

**SECTION 02226
TRENCH EXCAVATION AND BACKFILL**

PART 1: GENERAL

1.1 SCOPE

- A) This section includes all trench excavation, backfill and related work for the construction of the designated pipelines, service lines, hydrant assemblies, appurtenances, and other incidental work.
- B) Trench Excavation and Backfill Includes:
- 1) Clearing, grubbing, grading, excavation, fill, backfill, trenching, excess excavation, bedding, pipe zone and borrow material, and surface restoration that may be required to complete the work.
 - 2) Furnishing, placing and use of sheeting, shoring and sheet piling necessary in excavating to prevent widening or sloughing of the trench which could be hazardous to human safety, the pipe or appurtenances being installed, existing utilities and structures, or any other existing facility.
 - 3) Performing all pumping and fluming necessary to keep the trenches free from water. The method of dewatering shall provide for a completely dry foundation at the final lines and grades of the excavation and be in accordance with NPDES and CDPHE's permitting requirements.
 - 4) If the bottom of the excavation is soft or unstable and cannot satisfactorily support the pipe or structure in the opinion of the Engineer, a further depth and width shall be excavated and refilled with material as directed by the Engineer.
 - 5) Providing for uninterrupted flow of existing drains and sewers and the temporary disposal of water from other sources during the progress of the work.
 - 6) Supporting and protecting all structures, pipes, conduits, culverts, posts, poles, wires, fences, buildings and other public and private property adjacent to the work.
 - 7) Removing and replacing existing sewers, culverts, pipelines and bulkheads where necessary.

- 8) Removal and proper disposal of all surplus or excess excavated material from the jobsite.
 - 9) Performing all backfilling, grading and compaction to the limits specified or ordered by the engineer.
 - 10) Restoring all property damaged as a result of the work included under this section.
- C) The Work includes obtaining and transporting suitable fill material from off-site when on-site material is not available.
- D) The Work includes transporting surplus excavated material not needed for backfill at the location where the excavation is made, to other parts of the work where filling is required, or disposal of all surplus on other sites provided by the Contractor or as directed by the Owner.

1.2 LABORATORY SERVICES

- A) Owner will provide for the backfill compaction testing services as described below.
- 1) Sieve analysis (ASTM C136): One test for each select material source and type:
 - a) Selected bedding and pipe zone backfill material.
 - b) Crushed rock aggregate base course material.
 - c) Pit run aggregate material.
 - 2) Backfill Compaction:
 - a) One moisture density curve (AASHTO T180) for each size and type of material used for backfill. The maximum dry weight and optimum moisture content shall be indicated. The cost of all retests required due to any unauthorized change in backfill material shall be borne by the Contractor.
 - b) Test consolidated backfill material in trenches around pipes for conformance with specified "compaction requirements," contained herein:

- (1) Where tests indicate insufficient values, perform additional tests as required by the Owner's representative. Testing shall continue until specified values have been attained by additional compaction effort.
- (2) Retests shall be referenced to the corresponding failing test. The cost of all retests shall be borne by the Contractor.

1.3 CONSTRUCTION WITHIN ROADWAY AND RAILROAD RIGHT-OF-WAYS

- A) Permits: the contractor shall be responsible for ensuring that all permits required for construction are obtained.
- B) Contractor shall provide bonds and insurance as required by affected agency prior to proceeding with any work.
- C) Notification: the Contractor shall give written notice to appropriate officials of the affected Federal or State Highway Department, City, County or railroad at least five days, not including weekends and holidays, before starting construction within highway or railroad right-of-ways and as required under other roadways.

1.4 SUBMITTALS

- A) Submittals shall be in accordance with the requirements of these Contract Documents and shall include:
 - 1) When excess excavated material is disposed of at locations off the project site, the contractor shall obtain and submit written permission from the Owner of the property upon which the material is to be placed.
 - 2) Executed copy of permit(s) to dispose of material specified under this section.

1.5 PROTECTION

- A) Test Pits: The Contractor shall dig such exploratory test pits as may be necessary in advance of excavation to determine the exact location and elevation of subsurface structures, pipelines and conduits which are likely to be encountered and shall make acceptable provision for their protection, support, and maintenance in operation.
- B) Sheeting, Shoring and Bracing

- 1) The Contractor shall furnish and install adequate sheeting, shoring, and bracing to maintain safe working conditions, and to protect newly built work and all adjacent and neighboring structures from damage by settlement.
- 2) Bracing and sheeting shall conform to the recommendations in the Occupational Safety and Health Administration Standards for Construction (OSHA). A trench box may be used in lieu of sheeting and bracing as permitted by OSHA. Unless otherwise approved, all trench support materials shall be removed in a manner that will prevent caving of the sides and movement or damage to the pipe.
- 3) Bracing shall be arranged so as not to place a strain on portions of completed work until the construction has proceeded far enough to provide ample strength. Sheeting and bracing may be withdrawn and removed at the time of backfilling, but the Contractor shall be responsible for all damage to newly built work and adjacent and neighboring structures.
- 4) All sheeting, shoring and bracing shall be of Contractor's design and shall be in accordance with all Federal, State and Local codes and requirements.

C) Removal of water

- 1) The contractor shall at all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavations or other parts of the work and shall keep said excavations dry until the pipelines to be placed therein are completed. In water bearing sand, well points and/or sheeting shall be supplied, together with pumps and other appurtenances of ample capacity to keep the excavation dry as specified.
- 2) The contractor shall dispose of water from the work in a suitable manner without damage to adjacent property or structures.
- 3) Water shall not be allowed to rise until concrete has set for a minimum of 24 hours. Water shall not be allowed to rise unequally against an unsupported structure.
- 4) Contractor shall provide silt fences, straw bales, and/or sedimentation basins as required to clarify waters prior to discharge in accordance with Federal, State and Local requirements.

1.6 DEFINITIONS

A) Classification of Excavated Materials

- 1) Unclassified Native Material shall be defined as all material not classified as rock excavation or unsuitable material that is removed from the trench by required excavation.
- 2) Rock Excavation shall be defined as follows:
 - a) Rock excavation shall consist only of that solid bedrock or ledge rock and boulders over two (2) cubic yards in volume which cannot be removed by a D8K (or approved equal) with four barrel hydraulics and dual rippers or 90,000 pound class Excavator (P.C. 400 Komatsu or 235 Caterpillar or approved equal) with single shank ripper on back of bucket, which shall not be more than thirty-six inches (36") in width, but which requires systematic drilling, blasting or the use of rock splitters pneumatic hammers and wedges. All D8K's and 90,000 pound class Excavators shall be in excellent operating condition and operated by personnel competent to operate like machinery.
 - b) Removal of existing concrete and asphaltic surfaces does not qualify as rock excavation.
- 3) Unsuitable Materials
 - a) Unsuitable material shall be defined as all material that is either too wet, contains grass, roots, brush or other vegetation, large rocks or is classified under ASTM D 2487 as PT, OH, CH, MH or OL and materials which cannot be compacted to achieve the required percentage of maximum density for the intended use shall not be used in the work.

B) Trench Backfill Zones

- 1) Pipe embedment zone - The area from 4-inches under the pipe to 1/6 the outside pipe diameter distance above the bottom of pipe for the width of the trench.
- 2) Pipe zone - The area from the top of the pipe embedment zone to 6-inches above the pipe for the width of the trench.
- 3) Trench backfill zone - The area from 6-inches above the pipe to bottom line of surface restoration for the width of the trench.

C) Trench Classifications

- 1) Class I Trench - Class I trench shall have select granular material in all three zones for backfill material. For use under paved or graveled roadways, road shoulders, gravel and paved driveways, or as directed by the Engineer. The type of material required for each backfill zone shall be as follows:

Class I Trench	
Backfill Zone	Backfill Material
Pipe Embedment Zone	Type B or C
Pipe Zone	Type A, B or C
Trench Backfill Zone	Type A and/or E <i>(Top 12-inch under asphalt must be Type A)</i>

- 2) Class II Trench - Class II trench shall have select granular material in the pipe embedment and pipe zones and suitable native excavated material in the trench backfill zone to 6-inches below finish grade. The top 6-inches shall be select aggregate base course material as specified. For use under gravel roads, driveways, road shoulders and future or current paved areas, or as directed by the Engineer.

Class II Trench	
Backfill Zone	Backfill Material
Pipe Embedment Zone	Type B or C
Pipe Zone	Type A, B or C
Trench Backfill Zone	Type A and D <i>(Top 6-inch must be Type A)</i>

- 3) Class III Trench - Class III trench shall have select granular material in the pipe embedment zone and native excavated material in the pipe zone and trench backfill zone. For use under unimproved open areas or under gravel roads, road shoulders and driveways or future paved areas with the top surface of select aggregate base course material to the depth specified or shown on the drawings or as directed by the Engineer.

Class III Trench	
Backfill Zone	Backfill Material
Pipe Embedment Zone	Type B or C
Pipe Zone	Type D
Trench Backfill Zone	Type A and D <i>(Type A surface depth as specified)</i>

- 4) Class IV Trench - Class IV trench shall have unclassified native excavated material in the pipe embedment and pipe zones and unclassified native excavated material in the backfill zone for backfill material. For use under unimproved open rural area or as directed by the Engineer.

Class IV Trench	
Backfill Zone	Backfill Material
Pipe Embedment Zone	Type D
Pipe Zone	Type D
Trench Backfill Zone	Type D

PART 2: PRODUCTS

2.1 SELECTED GRANULAR BACKFILL MATERIAL REQUIREMENTS

- A) Selected backfill material shall consist of well-graded pit run, sand or crushed rock or screenings, meeting the following requirements:
- 1) Type A: 3/4-inch crushed rock aggregate base course material that meets the gradation requirements of CDOT for class 6 aggregate base course.

Type A - Class 6 CDOT Aggregate Base Course	
Sieve Size	Total Percent Passing by Weight
3/4 - inch	100
No. 4	30-65
No. 8	25-55
No. 200	3-12

- 2) Type B: Selected bedding and pipe zone backfill material shall be 3/4-inch minus screened rock durable and free from slaking or decomposition under action of alternate wetting and drying. The material shall meet the following gradation requirements:

Type B – 3/4-inch Minus Screened Rock	
Sieve Size	Total Percent Passing by Weight
3/4 - inch	100
No. 4	15 maximum

- 3) Type C: 3/8-inch minus crusher screenings for bedding material with one hundred percent (100%) passing the 3/8-inch sieve and fifty percent (50%) or less passing the No. 8 sieve.

Type C – 3/8-inch Minus Crusher Screenings	
Sieve Size	Total Percent Passing by Weight
3/8 - inch	100
No. 8	50 maximum

- 4) Type D: All materials considered as suitable for fill and backfill obtained from the required excavation meeting the requirements of paragraphs 2.1 and 2.2 herein.
- 5) Type E: Pit run aggregate that is relatively uniformly graded having a maximum rock size of 8-inches and no more than 20% by weight passing the No. 200 sieve size.

Type E – Pit Run Aggregate 8-inch minus	
Sieve Size	Total Percent Passing by Weight
8 - inch	100
No. 200	20 maximum

2.2 UNCLASSIFIED NATIVE MATERIAL

- A) Excavated material free of vegetable matter, large rocks and debris.
- B) Excavated material approved by the Engineer for use as backfill in designated trench backfill zones.
- C) Individual particles no larger than 8 inches in diameter within trench backfill zone and no larger than 2 inches in diameter within embedment and pipe zones.

2.3 FOUNDATION STABILIZATION

- A) Gravel or crushed aggregate with 100% passing the 1.5-inch sieve size or Engineer approved clean, well-graded granular material.

- B) Excavation Below Grade: Where the excavation is carried beyond or below the lines and grades shown on the plans or staked, the Contractor shall, at his own expense, refill all such excavated space with required pipe bedding material.
- C) Unstable Trench Bottom: Where the excavation is found to consist of muck, organic matter or any other material that the Engineer determines to be unsuitable for supporting the pipe, an additional depth shall be excavated as directed by the Engineer and replaced with an approved granular stabilization material. Payment shall be made on the unit price provided in the bidding schedule.

PART 3: EXECUTION

3.1 PREPARATION

- A) The site of an open cut excavation shall be first cleared of all obstructions preparatory to excavation. Wherever paved or surfaced streets are cut, saw wheel or approved cutting devices shall be used. Width of pavement cut shall not be less than 12-inches greater than trench width. All cut or broken pavement shall be removed from site during excavation.
- B) The Contractor shall maintain street traffic at all times and erect and maintain barricades, warning signs, traffic cones, and other safety devices during construction in accordance with Manual of Uniform Traffic Control Devices (MUTCD) to protect the traveling public. Provide flagmen as required during active work in roadway areas.
- C) Intent of specifications is that all streets, structures, and utilities be left in condition equal to or better than original condition. Where damage occurs and cannot be repaired or replaced, Contractor shall purchase and install new material which is satisfactory to Owner. Plans and/or specifications cover and govern replacement and restoration of foreseeable damage.
- D) The operations shall be confined to the work limits provided. Avoid encroachment on, or damage to, private property or existing utilities unless prior arrangements have been made with copy of said arrangement submitted to Engineer.

3.2 TRENCHING

- A) Excavation for trenches in which pipelines are to be installed shall provide adequate space for workmen to place and join the pipe properly, but in every case the trench shall be kept to a minimum width. The width of trench at the top of the

pipe shall not exceed the limits specified in Section 02667 or as shown on the drawings.

- B) Excavation shall be to the depth necessary for placing of granular bedding material under the pipe as shown on the drawings. If over digging occurs, the trench bottom shall be filled to grade with compacted granular bedding material.
- C) Unless otherwise permitted by the Engineer, trenching operations shall not be performed beyond the distance which will be backfilled and compacted the same day.
- D) In general, backfilling shall begin as soon as the conduit is in approved condition to receive it and shall be carried to completion as rapidly as possible. New trenching shall not be started when earlier trenches need backfilling or the surfaces of streets or other areas need to be restored to a safe and proper condition.
- E) Where the excavation activities require the removal of portions of an abandoned pipeline, 2,500 psi concrete plugs shall be installed in the open ends of the pipe. Concrete plugs to be a minimum one and one-half (1-1/2) times the diameter of the pipe.
- F) Water facilities, including pipe, fittings, valves, meter services, hydrants, and other appurtenances or at least every 50 linear feet shall not be installed without line and grade stakes approved by Ute Water Inspector. Line and grade for water mains shall be established under the direct supervision of a PLS.

3.3 EXCAVATION OF UNSUITABLE MATERIALS

- A) Unsuitable materials existing below the contract bottom limits for excavation shall be removed only as directed by the Engineer. Such excavation shall be conducted at a time when the engineer is present and shall not exceed the vertical and lateral limits as prescribed by the engineer.
- B) Where soft subgrade is encountered in which satisfactory stability cannot be obtained by moisture control and compaction, the unstable material shall be excavated to the depth required by the Engineer.
- C) Backfill with foundation stabilization material compacted in layers not exceeding 12-inches depth to required density and compaction.

3.4 DISPOSAL OF UNSUITABLE AND SURPLUS MATERIAL

- A) All excavated materials which are unsuitable for use in backfilling trenches or around structures, and materials excavated that are in excess of that required for backfilling and for constructing fills and embankments as shown on the drawings, shall be disposed of by the Contractor at own expense and at disposal sites provided by him as may be required.
- B) Surplus or excess excavated material shall be disposed of at designated spoil sites in a legal manner, in full compliance with applicable codes and ordinances.

3.5 ROCK EXCAVATION

- A) Where the bottom of the trench encounters ledge rock and/or boulders and large stones which meet the definition of "rock" as described herein, said rock shall be removed to provide additional clearance below the pipe zone as shown in the Contract Documents.
- B) Excavations below subgrade in rock shall be backfilled to subgrade with approved bedding material and thoroughly compacted as shown in the Contract Documents.
- C) Contractor to excavate and remove the overburden exposing the rock surface, allowing the Engineer to profile the excavated trench for rock measurement. The profiling of the exposed rock surface shall be done prior to commencement of rock removal activities.
- D) Blasting for excavation shall be permitted with approval by the Engineer and only after securing approval(s) from federal, state, and other authorities having jurisdiction.

3.6 REMOVAL OF CONCRETE CURBS & SIDEWALKS

- A) Where trench excavation requires removal of concrete curbs and/or sidewalks, the curbs and/or sidewalks shall be sawcut as required and removed at a tooled joint unless otherwise authorized by the Engineer.
- B) The intention of this requirement is to facilitate the replacement of curbs and sidewalks to the joint pattern of the existing and surrounding curbs and/or sidewalks. The sawcut lines for concrete sidewalk and curb cuts shown on the drawings are schematic and not intended to show the exact alignment of such cuts.

3.7 BACKFILL AND COMPACTION

- A) General

- 1) Backfill Immediately: All trenches and excavations shall be backfilled immediately after pipe is laid therein, unless otherwise directed by the Engineer. Under no circumstances shall water be permitted to rise in un-backfilled trenches after pipe has been placed.
- 2) Backfilling with Excavated material: Where specified or directed, material excavated in connection with the work shall be used for backfilling, in accordance with the type of trench classification shown on the contract drawings. No material shall be used for backfilling that contains stones, rock or pieces of masonry greater than 8-inches within the trench zone or greater than 2-inches within the pipe and embedment zones. No material shall be used for backfilling that contains frozen earth, debris, organic material, or marl.
- 3) In no case shall backfill material deposited by machinery be allowed to fall directly on the pipe and in all cases the bucket shall be lowered so that the shock of the falling backfill material will not cause damage.
- 4) All backfill material shall be placed with moisture-density control in accordance with the typical trench detail shown on the Standard Detail Sheets. All approved backfill material shall be adjusted to within two percent (2%) of the optimum moisture content prior to its placement in the trench. Jetting or water soaking trenches to achieve compaction of the backfill will not be permitted except when the backfill consists of gravel or other granular material having less than twenty percent (20%) by weight passing a No. 200 sieve.
- 5) During initial backfilling, the contractor shall take all necessary precautions to prevent movement or distortion of the pipe or structure being backfilled. Pipe zone material shall be placed and compacted in even lifts on both sides of the pipe to above the top of the pipe. Above the pipe bedding and pipe zone the earth backfill material shall be placed full width in uniform layers not more than twelve (12) inches thick. Each layer shall be compacted to the required density with approved mechanical or hand tamping equipment.

B) Embedment Zone

- 1) Pipe embedment material shall be placed in the trench, compacted and shaped to provide continuous support for the pipe between joints or fittings.
- 2) Bell holes shall be provided for all joints or fittings as required to permit assembly.

- 3) Pipe shall be laid directly on the embedment materials; embedment material particle size must be limited to less than 2-inch in diameter.

C) Pipe Zone

- 1) Backfill shall be placed in uniform layers on both sides of the pipe. Each layer shall be placed, then carefully and uniformly tamped to the specified density so as to eliminate the possibility of lateral displacement of the pipe.
- 2) Care shall be taken to ensure that the material under the haunches of the pipe is sufficiently compacted with handheld tamping bars supplemented by walking in and slicing material under the haunches with a shovel to ensure voids are completely filled.
- 3) Pipe zone material particle size must be limited to less than 2-inch in diameter.

D) Trench Backfill Zone

- 1) After the backfill has been placed and compacted around the pipe and structures to a height of 6-inches over the top as specified above, the remainder of the trench may be backfilled appropriately with proper equipment.
- 2) The backfill material shall be deposited in horizontal layers not exceeding 12-inches thick, and each layer shall be thoroughly compacted to the specified density by approved methods before the succeeding layer is placed.

E) Backfilling Under Existing Conduits

- 1) Where it is necessary to undercut or replace existing utility conduits and/or service lines, the excavation beneath such lines shall be backfilled the entire length with granular bedding material tamped in place in 6-inch layers to the required density. The granular bedding shall extend outward from the spring line of the conduit a distance of 2 feet on either side and thence downward at its natural slope.

F) Backfilling Under Pavement and Walks

- 1) Where any pavement, driveway, parking lot, curb and gutter, or walk is to be placed over a backfill area, granular material shall be used. The material

shall be placed and compacted to the required density in accordance with the specification contained herein.

3.8 COMPACTION REQUIREMENTS

- A) Compaction requirements for Type I, Type II and Type III trench shall be as follows:
- 1) Compaction of the pipe embedment and pipe zones shall be achieved by mechanical compaction in horizontal lifts or other approved method to ninety percent (90%) of the maximum dry density per AASHTO T99 test method.
 - 2) Compaction of the trench backfill zone shall be achieved by mechanical compaction in horizontal lifts or other approved method to ninety-five percent (95%) of the maximum dry density per AASHTO T99 test method.
- B) Compaction requirements for Type IV trench shall be as follows except under gravel roads, driveways, road shoulders or future or current paved areas which shall be compacted in accordance with paragraphs A.1 and A.2 above.
- 1) Compaction of the pipe embedment and pipe zones shall be achieved by mechanical compaction in horizontal lifts or other approved method to eighty percent (80%) of the maximum dry density per AASHTO T99 test method.
 - 2) Compaction of the trench backfill zone shall be achieved by mechanical compaction in horizontal lifts or other approved method to eighty-five percent (85%) of the maximum dry density per AASHTO T99 test method.

3.9 COMPACTION TESTS

- A) Trenches shall be backfilled and consolidated in layers, as specified, to the existing ground surface. All backfill shall be frequently tested to insure that the required density is being attained. Contractor shall contact governing agency to determine their requirements for compaction testing, however, the minimum requirements for compaction testing shall be as follows:
- 1) For every 300 lineal feet of trench and each branch or section of trench less than 300 feet in length, at least one compaction test shall be performed for each two foot vertical lift of backfill material placed. The first test shall be taken approximately two feet above the top of pipe and the last test shall be at the pavement subgrade or 6 inches below the ground surface in unpaved

areas. Compaction tests shall be taken at random locations along the trench and wherever poor compaction is suspected. If any portion of the backfill placed fails to meet the minimum density specified, the area shall be defined by additional tests if necessary and the material in the designated area shall be removed and replaced to the required density at the Contractor's expense.

- 2) All compaction testing shall be performed by a certified testing laboratory. The cost of the testing shall be borne by the Owner. It shall be the Contractor's responsibility to assist in coordinating the testing and to make necessary excavations in order to accommodate compaction tests at all locations designated.
- B) The initial test series for each type of backfill material shall be continued until the method of consolidation employed has proven to attain the required compaction. Any change in the proven method of consolidation will not be permitted unless approved by the Owner's Representative.
- C) Subsequent tests or series of tests shall be in locations and at depths ordered by the Engineer.
- D) The cost of all retests shall be borne by the Contractor.

3.10 SURFACE RESTORATION AND CLEAN UP

- A) Surface restoration shall conform to these Contract Documents where applicable. Restore ground surfaces to original conditions and elevations unless otherwise specified or directed.
- B) Clean up and remove all excess materials, construction materials, debris from construction, etc. Replace or repair any fences, mailboxes, signs, landscaping, or other facilities removed or damaged during construction. Replace all lawns, topsoil, shrubbery, flowers, etc., damaged or removed during construction. Contractor to be responsible for seeing that lawns, shrubs, etc. Remain alive. Leave premises in condition equal to or better than original condition before construction.
- C) Immediately after any section of a completed pipeline has been tested and approved by the Owner or Engineer, the Contractor shall replace all paved surfaces removed or damaged by his operation. All pavement replacement shall be in accordance with the typical trench detail shown on the standard detail sheets, and in accordance with any permit requirements imposed by the City, County or State.

- D) Unless otherwise approved, all asphalt pavements removed shall be replaced with hot mixed bituminous pavement and all aggregate base course material shall be Colorado Department of Transportation, Class 6 Aggregate Base Course. Paved surfaces shall be restored to their original line and grade and finished to match adjacent undisturbed surfaces. If Contractor is unable to replace asphalt pavement with hot mixed bituminous pavement, then temporary cold asphalt pavement shall be used. Contractor will be responsible for maintaining the cold asphalt pavement until it can be replaced with hot mixed bituminous pavement. All costs for temporary pavement, maintaining temporary pavement, an replacing asphalt pavement with hot mixed bituminous pavement shall be considered to be included in the bid price for pavement replacement.

- E) All curbs, gutters, sidewalks, gutter pans, driveways and other concrete street hardware within the right-of-way shall be replaced by a licensed specialty Contractor with a permit issued by the office of the City Engineer. All concrete shall be Colorado Department of Transportation, Class B unless otherwise noted.

PART 4: SPECIAL PROVISIONS

4.1 MEASUREMENT AND PAYMENT

- A) When not listed in the proposal, all trench excavation and backfill costs will be considered incidental work for which no separate payment will be made.

- B) When listed in the proposal, payment for work specified under this section will be made at the prices listed in the proposal and as outlined below. Quantities to be computed by the engineer from measurement of actual work completed and accepted.

- C) Trench Excavation
 - 1) Paid for on a linear foot basis for each size and classification of trench at the prices named in the proposal. Length will be measured horizontally along pipe actually installed without deducting for fittings and appurtenances.

- D) Foundation Stabilization
 - 1) Paid for on a cubic yard basis at the prices named in the proposal. Length and width will be measured horizontally along foundation stabilization material actually installed.

- 2) Depth measured to be actual depth installed below bottom of bedding. The average depth will be used with measurement intervals of 25 feet along centerline of trench.
- 3) No payment will be made for unauthorized foundation stabilization.

E) Rock Excavation

- 1) Payment for unforeseen rock conditions shall be made after negotiations to determine a unit price based on the best and safest method selected and approved by the engineer for the rock removal.
- 2) Rock excavation will be paid for on a cubic yard basis and or at the prices named in the Proposal. Measurement will be as outlined below.
 - a) The length will be the entire horizontal distance measured along the centerline of the trench.
 - b) The width for measurement purposes shall be 12 inches greater than the maximum outside diameter of the pipe.
 - c) The measurement for depth will be the vertical distance from the top of the rock to the depth shown on the plan. The depth will be measured at intervals of 25 feet along the centerline of the trench and the average depth between measuring points will be the depth used for computing the depth of rock.

F) Measurement and payment for rock excavation will be in addition to the payment for trench excavation and backfill. Payment for rock excavation shall include full compensation for all work necessary to excavate the rock material. Price indicated also includes the cost for embedment and pipe zone materials.

G) Asphalt Cement (AC) Pavement Cuts

- 1) When not listed in the proposal, all pavement cuts to be considered incidental to work for which no separate payment will be made.
- 2) When listed in the Proposal, payment for work specified under this section will be made at the prices listed in the Proposal. Quantities to be computed by the Owner's Representative for measurement of actual work completed and accepted.

- H) Payment indicated shall include complete compensation for all labor, equipment, materials and incidentals involved in the work specified herein. No additional compensation will be considered unless allowed and submitted in accordance with sections VIII and XIII of the General Conditions.

END OF SECTION