SECTION 02211 – SUPPLEMENTAL

EXCAVATING, FILLING AND GRADING

PART 1 – GENERAL

1.1 SCOPE. This section covers general earthwork activity and shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation, and disposal of all excess excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades, pumping and dewatering as necessary or required; protection of adjacent property; backfilling; pipe embedment; construction of fills and embankments; surfacing and grading; and other appurtenant work.

1.2 GENERAL. With reference to the terms and conditions of the construction standards for excavations set forth in the OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926, the Contractor shall employ a competent person and, when necessary, a registered professional engineer, to act upon all pertinent matters of the work in this section.

Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.

Conform to applicable state and local codes for disposal of excavated materials judged not suitable for backfill. Obtain disposal permit from local enforcing agency. Coordinate all cleaning and dewatering activities with Detroit Water and Sewerage Department for approval for discharge prior to construction activities.

1.3 QUALITY ASSURANCE. The Contractor shall utilize the services of a registered professional engineer, experienced in the design and analysis of all aspects of below grade construction, for the determination and control of the Contractor's means and methods of performing the work. Such means and methods shall be approved by the Engineer in advance of their use.

However, the approval by the Engineer shall not release the Contractor from liability for injury to persons or damaged property.

Do Work in accordance with the Michigan Department of Energy, Labor and Economic Growth Construction Standards Part 9: "Excavation, Trenching, and Shoring.

1.4 SUBMITTALS.

1.4.01 Drawings and Date. Submit detailed sequenced pre-excavation, excavation and backfilling plans for all work. Prepare and submit a Certificate of Design for each temporary sheeting system not detailed on the Drawings. Submit design calculations and necessary Drawings for shaft bracing, ground water control, ventilation requirements and geotechnical concerns.

Submit product data on geotextile separator and filter fabric.

1.4.02 Certifications. For dewatering systems, submit a Certificate of Design, support data, and detailed plans indicating proposed type and location of dewatering system and point of disposal of pumped water.

1.4.03 Samples. Provide 1.0 cubic foot or 115 pound (minimum) sample of all proposed materials in sealed plastic buckets. Deliver to Engineer as directed.

1.4.04 Test Reports. Submit field density test reports. Submit gradation test for all furnished material.

1.4.05 Record Drawings. Record location of underground utilities and other construction on project record drawings.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS. Provide and maintain barricades, warning lights, warning signs, and other protection required by applicable laws for safety of persons and property.

Protect benchmarks, adjacent structure, utilities, and property during construction operations. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent earth movement. Costs associated with replacing damaged elements and items shall be borne by the Contractor.

Notify Engineer of unexpected subsurface conditions, provide adequate safety measure and discontinue affected work in area until notified to resume work.

2.2 MATERIAL.

2.2.01 Filter Fabric. Filter fabric shall be a nonwoven geotextile fabric consisting of only continuous chains of polymeric filaments or yarns of polyester formed into a stable network by needle punching. The fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents; and shall have the following properties:

PROPERTY	TEST METHOD	UNIT	Minimum Average Roll Value
Fabric Weight	ASTM D3776	oz/yd^2	5.6
Grab Strength	ASTM D4632	lbs.	150
Grab Elongation	ASTM D4632	Percent	50
Apparent Opening Size	CW-02215	US Standard Sieve Size	80

The filter fabric shall have a minimum thickness of 60 mils and be provided in rolls wrapped with protective covering to protect the fabric from mud, dirt, dust, and debris.

2.2.02 Geotextile Separator. Geotextile with Grab Tensile Elongation at – Break less than 50 percent shall meet the requirements in the column for woven geotextiles. Geotextiles with Grab Tensile Elongation-at-Break equal to or greater than 50 percent shall meet the requirements of column for non-woven geotextiles below.

PROPERTY	TEST METHOD	Woven	Non-Woven
Grab Tensile Strength, lb.	ASTM D4632	270 min	200 min
Trapezoid Tear Strength, lb.	ASTM D4553	100 min	75 min
Puncture Strength, lb.	ASTM D4833	100 min	75 min
Apparent Opening Size, inch	ASTM D4751	8×10^{-3}	8×10^{-3}
Permittivity, Sec^{-1}	ASTM D4491	0.05 min	0.5 min

2.2.03 Granular Fills. Granular fill material shall be crushed rock or gravel; shall be free from dust, clay, and trash; and shall be graded 1-1/2 inch (3.8 cm) to No. 4 as defined in ASTM C33. Refer to the Drawings for locations of specific fill materials to be placed.

2.2.04 Bank-run Gravel. Michigan Department of Transportation Granular Material for Fill, Class I or such other sizes as may be approved. Fill may be approved excavated material or can be obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted. Material shall be free from vegetation and substantially free from loam and other organic matter, clay, other fine or harmful substances, frost snow, ice, and aggregations of frozen soil particles. Compact

thoroughly by means of suitable power-driven tampers or other power-driven equipment to density indicated on the Drawings.

2.2.05 Class II Granular Material. Approved sand, gravel, crushed stone, blast-furnace slag or combination thereof, with 100% passing 3 inch (7.6 cm) sieve, 60 to 100% passing 1 inch (2.5 cm) sieve, 0 to 30% passing No. 100 sieve, and loss by washing not to exceed 7%, per MDOT Standard Specifications 8.02.06 for Granular Material Class II.

2.2.06 Sand. Michigan Department of Transporation Material, type 2nS sand or such other sizes as may be approved.

2.2.07 Graded Gravel. Pea Gravel shall be used as backfill as indicated on the Contract Drawings.

2.2.08 Lean Concrete. Lean concrete shall be a mixture of Portland cement, aggregate and water, having a minimum compressive strength of 1500 psi (10,342.5 kPa) at 28 days.

2.2.09 Tests. All tests to ensure that embankment, fills and embankments, engineered fill, structure and trench backfill materials, and other fills and their placement comply with specified requirements shall be made by an independent testing laboratory at the expense of the Contractor. The following tests will be required as directed by the Engineer:

One moisture-density (Proctor) tests in accordance with AASHTO T-180 modified Method C for each type of embedment, fill, aggregate base, embankment, engineered fill, structure and trench backfill material proposed, except for granular embedment material."

One initial gradation tests for each type of embedment, fill, embankment, engineered fill, aggregate base, structure and trench backfill material and one additional gradation test for each additional 1000 tons of each material.

PART 3 – EXECUTION

3.1 INSPECTION. Locate off-site stockpile areas for suitable excavated material and borrow. Do not stockpile excavated material or borrow on site without approval of Engineer. Select disposal areas for unsuitable excavated material and dispose of in accordance with local laws and ordinances.

Carry out program of pre-excavation, excavation, dewatering, sheeting, and bracing in such manner as to eliminate undermining or disturbing buried utilities, conduits, foundations of existing structures, or of work previously completed under this contract.

Excavate to widths that give suitable room for building structures or laying and jointing piping; furnish and place all sheeting, bracing, and supports; do all pumping, and draining and render bottom of excavations firm and dry and acceptable in all respects.

Make excavations and construct embankments and backfill excavations to the lines and grades indicated on the Drawings and compact to the specified density or as indicated on the Drawings.

Provide suitable and safe bridges and other crossings where required for accommodation of travel, and to provide access to existing facilities during construction, and remove said structures thereafter.

3.2 PREPARATION. Establish the extent of excavation by area and elevation; designate and identify datum elevation. Identify, flag and stake known underground, surface and aerial utilities. Set out all required line and levels.

Remove existing signs, posts, catch basin frames and grates, and manhole frames and covers, within construction path unless directed otherwise. Store at site designated by Engineer.

The Contractor shall prevent any damage to pipe, conduits, wires, cables and structures above or below ground. No land monuments or property markers shall be damaged or removed without prior authorization of the Engineer.

3.3 PERFORMANCE.

3.3.01 Excavation. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

Excavate all materials encountered and existing below grade obstructions as required to allow construction of the proposed building structures, utilities and site work as shown on Drawings and as hereinafter specified. Remove any rocks or boulders encountered less than 1.2 cubic yard (0.4 cu meter) in volume.

Excavate to levels shown for footings, pile caps and grade beams. Excavate to 3 inches (5.1 – 7.6 cm) below bottom of slabs for mud mat unless otherwise indicated. Excavate as required to provide working clearance and to allow adequate inspection for structures. Excavate to subgrades specified herein below outside of building. Excavate in a manner, which minimizes the disturbance of the pre-excavation slopes.

Cut out soft areas of subgrade not readily capable of compaction. Backfill with approved fill materials and compact to density equal to requirements for subsequent backfill material.

Make no excavations to the full depth indicated when freezing temperature may be expected, unless the footings or slabs can be placed on non-frozen soil after the excavation has been completed. Protect the bottom of excavation from frost if placement of concrete is delayed. Should protection fail, remove frozen materials and replace with concrete or bank-run gravel, as directed, at no additional cost to Owner.

Provide all measures necessary to ensure the safety of workers and of the existing facilities at all times during construction and in accordance with applicable City, State and Federal regulations.

There may be pipes, drains, and other utilities in certain locations. These have been indicated on the Drawings to the extent known, however the completeness or accuracy of the information given is not guaranteed.

3.3.02 Classification of Excavated Materials. 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 work, regardless of the type, character, composition, or condition thereof.

3.3.03 Protection of Existing Structures. Support and protect from damage all existing pipes, poles, wires, fences, pavement, curbing, walkways, property line markers, bench marks, monuments and other structures, not indicated for relocation which the Engineer decides must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, restore without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

3.3.04 Relocation and Replacement of Existing Structures. Whenever the Contractor encounters certain unforeseen or unknown conditions pertaining to

existing structures and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed, to change the location of, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing.

Use care to avoid damage to materials when removing existing pipes or other structures.

The structures to which the provisions of the preceding two paragraphs apply include pipes, wires, and other structures which meet all of the following:

Are not indicated on the Drawings or otherwise provided for.

Encroach upon or are encountered near and substantially parallel to the edge of the excavation.

In the opinion of the Engineer will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

Remove fences that interfere with the Contractor's operations, and (unless otherwise specified) later restore them to at least as good condition as that in which they were found immediately before the work was begun, without additional expense to the Owner. Contractor shall restore fences promptly and shall not leave restoration until the end of the construction project.

3.3.05 Care And Restoration of Property. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when treads or wheels of which are so shaped as to cut or otherwise injure such surfaces.

Restore all surfaces which have been injured by the Contractor's operations, to a condition at least equal to that in which they were found immediately before work commenced. Use suitable materials and methods for such restoration.

Contractor shall restore existing property or structures promptly and shall not wait until the end of the construction period.

3.3.06 Unauthorized Excavation. Except where otherwise authorized, indicated, or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced, by and at the expense of the Contractor, with lean concrete. Unauthorized excavation in other locations shall be filled with approved fill materials and compacted to the specified density for that type of fill.

3.3.07 Dust Control. During progress of work, conduct operations and maintain area of activities, including sweeping and sprinkling of streets, so as to minimize the creation and dispersion of dust.

3.3.08 Blasting. Blasting or other use of explosives for excavation will not be permitted.

3.3.09 Dewatering. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations. Coordinate construction operations to minimize duration and extent of dewatering required.

Provide all equipment, tools, materials and labor required for dewatering operations for temporary control of artesian water in the underlying bedrock. Dewatering may be required in conjunction with grouting or other suitable methods necessary to seal leakage of artesian water. Leakage of artesian water may occur if rock grouting does not completely seal the rock of in the event that piles or sheeting penetrate the hardpan sufficiently to cause leakage.

Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations 2 feet (61.0 cm) or more below the bottom of the excavation.

Modify dewatering operation if geotechnical instrumentation indicates movement of structures, sheeting or embankments.

Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.

The Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

3.3.10 Stabilization. Subgrades for concrete 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 under the feet of the workers.

3.3.11 Compaction Equipment. Provide sufficient equipment units of suitable types to spread, level, and compact fills promptly upon delivery of materials.

Contractor may use any compaction equipment or device which he finds convenient or economical, but the Engineer retains the right to disapprove equipment which, in his opinion, is of inadequate capacity or unsuited to character of material being compacted.

3.3.12 Construction Requirements. Subgrades and fills shall be periodically wetted to prevent desiccation. Should soils become desiccated, they shall be removed and replaced; soaked or; scarified, moisture conditions and recompacted as specified herein to provide a subgrade within the specified moisture and compaction limits. Any soft areas which develop due to excessive moisture increase shall be dried out or removed prior to placing additional lifts or concrete.

3.3.13 Earthfills and Embankments. Fills and embankments shall be constructed to the lines and grades indicated on the Drawings. To the maximum extent available, excess suitable material obtained from structure and trench excavation shall be used for the construction of fills and embankments. Additional material shall be provided as required.

All material placed in lifts and embankments shall be free from rocks or stones larger than 6 inches (15.2 cm) in their greatest dimension, brush, stumps, logs, roots, debris, and other organic or deleterious materials. No rocks or stones shall be placed in the upper 18 inches (45.7 cm) of any fill or embankment. Rocks or stones within the allowable size limit may be incorporated in the remainder of fills and embankments, provided they are distributed so that they do not interfere with proper compaction.

Subgrade Preparation: After preparation of the fill or embankment site, the subgrade shall be leveled and rolled so that surface materials of the subgrade will be as compact and well bonded with the first layer of the fill or embankment as specified for subsequent layers.

Placement and Compaction: All fill and embankment materials shall be placed in approximately horizontal layers not to exceed 8 inches (20.3 cm) in uncompacted thickness. Material deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled before compaction.

Each layer of material shall have the best practicable moisture content for satisfactory compaction. The material in each layer shall be wetted or dried as required and thoroughly mixed to ensure uniform moisture content and adequate compaction. Each layer shall be thoroughly compacted to 95 percent of maximum density at a moisture content in the range of 2 percent below to 2 percent above the optimum moisture content, or as indicated on the Drawings. If the material fails to meet the density specified, compaction methods shall be altered.

Wherever a trench is to pass through a fill or embankment, the fill or embankment material shall be placed and compacted to an elevation not less than 12 inches (30.5 cm) above the top of pipe elevation before the trench is excavated.

Earthfills and Embankments Over Reservoir of Basin Roof Slabs: Earthfills and embankments over reservoir or basin roof slabs shall be placed an compacted by using methods that will not damage or overload the structure; compaction in addition to that attained by placement operations will not be required. Rubber-tired equipment shall be used insofar as possible. Individual items of equipment operated on reservoir or basin roof slabs shall not have loaded weight in excess of 14,000 pounds (6342 kg) and shall be so operated that no impact loads are imposed on the structure. Fill material shall not be piled on the roof slab to a depth greater than 12 inches (30.5 cm) above finished grade elevation. Fill construction shall begin at the walls, and construction equipment shall operate on a layer of fill material at least 12 inches deep. Special care shall be taken to avoid damaging or disturbing any roofing membrane, tile drains, or granular fill material.

3.3.14 Granular Fills. Granular fills shall be provided where indicated on the drawings. Granular fills shall be placed on suitably prepared subgrades and compacted by vibration. Granular fills shall be compacted to not less than 95 percent of maximum density as determined by AASHTO T-180 modified Method C or as indicated on the drawings.

3.3.15 Trench Work. No more trench shall be opened per sequence phase than is indicated on the contract drawings until concrete is placed over previous opened trench areas. All trench excavation shall be open cut from the surface.

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 Master Specification Section 02620, Water Main Services.

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 5 feet (1.5 m). Greater pipe cover depths may be necessary on vertical curves or to provide adequate 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, except where future surface elevations are indicated on the drawings.

Trenches shall be excavated to a width as indicated on the contract drawings.

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.

Cutting trench banks on slopes to reduce earth load to prevent sliding and caving shall be used only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits.

Whenever unsuitable or unstable soil conditions are encountered, trenches shall be excavated below grade to undisturbed and the trench bottom shall be brought to grade with suitable material.

3.3.16 Mechanical Excavation. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

Where determination of the exact location of pipe or other underground structure is necessary for doing work properly, the Contractor may be required to excavate test pits to determine such locations. When such test pits may be properly considered as incidental to other excavations, the Contractor will receive no additional compensation, the work being understood to be included as a part of the excavation.

Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, and that trench alignment is such that pipe, when

accurately laid to specified alignment, will be centered in the trench with adequate sidewall clearance. Undercutting the trench sidewall to obtain sidewall clearance will not be permitted.

3.3.17 Pavement Cutting. Cuts in pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be by saw cutting in a manner which will provide a clean, flat edge along each side of the trench and along the perimeter of cuts for structures.

Pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches (15.2 cm) 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 center line of the trench.

Pavement removal for connections to existing lines or structures shall not exceed the extent necessary for the installation.

Pavement shall be removed and restored between existing construction or contraction joints, located at or outside the limits of excavation at intersecting streets or roads, except as otherwise shown or specified.

Where the trench parallels the length of concrete walks, and the trench location is all or partially under the walk, the entire walk shall be removed and replaced. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and subsequently replaced between existing joints or between saw cuts as specified for pavement.

Contractor shall excavate below the underside of the pipe, except where otherwise required, to provide for the installation of granular embedment.

3.3.18 Pipe Embedment. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the requirements indicated on the Drawings and to the following supplementary requirements.

Embedment material shall contain no cinders, clay lumps, or other material which may cause pipe corrosion. Embedment below the bottom of the pipe to just above the top of pipe shall conform to the applicable class below:

Class A Arch Encasement – Is not required unless improper trenching or unexpected trench conditions require its use as determined by Engineer.

Class B Bedding – Shall be used for all steel, pretensioned concrete, profile wall HPDE, PVC, ABS, FRP, and vitrified clay pipelines, and for all other pipelines not otherwise specified.

Class C Bedding – Shall be used for all reinforced concrete, prestressed concrete, and ductile iron pipelines.

Embedment for Ductile Iron, Steel, FRP, and PVC Pipelines: Granular embedment for ductile iron, coal tar coated steel, FRP, and PVC pipelines shall be pea gravel or crushed rock with rounded or subrounded particles; crushed rock with sharp edges which could cause significant scratching or abrasion of the pipe or damage to the polyethylene tube protection shall not be used. Inundated sand may be used for granular embedment in locations where the use of water will cause no damage to adjacent property and where it can be placed and properly compacted without damage to the pipe.

Placement and Compaction: Granular embedment material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finish subgrade surface by withdrawal of pipe slings or other lifting tackle.

After each pipe has been graded, aligned, and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

Class C embedment shall be compacted to the top of the pipe in all areas where compacted backfill is specified.

Each lift of granular embedment material shall be vibrated with a mechanical probe type vibrator during placement to ensure that all spaces beneath the pipe are filled. Each lift of embedment material shall be compacted with a platform type vibrating compactor to at least 95 percent of maximum density or as indicated on the Drawings.

3.3.19 Trench Backfill. All trench backfill above pipe embedment shall conform to the following requirements.

A layer of backfill material not more than 8 inches (20.3 cm) deep may be placed over concrete arch encasement or concrete reaction blocking after the concrete has reached its initial set, to aid curing. No additional backfill shall be placed over arch encasement or blocking until the concrete has been in place for at least 3 days.

Compacted Trench Backfill: Will be required for the full depth of the trench. Backfill and compact trenches only after pipe or other appurtenances have been inspected, tested and locations of pipes and appurtenances have been recorded.

3.3.20 Structure Backfill. The quality and moisture content of materials for backfill around and outside of structures shall conform to the requirements for materials used for earthfills and embankments. Before backfilling against walls, the permanent structures (including basement floor slabs) must be completed and the concrete shall have attained its 28-day design strength required to resist backfill pressures without damage. Temporary bracing will not be permitted except by written permission from the Engineer. When filling on both sides of a wall or pier, place fill simultaneously on each side. Correct any damage to the structure caused by backfilling operations at no cost to Owner. Backfill materials shall be deposited in layers no to exceed 8 inches (20.3 cm) in uncompacted thickness and shall be compacted to at least 95 percent of maximum density at a moisture content in the range of 2 percent below to 2 percent above the optimum moisture content, or as indicated on the Drawings. Compaction of structure backfill by rolling will be permitted, provided the desired compaction is obtained and damage to the structure is prevented. No backfill shall be deposited or compacted in water.

Particular care shall be taken to compact structure backfill which will be beneath pipes, drives, roads, parking areas, walks, curbs, gutters, or other surface construction or structures. In addition, wherever a trench is to pass through structure backfill, the structure backfill shall be placed and compacted to an elevation not less than 12 inches (30.5 cm) above the top of pipe elevation before the trench is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.

3.3.21 Drainage Maintenance. Trenches across roadways, driveways, walks, or other traffic ways adjacent to drainage ditches or watercourses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the traffic way, 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 watercourses crossed by the line of trench shall be removed immediately after backfilling is completed, and the original section, grades, and contours of ditches or watercourses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3.3.22 Disposal of Excess Excavated Material. All excavated materials, together with all construction debris, shall be removed from the site and disposed of at an appropriate landfill by, and at the expense of, the Contractor. The Contractor, at his expense, shall test the excavated material in accordance with current regulations, prior to removal and disposal.

3.3.23 Settlement. 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.

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.

3.4 FIELD QUALITY CONTROL. All fill materials will be subject to quality control testing. A qualified laboratory will be selected and paid by the Contractor to perform test on materials. Test results and laboratory recommendations will be made available to Engineer and Contractor.

Provide samples of each fill material from the proposed source of supply. Allow sufficient time for testing and evaluation of results before material is needed (a minimum of two weeks). Submit samples from alternate source if required.

Engineer will be sole and final judge of suitability of all material.

The laboratory will determine maximum dry density at optimum water content in accordance with AASHTO T-180 modified Method C as applicable for the materials to be used.

Tests of materials as delivered may be made from time to time. Materials in question may not be used pending test results. Remove rejected materials and replace with new approved material.

End of Supplemental Section