for use. Remove the cylinder by lifting it straight up thus allowing the sample to diffuse on the smooth, level surface. the flowable mortar should diffuse into a circular shape having an approximate diameter of not less than 8 inches.

2.03 FOR CLAY CUTOFF WALL

A. Clay material shall have no organic material.

B. Clay material shall be compacted to 95 percent Standard Proctor.

PART 3 - EXECUTION

3.01 GENERAL

A. Flowable mortar shall be used where cutoffs are required and the area is in streets, alleys, across sidewalk and driveways, and at any other place subject to vehicular traffic or other superimposed loads.

B. Installation of cutoffs shall be according to "Backfilling Trenches" in Section 02220, "Earthwork."

C. The flowable mortar shall be covered or otherwise protected while in the plastic state. Backfill shall not be placed on the flowable mortar prior to final set or hardening as determined by the Engineer.

D. Cutoff material shall be placed from bottom of trench to top of ground.

END OF DOCUMENT

SECTION 02270
SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 SCOPE

A. This section shall consist of temporary control measures as shown in the plans or directed by the ENGINEER during the life of the Contract to control erosion and water pollution, through the use of berms, sediment basins, fiber mats, netting, mulches, grasses, slope drains, temporary silt fences, and other control devices.

B. The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to assure economical, effective, and continuous erosion control throughout the construction and post-construction period.

C. The City of Chattanooga, Department of Public Works, Storm Management Division guidelines, "General Criteria for Controlling Erosion and Sediment from Land Disturbing Activities." 1988 edition shall be included in these specifications by references.

PART 2 - PRODUCTS

2.01 SEDIMENT STRUCTURES

Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from siltation.

2.02 TEMPORARY SEEDING AND MULCHING

Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion. See Section 02485.

2.03 BALED HAY OR STRAW CHECKS

A. Baled hay or straw erosion checks are temporary measure to control erosion and prevent siltation. Bales shall be either hay or straw containing five (5) cubic feet or more of material.

B. Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment, along the toe of slopes, in ditches, or other areas where siltation erosion or water run-off is a problem.

2.04 TEMPORARY SILT FENCES

Silt fences are temporary measure utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the run-off water.

2.05 EROSION CONTROL FABRIC

Erosion control fabric shall be Hold/Gro Erosion Control Fabric as manufactured by Gulf States Paper Corporation, or approved equal, and shall consist of strips of biodegradable paper, interwoven with yarn that is subject to degradation by ultraviolet light.

PART 3 - EXECUTION

3.01 PROJECT REVIEW

Prior to the preconstruction conference, the Contractor shall meet with the ENGINEER and go over in detail the expected problem areas in regard to the erosion control work. Different solutions should be discussed so that the best method might be determined. It is the basic responsibility of the Contractor to develop an erosion control plan acceptable to the ENGINEER.

3.02 PRECONSTRUCTION CONFERENCE

At the preconstruction conference, the Contractor shall submit for acceptance his schedule for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing, grading, bridges and other structures at watercourses, construction, and paving. He shall also submit for acceptance his proposed method of erosion control on haul roads and borrow pits and his plan for disposal of waste materials. No work shall be started until the erosion control schedules and methods of operations have been accepted by the ENGINEER.

3.03 CONSTRUCTION REQUIREMENTS

A. The ENGINEER has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, and borrow and fill operations, and the authority to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of sediment basins, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds to the extent directed by the ENGINEER.

B. The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions

that develop during construction that were not foreseen during the design stage that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

C. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing, exceed 15,000 square feet without approval by the ENGINEER.

D. The ENGINEER will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

E. Under no conditions shall the amount of surface area or erodible earth material exposed at one time by excavation or fill within the project area exceed 15,000 square feet without prior approval by the ENGINEER.

F. The ENGINEER may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.

G. In the event of conflict between these requirements and Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

3.04 CONSTRUCTION OF STRUCTURES

A. SEDIMENT STRUCTURES

1. Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.

2. When use of temporary sediment structures are to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

B. TEMPORARY SEEDING AND MULCHING

Seeding and mulching shall be performed in accordance with the section entitled "Seeding and Mulching."

C. BALED HAY OR STRAW EROSION CHECKS

Hay or straw erosion checks shall be embedded in the ground 4 to 6 inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot, or be removed after they have served their purpose, as determined by the ENGINEER. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris clean-out will be considered routine maintenance.

D. TEMPORARY SILT FENCES

1. Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are constructed of wire mesh with a covering of burlap or some other suitable material on the upper grade side of the fence and anchored into the soil.

2. The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the ENGINEER. The silt fence becomes the property of the Contractor whenever the fence is removed.

E. EROSION CONTROL FABRIC

1. Fabric shall be installed immediately after seeding operations have been completed in work areas. Mulch shall not be used under the fabric.

2. Installation instructions shall be supplied by the manufacturer, and fabric shall be applied in accordance with the manufacturer's recommendation as directed by the specifier.

3. Fabric shall be unrolled and draped loosely, without stretching, so that continuous ground contact is maintained. In ditches, fabric shall be unrolled and applied parallel to the flow direction. On slopes, fabric shall be applied parallel to the slope direction unless the ENGINEER approves an alternate application method.

4. In ditches and on slopes, each upslope and each downslope end of each piece of fabric shall be placed in a 4-inch trench, stapled on 9-inch centers, backfilled and tamped. Where one roll ends and a second roll starts, the upslope piece shall be brought over the end of the downslope roll so that there is a 12-inch overlap, placed in a 4-inch trench, stapled on 9-inch centers, backfilled and tamped.

5. On slopes where two or more widths of fabric are applied, the two edges shall be overlapped according to manufacturer's installation instructions and stapled at 18-inch to 24-inch intervals along the exposed edge of the lap joint. The body of the fabric shall be stapled in a grid pattern with staples 3 feet maximum on center each way.

6. Where heavy concentrations of water or extremely erodible soil conditions exist, erosion checks shall be installed at intervals up to 50 feet as directed by the ENGINEER. Erosion checks shall be a 4-inch deep trench perpendicular to the flow line across the width of the fabric. The fabric shall be stapled at 9-inch intervals along the bottom of the trench across the entire width of the fabric, backfilled and stamped.

3.05 MAINTENANCE

A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.

B. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, and are ordered by the ENGINEER, such work shall be performed by the Contractor at his own expense.

C. Where the work to be performed is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls and falls within the specifications for a work item that has a contract price, the units of work shall be paid for at the proper contract prices.

3.06 EROSION CONTROL OUTSIDE PROJECT AREA

Temporary pollution control shall not include construction work outside the project area where such work is necessary as a result of construction such as: borrow pit operations, haul roads and equipment storage sites. Bid Price in such cases shall not include all necessary clearing and grubbing, construction incidentals, maintenance, and site restoration when no longer needed. This will be the responsibility of the Contractor.

END OF DOCUMENT