

CITY OF MEMPHIS – STANDARD CONSTRUCTION SPECIFICATIONS
SECTION 02631 EARTHWORK

PART 1 – SCOPE

1.01 This work shall consist of all types of excavation, special protection, protection of existing utilities, backfilling, and grading for all types of drainage facilities including such labor, material and equipment, and all other items as may be necessary to complete the earthwork as shown on the Plans, stipulated in the Contract Documents, or directed by the Owner.

PART 2 – MATERIALS AND EQUIPMENT

2.01 MATERIAL

A. Lumber.

Lumber to be used for bracing trenches shall be no less than 2 inch thick rough cut oak.

B. Pit Run Gravel.

Pit run gravel shall consist of one of the three gradations shown in the table below.

1. Total Percent, by Dry Weight, Passing Each Sieve (U.S. Standard)

| <u>Size No.</u> | <u>2 ½"</u> | <u>2"</u> | <u>1 ½"</u> | <u>1"</u> | <u>3/8"</u> | <u>No. 40</u> | <u>Clay*</u> |
|-----------------|-------------|-----------|-------------|-----------|-------------|---------------|--------------|
| 1 | 100 | 95-100 | | | 35-65 | 10-30 | 1-12 |
| 2 | | 100 | 95-100 | | 40-65 | 10-30 | 1-12 |
| 3 | | | 100 | 90-100 | 45-65 | 10-35 | 2-12 |

* Clay content shall be determined by the Hydrometer Test – AASHTO T 88. Clay content up to 15 percent may be used with the approval of the Owner.

2. That portion passing the No. 40 sieve shall be known as the binder. The binder aggregate shall consist of hard durable particles of limestone or a sound silicious material. Shale aggregate or pipe clay binder will not be acceptable, and in no case shall the percent of silt exceed the percent of clay by more than 25 percent.

3. If the binder material is insufficient to properly bond the aggregate, a satisfactory binding material may be incorporated, as approved by the Owner, so that the resultant mixture will comply with these Specifications. The mixing shall be done uniformly, and blending of materials on stockpiles or in the pits by bulldozers, clamshells, draglines, or similar equipment will not be permitted.

C. Backfill Material.

Material for backfill shall be fine compactible soil selected from site excavation if approved by the owner as being suitable. Additional material needed shall be obtained from borrow excavation.

2.02 EQUIPMENT

All equipment necessary for the satisfactory performance of this work shall be on the Project and approved before work will be permitted to begin.

PART 3 – CONSTRUCTION REQUIREMENTS

3.01 EXCAVATION

A. General.

All excavation performed under this Section including trench excavation, structure excavation, and channel excavation but excluding undercut will be considered unclassified excavation regardless of the nature of the material and objects excavated and will not be measured or paid for separately except as specifically noted herein. Pavement removal and replacement shall be accomplished as specified in Specification Section 02950.

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1. Undercut Excavation.

a. Undercut excavation shall consist of removing and disposing of soft, spongy earth, muck, mud, unconsolidated fill, organic matter, and any other unsatisfactory materials below the grade established on the Plans for storm drains, structures, and channels where determined necessary by the Owner. No undercut excavation shall be performed without prior authorization of the Owner in writing. The limits of undercut excavation will be determined by the Owner, who will be present during the undercut operations.

b. Undercut areas shall be backfilled with suitable material to the grade established on the Plans. The backfill shall be placed in 6 inch maximum lifts and compacted by use of a bulldozer.

2. Unauthorized Excavation Below Subgrade or Outside of Limits.

All unauthorized excavation carried beyond or below the lines and grades given by the Plans or Contract Documents, together with the removal of such excess excavated materials, and the cost of refilling the space of such over dig or unauthorized excavation, shall be at the Contractor's expense. The excess space between the undisturbed bottom and sides of the excavation and subgrade limits shown on the Plans for storm drain pipe shall be refilled with suitable material and compacted per Specification Section 02631, Paragraph 3.01.A.1a unless otherwise directed by the Owner. The excess space between the undisturbed bottom of the excavation and subgrade elevations shown on the Plans for box culverts and concrete channel lining shall be refilled with suitable material and compacted per Specification Section 02631, Paragraph 3.01.A.1a. The unauthorized excavation outside of side excavation limits shall be backfilled with select material unless otherwise directed by the Owner. The backfill shall be compacted in accordance with Specification Section 02631, Paragraph 3.01.A.1a.

3. Change in Excavation Location or Grade.

If the Owner orders in writing that the location or grade of a proposed drainage facility be changed from that shown on the Plans, the following provisions will apply.

a. If the change is made before excavation work has begun and the facility being constructed is covered in the Proposal Sheet(s) by pay items with appropriate depth classifications (pipes, manholes, and similar items), the appropriate pay item will apply to the new depth measurements along the changed centerline. If the changed location or grade introduces a new depth classification not included in the Proposal Sheet(s), a Change Order or Construction Change Order will be prepared in accordance with Specification Section 00710 Article 9 "Changes". If the facility being constructed is not covered in the Proposal Sheet(s) by pay items with depths classifications (box culverts, concrete channel lining, unlined channel, inlets, junction structures, etc.) and if the average depth of excavation per linear foot at the changed location or grade is within 10 percent of the original Plan quantity, there will be no change in the unit price for this work and no additional compensation (or reduced compensation) will be allowed for the change. If the average depth of excavation per linear foot at the changed location is more than 10 percent above or below original Plan quantities, a new unit price for the actual excavation depth will be established. For purposes of comparing changed quantities to Plan quantities, a 1 foot wide strip will be assumed from natural ground line to invert along both the revised and original locations; quantities will then be calculated for the 1 foot wide strip along both conditions and then divided by the proper lengths.

b. If the change is made after excavation has already begun on the original Plan location, the procedures described above will apply to payment for work along the changed location. If abandonment of an existing excavation or a portion of an existing excavation is required due to a change by the Owner, the Contractor will be compensated for the backfilling and restoration of the abandoned excavation. Backfilling

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and restoration of the abandoned excavation will be accomplished in accordance with the appropriate section of these Specifications.

c. Filling a portion of existing excavation to meet changed grades will be accomplished in accordance with Specification Section 02631 Paragraph 3.01.A.1a.

d. If a change in location and/or grade is authorized in writing by the Owner at the written request of the Contractor; whether before or after excavation work has begun; the Contractor will not receive an additional compensation whatsoever for the changed work even though lengths and/or depth of excavation may be greater than original Plan quantities. Backfilling and restoration of abandoned excavation work will be accomplished totally at the Contractor's expense. If changes requested by the Contractor result in reduced lengths and/or depth of excavation, the revised quantities using Proposal unit prices or Change Orders/Construction Change Orders as appropriate will be used to develop payment.

4. Disposition of Excavated Material.

a. Excavated materials suitable for backfill shall be stored no closer than 2 feet from the edge of the excavation to allow free passage of the Owner and permit the Owner to perform his work in an expeditious and safe manner. Excavated material shall not obstruct crosswalks, sidewalks, street intersections, nor interfere unreasonably with travel on streets by occupants of adjoining property. Gutters or other surface drainage facilities shall not be obstructed. When clear access to fire hydrants, mail boxes, sewer and conduit manholes, and similar utility or municipal service facilities is required, the Contractor must provide such access. Excavated material intended for backfill shall be stored in such a manner as to minimize loss of excavated material due to erosion.

b. All materials excavated, disturbed, damaged, or removed by the Contractor and not to be used for refilling trenches, channels, or structure excavations or to be used in restoration of subsurface or surface facilities or conditions, shall be removed from the site and disposed of by the Contractor, unless otherwise directed. The City reserves the right to retain excess excavation material and direct the Contractor to deliver it to a site specified by the Owner at the Contractor's expense. If the Contractor proposes to store or place such excess excavated material upon any property, written consent of the property owner or owners must be secured in advance and a certified copy thereof be filed with the Owner. No surplus or excess materials shall be deposited in any stream channel nor in any place where preconstruction surface drainage would be changed, without written permission of the Owner.

5. Control of Storm Water.

a. The Contractor shall keep all excavations free of water. He shall provide all dams, flumes, channels, sumps, or other works necessary to keep the excavation entirely clear of water and shall provide and operate pumps or other suitable equipment of adequate capacity for dewatering the excavations. He shall avoid producing mud in the trench or channel bottom by his operations. If necessary or so ordered by the Owner, the Contractor shall place pit run gravel at his own expense to maintain a firm, dry excavation bottom and base. Pipe bedding, laying, jointing, and the placing of concrete or masonry shall be done in a water free trench or excavation, which shall be kept clear of water until pipe joints, concrete and masonry have set and are resistant to water damage. The water shall be disposed of at the Contractor's expense.

b. All gutters, pipes, drains, conduits, culverts, catch basins, inlets, ditches, creeks, and other storm water facilities shall be kept in operation, or their flows shall be satisfactorily

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diverted and provided for during construction. Any facilities disturbed during construction shall be restored to the satisfaction of the Owner.

6. Excavation Around Obstructions.

a. The Contractor shall perform all excavation by hand where excavation by machinery would endanger trees, structures, or utilities which otherwise might be saved by the use of hand excavation.

b. The Contractor shall cautiously excavate test holes to locate the limits of underground obstructions anticipated within the excavation. When a water pipe, gas pipe, sewer, or similar utility comes within the limits of the trench, such facilities shall be properly supported.

B. Trench Excavation.

1. All trenches shall be open cut unless otherwise shown on the Plans. Tunneling, boring, or jacking will be allowed only on permission of the Owner, unless otherwise shown on the Plans, and a complete record thereof shall be kept in the Contractor's project diary.

2. The Contractor shall be responsible for prosecuting the work in accordance with the grades and lines shown on the Plans or as directed by the Owner. Trenches may be excavated by machinery to a depth that will not disturb the finished subgrade. The remaining material shall be hand excavated so that the pipe may be laid on a firm, undisturbed subgrade.

3. No more than 300 feet of trench shall be opened at any time in advance of the completed storm drain, nor shall more than 100 feet be left unfilled except by written permission from the Owner. In special cases the Owner may limit the distance to which the trench may be opened by notifying the Contractor in writing.

4. The width of trenches below a level 1 foot above the outside top of pipe shall be such as to leave not less than 6 inches on each side of the outside of the pipe for all sizes up to and including 15 inch diameter pipe. Maximum trench width dimension for these pipe sizes shall be 36 inches. For 18 inch diameter pipe, the width of trenches below a level 1 foot above the outside top of pipes shall be such as to allow not less than 6 inches on each side of the pipe, with a maximum trench width of 42 inches. For pipes sizes over 18 inches, the width of trenches below a level 1 foot above the outside top of the pipe shall be such as to allow not less than 12 nor more than 15 inches on each side of the outside top of the pipe. If the trench width at or below that level 1 foot above the outside top of pipe exceeds the widths specified, provision shall be made for the additional load upon the pipe at the Contractor's expense. For pipes other than circular, trench width shall be adjusted to provide for the additional pipe width along the horizontal axis.

5. The sides of the trench shall be as nearly vertical as possible. The bottom of the trench shall be carefully graded, formed, and aligned according to the Plans and to the satisfaction of the Owner before storm drains are laid thereon.

6. The bottom of the trench shall be excavated at each joint of bell and spigot pipe to allow the body of the pipe a uniform contact and support throughout its entire length. When mortar joints are specified, bell holes shall be excavated at each joint in the pipe line to provide space underneath the pipe in which to properly build up mortar joints.

C. Excavation For Drainage Structures.

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1. The Contractor shall be responsible for prosecuting the Work in accordance with the lines and elevations shown on the Plans or as directed by the Owner. The Contractor shall excavate as required for all structures with foundations carried to firm, undisturbed earth at the elevation of the underside of the structure.
2. The outside dimensions of all manholes, inlets, box culverts, channel lining, and other drainage structure excavations shall be at least 12 inches greater than the outside of the masonry or concrete work to permit backfilling around structure.
3. Where structures are to be built in street right-of-way or paved areas, the excavation shall not exceed 2 feet from the outside of the masonry or concrete work. In the event that the excavation exceeds this limit, the Contractor will be required, at his expense, to backfill the entire space around the structure with suitable material compacted as specified in Specification Section 02631 Paragraph 4.0.
4. For drainage facilities to be constructed in fill areas, the fill shall first be placed and compacted in accordance with these Specifications. The excavation for the drainage facilities shall then commence following the placement of fill.

D. Unlined Channel Excavation.

The Contractor shall be responsible for prosecuting the Work in accordance with the grades and lines shown on the Plans or as directed by the Owner. The sides and bottom of the channel shall be excavated and shaped so as to conform with the cross-sections shown on the Plans or as directed by the Owner.

3.02 SPECIAL PROTECTION

A. Treacherous Ground.

When running sand, quicksand, or other treacherous ground is encountered, the work shall be carried on with the utmost vigor and shall be prosecuted day and night should the Owner so direct.

B. Sheeting and Shoring.

1. The Contractor shall furnish, place, and maintain such sheeting and shoring as may be required to support the sides of any excavation to prevent earth movement that could endanger the work or workmen; or to prevent any earth movement which might in any way delay the Work, change the required width of the excavation, or endanger adjacent pavement, utilities, sewers, buildings, or other structures above or below the ground surface; or to contain the construction within a specified area such as an easement or street right-of-way. The Contractor shall place this sheeting and shoring for such protective purposes without the Owner's instructions.
2. During the extraction of sheeting, care shall be exercised to prevent damage due to settlement or movement of new drainage facilities. The sheeted trench width, as measured between those faces of the sheeting in contact with the earth trench wall, shall not exceed the maximum width of trench specified in Specification Section 02631 paragraph 3.01.B. below an elevation 1 foot above the top of the pipe. Walers and struts shall be designed and installed to present no obstructions to proper placement of the pipe, bedding, cradle or encasement, nor shall they interfere with the satisfactory laying and jointing of the pipe.
3. Sheeting, bracing, and shoring shall be withdrawn and removed as the backfilling is being done, except where and to such extent as the Owner shall order that sheeting, bracing, and shoring be left in place, or where the Owner will permit the same to be left in place at the Contractor's request. The Contractor shall cut off any such sheeting at least 2 feet below the surface and shall remove the cutoff material from the excavation.

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4. All sheeting, bracing, and shoring which is not left in place under the foregoing provisions shall be removed in a manner which will not endanger the completed work or other structures, utilities, sewers, or property whether public or private. The Contractor shall exercise care to prevent the opening of voids during the extraction process.

5. Steel drag shields or trench boxes may be used in lieu of sheeting, shoring, and bracing unless the Owner directs otherwise.

C. Excess Width Of Trench.

If the Contractor is permitted to use equipment that results in wider trenches than hereinbefore specified, concrete cradle or additional concrete cradle shall be used around pipe if required to resist the additional load caused by the extra width. The dimensions of this cradle will be specified by the Owner, and no extra compensation will be allowed for the additional material or work.

D. Blasting.

1. Blasting shall be under taken only after the Contractor has received written authorization from the Owner. With respect to the use of explosives in blasting, the Contractor shall apply for and receive all necessary permits and comply with all federal and state laws, rules, ordinances and regulations and requirements of the insurer governing the keeping, storage, use, manufacture, sale, handling, transportation, or other disposition of explosives. The Contractor shall provide additional liability insurance to the City, with limits and coverages as specified by the Owner, covering blasting operations in advance of any blasting. All operations involving the handling, storage, and use of explosives shall be conducted with every precaution under the supervision of a properly licensed individual. The Contractor shall take special precautions for the proper use of explosives both at or near the top of the excavation and in the excavation in order to prevent harm to human life and damage to surface structures, utilities, sewers, or other subsurface structures. The Contractor shall advise the Owner in advance when charges are to be set off. Blasts shall not be fired until all persons in the vicinity have had ample notice and have reached positions of safety.

2. Storm drains shall be carefully protected from all blasts, and all excavations requiring blasting shall be fully completed at least 30 feet in advance of the laying of the pipe. In all cases, the mouth of the pipe shall be provided with a board or other stopper carefully fitted to the pipe to prevent all earth or other substances from entering.

3. After a blast is fired, the Contractor shall thoroughly scale the excavation. All loose shattered rock or other loose material which may be dangerous to the workmen, pipe, or structure shall be removed and the excavation made safe before proceeding with the Work. The fact that the removal of loose, shattered rock or other loose material may enlarge the excavation beyond the required width will not relieve the Contractor from making such removal and filling the extra space. The Contractor shall not be entitled to extra compensation therefore.

E. Wellpoints.

The Contractor shall use wellpoints, sump pumps, or any other method of dewatering as required to lower the water table below the bottom of the excavation. He shall make a request to the Owner and receive approval of the use of special dewatering equipment other than well points or sum pumps. Dewatering operations are considered incidental to the Work and no additional compensation shall be made to the Contractor.

F. Underpinning.

When excavations require underpinning of existing structures, the Contractor shall submit shop drawings of underpinning details to the Owner prior to commencement of excavation below the

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foundation of the structure. Review of underpinning details by the Owner shall not relieve the Contractor of his responsibility for protection of the structure and its contents.

3.03 EXISTING UTILITIES

A. Location.

The Plans indicate the available records of location of existing structures and facilities, both above and below the ground, but the City assumes no responsibility for the accuracy or completeness of this information. Utility service connections are not shown on the Plans, but can be encountered at any location on the Project. If it is necessary to adjust or relocate any utility, it shall be the Contractor's responsibility to coordinate the work with the appropriate utility. Any cost or delays incurred by the Contractor in this activity shall be incidental and no additional compensation will be made.

B. Protection.

1. If the construction of the storm drains, structures, or channel requires the removal and replacement or protection of any overhead wires or poles, the Contractor shall make satisfactory arrangements for such work with the owner or owners of such wires and poles and no additional payment will be made by the City.

2. The Contractor shall protect any sewer or utility within the limits of the construction. The Contractor shall proceed with caution in any excavation and shall use every means to determine the exact location of underground structures, pipe lines, conduits, and similar obstructions prior to excavation in the vicinity thereof. The City will not be responsible for the cost of protection or repair or replacement of any structure, pipe line, conduit, service connection, or similar facility above and below ground which may be broken or otherwise damaged by the Contractor's operations. All water and gas pipes and other conduits adjacent to or crossing the excavation shall be properly supported and protected by the Contractor.

C. Service Connections.

1. Sewer and utility services between mains and buildings shall be maintained and adjusted as necessary by the Contractor so as to provide as nearly a continuous operation as reasonably can be expected. This shall be accomplished in any way that the Contractor may desire, provided that the individual service not be inoperative more than two consecutive hours. The occupants shall be notified by the Contractor at least six hours in advance of such service interruptions. When a break occurs, the Contractor shall notify the affected occupant(s) of the probable length of time that the service will be interrupted.

2. If existing underground facilities or utilities require removal and replacement for the prosecution of this Work, all replacements of such underground construction or parts thereof shall be made with new materials conforming to the requirements of these Specifications or, if not specified, as approved by the Owner.

3. The removal and replacement of water services to accommodate new construction shall be the Contractor's responsibility within the limits where the new service line grade blends smoothly with the existing service line grade. This work will be incidental to the construction of the drainage facility and no additional compensation will be made.

4. The removal and replacement of sewer services to accommodate new construction shall be the Contractor's responsibility from the sewer main to a point where the new grade and existing grade can be matched. Payment will be made in accordance with Specification Section 02631 Paragraph 5.05.

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5. The Contractor shall be responsible for any damage to the service as a result of his operations. The City does not guarantee the number, size, condition, nor length of adjustment necessary to bring a service to a new grade.

3.04 BACKFILLING

A. General.

1. Bedding for drainage facilities shall be constructed in accordance with the following specifications for the various type facilities:

- a. Storm Drain Pipe: Specification Section 02632 Paragraph 3.02.B
- b. Manholes, Inlets and Special Structures: Specification Section 02640 Paragraph 3.02
- c. Reinforced Concrete Box Culverts: Specification Section 02641 Paragraphs 3.02.B and 3.01.B

After drainage facilities have been bedded and installed in accordance with appropriate specifications and upon permission of the Owner, the backfill may be placed. No trash will be allowed to accumulate in the space to be backfilled. Particular care shall be taken to avoid allowing wood to be included in the backfill, other than sheeting and shoring that has been approved to be left in place.

2. The Contractor shall at all times be responsible for the condition of the trenches and filled areas. He shall maintain frequent inspection of same and at any time before the final acceptance of the work by the City the trenches or filled areas settle and sunken places appear, he shall be required to refill these sunken places with suitable material as soon as they are discovered. All trenches shall be barricaded and caution lighted at all times for the protection of the public.

3. Backfilling shall be accomplished as soon as practicable after underground work is completed and inspected. Backfilling operations shall proceed in an orderly fashion following as closely behind construction operations as practical.

4. All backfill shall be placed in uniform horizontal layer. "Ramping," that is pushing backfill material down a ramp into excavated areas, will not be permitted unless authorized in writing by the Owner.

B. Backfill in Street Right-Of-Way and Improved Property

1. Backfill Material in Pavement Areas.

Backfill in excavations through pavement in street right-of-way or wherever prevention of backfill settlement is considered essential such as driveways and paved parking areas on private property, and where the Plans require or the Owner orders, shall be made with pit run gravel or other acceptable material from the top of the bedding material or foundation to the subgrade elevation of the pavement. Pea gravel, sand or similar granular materials approximately uniform in size and without bonding properties shall not be used.

2. Backfill Material Outside of Pavement Areas.

a. Backfill in excavations outside of pavement in street right-of-way or outside of public right-of-way shall be made with select, job-excavated earth from the top level of the bedding material or foundation to the subgrade elevation in paved area, or to within 1 inch of the surface in areas to be sodded, or to the surface in all other areas.

b. Nongranular, job-excavated material shall be free from debris, organic matter, perishable compressible materials, and shall contain no stones or lumps or rock fragments larger than 6 inches in dimension, nor be in such amount that will interfere with

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the consolidating properties of the fill material. Care shall be taken that stones and lumps are kept separated and will distributed, and that all voids are completely filled with fine materials. The upper 3 feet of backfill in sodded or planted areas shall be free of such rocks or lumps larger than 1 inch in diameter.

3. Placement and Compaction.

a. Storm Drain Trenches.

As soon as the pipe has been bedded, laid, jointed, and inspected by the Owner, backfilling shall continue in the following manner. Backfill shall be placed by hand in 6 inch loose layers above the bedding and tamped with heavy tampers or pneumatic tampers, special care being taken not to damage the pipe or joints, to a point 2 feet above the outside top of the pipe. From this point to the subgrade elevation of the pavement, or to the bottom of the sod, or to the original ground surface in all other areas, suitable backfill shall be placed in 12 inch loose layers and compacted to 95 percent of maximum density at plus or minus 2 percent of optimum moisture content as determined by Laboratory Standard Proctor Test (ASTM D 698).

b. Structure and Box Culvert Excavations.

As soon as the masonry or concrete work has set sufficiently to withstand compaction, and the Owner has inspected it, suitable backfill shall be placed in 6 inch loose layers concurrently and uniformly on all sides and compacted with heavy tampers or pneumatic tampers to 95 percent of maximum density at plus or minus 2 percent of optimum moisture content as determined by Laboratory Standard Proctor Test (ASTM D 698). Suitable backfill shall be placed in this manner concurrently on all sides from the foundation of the structure or culvert to the subgrade elevation of the pavement, or to the bottom of the sod or to the original ground surface in all other areas.

c. Concrete Channel Lining Excavations.

As soon as concrete work has set sufficiently to withstand backfilling and has been inspected by the Owner, select backfill material shall be placed by methods other than ramping and compacted by jetting or flooding from the foundation of the channel lining to 3 inches above the top of the wall. Backfill will be rounded slightly adjacent to the top of wall to an elevation 1 inch above the top of the wall to assure positive surface drainage over the top of the wall. Backfill operations shall be coordinated with placement of the weep hole drainage system behind the channel lining wall. Special care shall be exercised during backfilling operations to prevent settlement behind channel lining walls.

C. Backfill in Open Areas and Unimproved Property

1. Backfill Material. Backfill for storm drain pipe excavations in open areas and unimproved property shall be made with select earth material from the top level of the bedding material or foundation to the surface. Backfilling for structures, box culverts, and concrete channel lining excavations in open areas and unimproved property shall be performed in accordance with Specification Section 02631 Paragraph 3.04.B. Nongranular, job-excavated material to be used for backfill shall be free from debris, organic matter and perishable compressible materials, and shall contain no stones or lumps or rock fragments larger than 6 inches in dimension or in such amount that will interfere with the consolidating properties of the fill material. Stones and lumps shall be kept separated and well distributed, and all voids shall be completely filled with fine materials.

2. Placement of Backfill. Backfill procedures specified for improved areas shall apply from the trench bottom to a point 2 feet above the outside of the pipe. From this point to slightly above the surrounding surface elevation, suitable backfill may be placed by bulldozer or other mechanical means.

D. Drainage Facilities Placed on Fill

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1. Fill material placed in areas over which drainage facilities will be constructed shall be select earth material from the elevation of suitable subgrade to the bottom elevation for bedding or foundation of the drainage facility.

2. Placement and Compaction. If drainage facilities are constructed on filled areas, the fill material shall be placed in 6 inch loose layers and compacted to 95 percent of maximum density at plus or minus 2 percent of optimum moisture content as determined by Laboratory Standard Proctor Test (ASTM D 698) up to a point at least 2 feet above the outside top of the pipe or to the foundation of manholes, inlets, special structures, box culverts, concrete channel lining and concrete ditch paving. If compaction standards for storm drain pipe exceed that of the adjoining fill, the width of compaction for the storm drain shall be not less than the outside diameter of pipe plus 10 feet. If compaction standards for the manhole, inlets, special structure, box culverts, concrete channel lining and concrete ditch paving exceed that of adjoining fill, the limits of compaction for the facility shall be not less than 5 feet outside of the facility base slab.

3.05 FINAL GRADING

A. Final grading around and above drainage facilities shall be shaped to the slope of adjacent undisturbed ground. Sufficient grading operations shall be performed to provide natural surface drainage from adjacent properties into drainage facilities.

B. Grading above the top of concrete channel lining walls shall be accomplished in accordance with proposed cross-sections supplied by the City at the preconstruction conference or as directed by the Owner. Grading shall provide adequate drainage over the top of channel walls. Side slopes shall be graded to provide a minimum slope of ½ inch per foot beginning 3 inches above the top of channel walls. Side slopes shall be rounded off near the channel wall to an elevation of 1 inch above the top of wall. The addition of sod will provide a final side slope elevation 2 inches above the top of wall.

PART 4 – MEASUREMENT

4.01 UNDERCUT BACKFILL

Undercut backfill will be measured by the ton of suitable material.

4.02 SHEETING AND SHORING DIRECTED TO REMAIN IN PLACE

Sheeting and shoring directed to remain in place will be measured by the 1,000 board feet, in place prior to being cut off below grade. Sheeting and shoring placed and removed by the Contractor will not be measured for payment.

4.03 PAVEMENT BACKFILL

Pit run gravel or other suitable materials used for backfill as determined by Specification Section 02631 Paragraph 3.04.B will be measured by the ton and will be paid for at the contract unit price per ton furnished and placed, which price will be full compensation for furnishing, placing and compacting the selected fill.

4.04 UNLINED CHANNEL

Unlined channel will be measured per linear foot along the centerline for various channel cross-sections, complete in place.

4.05 SEWER BUILDING (HOUSE) CONNECTION REMOVAL AND REPLACEMENT

Sewer building connection removal and replacement for construction of drainage facilities shall be measured per each, complete in place. Sewer building connections damaged by the Contractor which do not require removal and replacement for construction of drainage facilities will not be measured for payment.

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4.06 GENERAL

All work for excavation, blasting, drainage of trench and dewatering, backfilling of excavation, compaction, grading, protection of existing utilities, water service connection adjustments, disposal of excess materials, and all other similar items included in this section of the Specifications but not covered by a Pay Item herein will be considered as a subsidiary obligation of the Contractor under other Pay Items of the Contract.

4.07 COMPACTION TESTING

Soil test as required by the Owner will be paid for by the test as performed by a testing agency which meets the approval of the Owner.

PART 5 – PAYMENT

5.01 UNDERCUT BACKFILL

Accepted quantities of undercut backfill will be paid for at the contract unit price per ton of backfill material furnished and placed, which price will be full compensation for undercut excavation, special protection, protection of existing utilities, and backfilling to bottom of facility subgrade elevations, complete in place.

5.02 SHEETING AND SHORING DIRECTED TO REMAIN IN PLACE

Accepted quantities of sheeting and shoring directed by the Owner to remain in place will be paid for at the contract unit price per 1,000 board feet in place prior to being cut off below grade, which will be full compensation for material only. The cost of placing sheeting and shoring to remain in place shall be incidental to the work. No payment will be made for sheeting and shoring placed and removed by the Contractor.

5.03 COMPACTION TESTING

Accepted quantities of compaction tests as required by the Owner will be paid for at the contract unit price per test.

5.04 UNLINED CHANNEL

Accepted quantities of unlined channel will be paid for at the contract unit price per linear foot for various channel cross-sections, which price will be full compensation for excavation, removal, and disposal of excavated material and grading, complete in place.

5.05 SEWER BUILDING (HOUSE) CONNECTION REMOVAL AND REPLACEMENT

Accepted quantities of sanitary sewer building connections removed and replaced will be paid for at the contract unit price per each connection, which price will be full compensation for excavation, removal of old connection line and appurtenances, materials and construction of new connection, joining to existing connection line, and backfilling, complete in place.

5.06 PAYMENT WILL BE MADE UNDER:

| <u>Item No.</u> | <u>Pay Item</u> | <u>Pay Unit</u> |
|-----------------|--|------------------|
| 02631-01 | Undercut Backfill | Ton |
| 02631-02 | Sheeting and Shoring Directed to Remain In Place | 1,000 Board Feet |
| 02631-03 | Soil Compaction Test | Each |
| 02631-04 | Unlined Channel | Linear Foot |
| 02631-04.____ | Description | Linear Foot |

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| <u>Item No.</u> | <u>Pay Item</u> | <u>Pay Unit</u> |
|-----------------|--|-----------------|
| 02631-05 | Sewer Building (House) Connection Removal and Replacement | Each |
| 02631-06 | Pavement Backfill | Ton |

END OF SECTION 02631