

SECTION 6

EXCAVATION, TRENCHING, BACKFILLING, AND BEDDING

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STANDARD CONSTRUCTION SPECIFICATIONS

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6.00 SCOPE

The work included in this section shall consist of furnishing all materials and equipment and performing all labor and services necessary to prepare the site and construct the facilities specified herein and shown on the plans. The work shall include clearing and grubbing of any or all types of materials, removal and stockpiling of topsoil, site grading, construction of embankments, trenching, dewatering, sheeting, shoring, bracing, and the backfilling and tamping of trenches and foundations. The Contractor shall perform all excavation to the depth shown of the plans or specified herein for all underground structures, including manholes, piers, and all other pipeline appurtenances show on the plans.

6.10 GENERAL

Where construction of the utility requires removal and replacement of pavements, driveways and sidewalks, cutting shall be by use of a concrete saw. The minimum depth of the vertical saw shall be $\frac{1}{2}$ the thickness of the pavement. Any damage done outside the limits of the removals specified shall be repaired ant the expense of the contractor. Direct payment will not be made for sawing, but shall be considered subsidiary to the items for which payment is made.

The contractor shall be responsible for providing, erecting and maintaining signage required for the work.

Comply with local requirements and specific requirement of the Stat of Nebraska. Special attention is directed to Title 29 Labor, Part 1518 – “Safety and Health Regulations for Construction” and Subpart P “Excavations, Trenching and Shoring.” Nothing contained in these specifications or Contract Documents shall relieve the contractor from complying with and Local, State, or Federal safety requirements.

No trees shall be removed unless shown on the plans or written instructions have been issued by the City Engineer or his authorized representative.

6.30 CONSTRUCTION METHODS

6.31 TRENCH EXCAVATION

A. Common Excavation - The trench shall be excavated along the lines and to the grades by open cut from the surface of the ground and at the width and to the depth necessary for the proper construction of the utility and its appurtenances, according to the plans and these specifications. Excavation shall include the removal of all materials not classified as unclassified excavation, including clay, silt, sand, gravel, hard pan, loose shale, and other louse stones in masses and boulders measuring less than one-half cubic yard in volume.

B. Unclassified Excavation – Excavation shall comprise of the satisfactory removal and disposition of all boulders measuring one-half cubic yard or more in volume and concrete or masonry structures encountered during excavation. Dispose of the material at a site approved by the City Engineer or his authorized representative.

C. General Preparation of Sub-grade - During common trench excavation, in which adequate soil conditions are present the Contractor shall avoid over excavation of the pipe bed sub-grade.

Any part of the bottom of the trench excavated below the specified sub-grade shall be refilled with approved materials compacted in two inch lifts to 95% of maximum unit weight density in accordance with these specifications. If additional excavation is required to correct unstable foundation conditions, the Contractor shall notify the City Engineer or his authorized representative and agree on the material used.

D. Trench Width - Cut utility trench walls vertically from bottom of trench to 1 foot above top of pipe. The width of the utility trench wall from bottom of trench to one foot above pipe shall be no greater than the width specified in the standard bedding details. Excessive trench width may be cause for providing a higher grade of pipe or bedding at no cost to the City. The width of the trench at the top of the pipe shall not be more than 18" larger than the diameter of the pipe if the outside diameter of the pipe is less than 33 inches and not more than 24 inches if the outside diameter of the pipe is larger than 33 inches.

E. Dewatering – The contractor shall provide and maintain adequate equipment to remove and dispose of ground water entering the excavations, trenches or other parts of the work. 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 complete to the extent that no damage from hydrostatic pressure, flotation or other cause will result. Unless dewatering is specified in the BID, no separate payment will be made for dewatering as it will be considered incidental to the BID for pipe.

6.32 BEDDING

A. Classes of Bedding - Bedding shall be defined as the area from the trench sub-grade as defined above to 12 inches above the top of the pipe. The Contractor shall use special care in placing this portion of the back fill so as to avoid injuring or moving the pipe. Embedment material must be place and compacted uniformly on each side of the pipe to prevent lateral displacement. The City Engineer or his authorized representative will determine in the field, following excavation, which sections of pipe shall receive granular bedding. The earth shall be thoroughly compacted in the bedding area in and around the pipe and joints with approved mechanical hand tampers.

B. Concrete Cradle Bedding, Class A - The Contractor shall provide for the bedding of a ditch conduit in accordance with the standard detail titled Class A Bedding in which the lower part of the conduit is bedded in a cradle constructed of 2000 psi (140.7 kg/sq cm) concrete or better, having a minimum thickness under the pipe of one-fourth its outside diameter. The cradle shall be poured as a unit without horizontal construction joints. The remainder of the conduit is entirely surrounded to a height of 12 inches (30.5 cm) above its top by densely compacted backfill placed in lifts not exceeding 4 inches (10.2 cm) in thickness.

C. First Class Bedding, Class B - The Contractor shall provide for the bedding of a ditch conduit in accordance with the standard detail titled Class B Bedding in which the pipe is carefully bedded on fine granular materials in an earth foundation that is

carefully shaped to fit the lower part of the pipe for a width of at least 60% of its breadth, and in which the remainder of the conduit is entirely surrounded to a height of 12 inches (30.5 cm) above its top by densely compacted material that is carefully placed to fill completely all spaces under an adjacent to the pipe in lifts not exceeding 4 inches (10.2 cm) in thickness.

D. Ordinary Bedding, Class C - The Contractor shall provide for the bedding of a ditch conduit in which the pipe is bedded with "ordinary" care in an earth foundation shaped to fit the lower part of the pipe in accordance with the standard detail titled Class C Bedding – Shaped Subgrade. The contractor, at his option may provide a granular foundation course in accordance with the standard detail titled Class C Bedding - Granular Foundation instead of earth shaped foundation. No additional payment will be made for said granular foundation. The lower 50% of outside breadth shall be to 95% of Standard density, ASTM D-698 or 75% Relative density, ASTM D-2049 and in which the remainder of the pipe is surrounded to a height of at least 12 inches (30.5 cm) above it top by compacted backfill at above specified density. Carefully place and fill all spaces under and adjacent to the pipe in lifts not exceeding 8 inches (20 cm) loose measurement in thickness.

E. Special Bedding, Class D - This method of bedding a ditch conduit in which little care is exercised to shape the foundation to accept the lower part of the conduit. The trench bottom shall support the entire length of the conduit. No bell holes are required.

6.33 TRENCH BACKFILL

A. Backfilling - All backfill unless otherwise specified, shall be compacted to the minimum of 95% of the established Standard Density ASTM D-698 and at optimum moisture content, plus or minus 3% or a minimum of 75% Relative Density ASTM D-2049. All mechanical methods proven to create desired result can be used, with special care given to required pipe cover as per manufactures installation requirements. Test of the backfill will be done in accordance with the soil testing section of this specification. All testing and completed backfill must be completed to the satisfaction of the City Engineer or his authorized representative. Water flushing for consolidation of backfill is not permitted.

B. Common Trench Backfill - Backfill in the area above up to the top of the conduit bedding of pipe shall be designated as trench backfill. Trenches shall not be backfilled until all required tests are performed and until the system installed conforms to the requirements of the plans and specifications. The trenches shall then be carefully backfilled up to the top of the conduit bedding as specified in the section entitled Pipe Bedding. As backfilling proceeds, the entire mass shall be compacted with a mechanical compactors, provided, however, in all locations where plastic soils are encountered, the backfill material shall not be placed until the moisture content is optimum to obtain maximum density when tamped into place with mechanical tampers. Exercise extreme care in backfilling operations to avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion. Repair damages, distortions or misalignments to full satisfaction of Engineer.

Trench backfill and compaction testing shall adhere to the following requirements:

Under pavements and in Public Right-of-Way: The backfill material above the top of the conduit bedding shall be deposited in approximately 8 inch (20 cm) layers, loose measurement and compacted to the required densities. The Contractor is responsible for restoring any pavement or surfacing disturbed by his work in accordance with these contract documents. Observe specific pipe or conduit manufacturer's recommendations regarding methods of backfilling and compaction. Backfill shall be compacted to at least 95% of the maximum dry density (obtained at optimum moisture content plus or minus 3% for silt or clay with no required moisture content for sand) as determined by ASTM D-698.

Other Areas: Place backfill in lifts thickness capable of being compacted to densities specified. Maximum lift thickness shall be 2 feet but shall be a minimum of 3 feet above top of pipe. Observe specific pipe or conduit manufacturer's recommendations regarding methods of backfilling minimum cover above pipe and compaction methods. Backfill shall be compacted to at least 90% of the maximum dry density (obtained at optimum moisture content plus or minus 3% for silt or clay with no required moisture content for sand) as determined by ASTM D-698.

C. Backfill around structures and appurtenances - Compaction of backfill within 3 feet of all structures and utility appurtenances, including but not limited to, valves, hydrants, manholes, and inlets. Shall be accomplished by hand methods using appropriate equipment for the soil type(s) encountered.

D. Backfill Material - Materials excavated from the utility trench shall be reused for trench backfill material unless otherwise stated in the plan details. Any material containing frozen earth, large rocks, cinder, trash, vegetation, decomposing material or any other material deemed unsuitable by the City Engineer or his authorized representative shall not be used.

E. Backfill Moisture Control - All backfill and sub-grade material that is outside the specified moisture requirements must be moisture conditioned prior to placement. When additional moisture is needed apply to backfill uniformly and mix soils with mechanical equipment until soil is uniform in moisture content. Continue until soil contains proper moisture content to meet requirements and will obtain passing densities when compacted.

Soil that is too wet to obtain specified compaction may be spread out and dried to proper moisture content. Materials may be disked, harrowed, or mixed with dryer material to assist in the drying process.

F. Backfill Gravel - All gravel used for backfill shall consist of natural bank gravel having durable particles graded from fine to coarse in a reasonable uniform combination with no stones larger than 2 inches in size. It shall not contain a total of more than 10% by weight of loam or clay. No more than 15% shall pass a No. 200 sieve.

G. Freezing Weather - Backfilling shall not be done in freezing weather, except by permission of the City Engineer or his authorized representative, nor shall any fill be made where the material already in the trench is frozen. If construction proceeds at any time when frozen material is encountered and frozen material is placed in the

trench line, all such trenches shall be re-compacted in the spring after frost conditions are no longer present in the ground. This recompaction of the trench shall include the removal of all material to a depth of 12 inches below the depth of the frozen material and the replacement and re-compaction of the trench to the proper grade with suitable material.

H. Disposal of Surplus Material - The contractor shall dispose of all surplus material not needed for fills or other designated purposes. All material deemed unsuitable by the Engineer shall be disposed of properly and replaced with approved material.

6.34 MISCELLANEOUS

A. Protection of Existing Utilities and Properties - The accuracy of location of existing underground utilities as shown on the plans is not guaranteed. It shall be the duty of the Contractor to locate these utilities in advance of excavation and to protect them from damage after uncovering. No house service lines are shown on the plans. The Contractor shall contact the owners of the utilities for assistance in locating these service lines. Any expense incurred by reason of damaged or broken lines shall be the responsibility of the Contractor.

B. Abandonment of Utilities - When pipes, conduits, sewers, or other structures are removed from the trench leaving dead ends in the ground, such ends shall be fully plugged or sealed with approved concrete plugs by the Contractor. Abandoned structures such as manholes or chambers shall be entirely removed unless otherwise specified or shown on the plans. All materials from abandoned utilities which can be readily salvaged shall be removed from the excavation by the Contractor. All salvageable materials remain the property of the City of Kearney unless otherwise agreed upon.

C. Survey Reference Protection - Give careful attention to maintain bench marks, survey monument and any survey staking during the project. The cost of re-staking or avoidable destruction to survey markers will be at the expense of the contractor. At any point an established survey point is disturbed notify proper personnel as to avoid the use of incorrect bench marks.

D. Construction Right-of-Way - Project construction shall be contained to designate City right-of-ways during all phases. Any damaged to adjacent properties, structures, vegetation, or any damage claims resulting from operations outside of the City right-of-ways will be the sole responsibility of the Contractor.

E. Protection - Barricade and fence open excavations or depressions resulting from work during non-working hours and when not working in immediate area.

F. Settlement – The contractor shall be responsible for all settlement and erosions of backfill, fills and embankments which may occur within two years after the final completion and acceptance of the project.

6.35 CLEANUP

A. Project Clean-up – It shall be the complete responsibility of the Contractor to maintain the work site area in a clean and orderly manner. Every effort will be made to contain debris and wasted construction materials. All signage, drives, sprinklers, or any other utility damaged due to construction must be replaced or restored to its original condition. Any temporary site access and storage areas will be restored to final condition.

6.70 QUALITY CONTROL

6.71 TESTING

A. Soils Testing - Trench compaction testing shall adhere to the following requirements:

Under pavements and in Public Right-of-Way: Backfill shall be compacted to at least 95% of the maximum dry density (obtained at optimum moisture content plus or minus 3% for silt or clay with no required moisture content for sand) as determined by ASTM D-698. Test will be taken at a minimum 100 feet intervals horizontally and 2 feet intervals vertically of compacted area worked.

Other Areas: Backfill shall be compacted to at least 90% of the maximum dry density (obtained at optimum moisture content plus or minus 3% for silt or clay with no required moisture content for sand) as determined by ASTM D-698. Test will be taken at a minimum 300 feet intervals horizontally and 2 feet intervals vertically.

In place field density test will be performed for by the owner. Costs of passing test will be paid for by the owner. Where backfill compaction does not meet moisture density test requirements, performance of additional testing as required until compaction meets or exceeds requirements will be borne solely by the contractor. All cost associated with failing tests will be paid by the contractor.

The Engineer in charge shall be furnished a copy of the density testing results. Information on length or area worked material identification and description, test thickness such as probe length or sample depth, location of sample, elevation of sample, etc. shall be recorded for each sample.

Required proctor curves will be obtained by the contractor at no additional cost to the Owner.

In the case tested backfill areas fail to meet established moisture, density requirements the cost for removal, recompaction of materials, and retesting shall be the responsibility of the Contractor. Retesting shall be performed prior to the continuation of backfilling efforts. It will be the responsibility of the Contractor to schedule retesting as to avoid delays in progress.

B. Geotechnical Laboratory Testing - At the expense of the Contractor the following laboratory tests shall be performed by an independent testing laboratory to ensure compliance of all backfilled areas:

One Standard Density test (ASTM D698) for cohesive soils, and for each type of embedment or backfill material proposed.

One Relative Density test (ASTM D4253 or ASTM D4254) for cohesion-less soils, and for each type of embedment or backfill material proposed.

6.72 EROSION CONTROL

A. Soil Erosion and Sedimentation Control - The Contractor shall conduct his operations in such a manner that all soil is confined within the project limits and prevented from entering storm sewers, water courses, rivers, lakes, reservoirs, or wetlands.

The Contractor shall place a filter or barrier composed of straw, stone or other courses to prevent sedimentation in these structures. After the construction operations are completed, the Contractor shall remove these filters and clean all the sediment and debris from the catch basins, ditches, or other storm sewer structures.

Soil erosion and sedimentation control measures if indicated on the plans are considered as minimum requirements and are not to be considered as complete and all inclusive. Additional control measures as may be required due to circumstances or conditions at the time of construction or as directed by the City of Kearney, or the designated Soil Erosion Control agency, shall be placed as required to insure conformance with all NPDES permitting requirements. Deviations from or additions to the erosion control measures shown on the plan shall be subject to the approval of the City of Kearney or his authorized representative.

The cost of this work and other control measures which may be required or directed by the City of Kearney shall be incidental to the cost of the project unless specific items have been provided in the proposal.

6.90 MEASUREMENT AND PAYMENT

A. Measurement and Payment - No separate payment will be made for Excavation, Trenching, Bedding, and Backfill or any related operations. These operations are included in the Bid for pipe installation and will be paid in accordance to the Bid.

B. Removal and Replacement of Existing Pavements - Any pavement, driveways and sidewalks removed for trench excavation will be done in strict accordance to the plans. If a need to extend the limits of removal is encountered it must be approved by the City Engineer or his authorized representative. Payment for the removal and replacement of such items will be at the contract unit price per square foot of material in accordance to the drawings. Any material removed in excess of the construction drawings will be at the Contractors expense, unless approved by the City Engineer or his authorized representative prior to removal. Sawing for removal will be considered as part of the contract replacement bid and will not be paid for separately.

C. Unclassified Excavation – Separate payment will be made for this item according to the unit price BID per lineal foot of trench.

D. Disposal of Surplus Material - No measurement or direct payment will be made for disposal of stock piling surplus materials. The cost of disposal or stock piling

surplus materials shall be considered subsidiary to the other items for which payment is made.

E. Unsuitable Materials - All material deemed unsuitable by the Engineer and required to be removed from the job site, as well as approved replacement material not readily available at the job site, shall be measured and paid for by the cubic yard.