SECTION 02315

UTILITY TRENCHING, BACKFILL AND COMPACTION
(WATER MAIN & APPURTENANT STRUCTURES)

PART 1 GENERAL

1.1 SUMMARY

A. The work covered by this specification consists of furnishing all plant, labor, equipment, appliances and materials, and performing all operations in connection with the excavation and preparation of utility trenches and bedding and backfill of utilities to the locations, lines, elevations, and grades as provided for in the Drawings, Specifications, and Special Provisions of the Contract.

B. Excavation, backfill, and compaction for appurtenant structures such as, but not limited to, manholes, inlets, catch basins, handholes, transitions sections, junction chambers, structures, vaults, valve boxes, gate wells, and hydrants, shall be deemed to be in the category of trench excavation.

C. Protection of existing utilities, sidewalks, pavements, trees, and other facilities in the vicinity of the trench excavation is included in the work covered by this specification.

D. Related Requirements
1. Section 02336 – Horizontal Directional Drilling (Water Main)
2. Section 02660 – Water Main Systems
3. Section 02661 – Ductile Iron Water Main Pipe
4. Section 02662 – High Density Polyethylene Water Main Pipe

1.2 MEASUREMENT AND PAYMENT

A. Excavation and compaction for the preparation of a utility trench, including all the work as covered by this specification and any sheeting, shoring or bracing to safely install an underground utility, shall be included in the costs per unit of measurement for the associated utility to be installed.

B. Excavation and compaction in preparation for the installation of an appurtenant structure as defined herein, including all the work as covered by this specification and any sheeting, shoring or bracing to safely install the appurtenant structure, shall be included in the costs per unit of measurement for the associated appurtenant structure to be installed.

C. Bedding, Initial Backfill, and Final Backfill to final grade for the installation of a utility, including all the work as covered by this specification and all labor, materials, equipment and compaction necessary to successfully install an underground utility, shall be included in the costs per unit of measurement for the associated utility to be installed.

D. Bedding, Initial Backfill, and Final Backfill for the installation of an appurtenant structure as defined herein, including all the work as covered by this specification and all labor, materials, equipment and compaction necessary to successfully

install the appurtenant structure, shall be included in the costs per unit of measurement for the associated appurtenant structure to be installed.

E. Protection of existing utilities, sidewalks, pavements, trees, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations shall be included in the costs per unit of measurement for the associated utility to be installed.

F. Dewatering necessary to provide for a clean, dry trench free from standing water and so that there is no unbalanced upward pressure on the bottom of the open excavation until utility installation is completed shall be included in the costs per unit of measurement for the associated utility to be installed.

G. Boulder removal shall be included in the costs per unit of measurement for the associated appurtenant structure to be installed.

H. Should Rock within the proposed trench excavation be encountered, payment for removal, disposal, and backfill of areas to properly support the utility or appurtenant structure shall be measured and paid for in accordance with the Contract provisions for changes in Work on a time and material basis as described in the General Conditions of the Contract.

I. Trench Undercut and Backfill.....Cubic Yard
The Owner shall pay for the removal and satisfactory disposal of all unsuitable material located below the subgrade elevation of the trench excavation and backfill the excavation to the original subgrade elevation with approved select aggregate material. **Trench Undercut and Backfill** will be paid for at the Contract unit price per cubic yard based on volume of the excavation supported by actual width, length, and depth measurements taken by the Owner. Approved aggregates placed and compacted within the undercut section will not be paid for separately but shall be included in the unit price bid for **Trench Undercut and Backfill.**

1.3 REFERENCES

A. Abbreviations and Acronyms
1. ASTM – American Society for Testing and Materials
2. MDOT – Michigan Department of Transportation
3. OSHA – Occupational Safety and Health Administration
4. USCS – Unified Soil Classification System

B. Definitions
1. Appurtenant Structure – structures or appurtenances related to utility construction, such as but not limited to; manholes, inlets, catch basins, handholes, transitions sections, junction chambers, structures, vaults, valve boxes, gate wells, and hydrants
2. Bedding – select material on which the utility is supported within trench excavations and installed at the trench subgrade elevation and up to a point within the pipe zone dependent on the pipe design, material and loading factors above and around the utility
3. Boulder – a solid mineral mass with a volume of less than 1.00 cubic yards
4. Final Backfill - area of the trench excavation cross-section extending from the top of the pipe zone to the top of the trench and bottom of the surface restoration or pavement section

5. Haunch Bedding – area of the bedding cross-section between the bottom of the utility and the springline of the utility
6. Initial Backfill – area of the trench excavation cross-section extending from the top of the bedding material, to a minimum level of 12 inches over the top of the installed utility
7. Initial Bedding Layer - area of the bedding cross-section between the subgrade and the bottom of the utility
8. Inner Bedding – the bedding zone directly beneath the utility. Typically, the middle 1/3 of the trench bottom width
9. Pipe Zone – area of the trench excavation cross-section extending from the subgrade to a level a minimum of 12 inches over the top of the installed utility
10. Rock – a solid mineral mass with a total volume of greater than 1.00 cubic yards
11. Sand Backfill Trench – Utility trench or portion of utility trench or excavation in which the final backfill is within the zone of influence of existing or proposed graveled, slag or hard surfaced road, pavements, hard surfaced parking lots and driveways, sidewalks and curbs
12. Standard Backfill Trench – Utility trench or portion of utility trench or excavation outside the Sand Backfill Trench
13. Subgrade – Surface or elevation remaining after completing trench excavation or the top surface of an over-excavation or undercut backfill (stone or soil) immediately below the utility or utility bedding, as applicable. Commonly referred to as "Foundation".
14. Suitable Material – Materials, either excavated or delivered, capable of meeting identified compaction requirements, meeting MDOT Class II, IIA, III or IIIA or ASTM D 2487 soil classification group (USCS) SW, SM, SC, SP and or a combination of these group symbols; free of mineral masses ~~rock~~ or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
15. Unsuitable Material – Material which;
    - Contains mineral masses, gravel or clay lumps larger than 3 inches in any dimension,
    - Contains more than 1% organic matter,
    - Has a Liquid Limit exceeding 40 and/or a Plastic Limit exceeding 10
    - Contains construction debris such as brick, broken concrete, wire, etc, or waste, vegetation, and other deleterious matter.
    - Is frozen or contains ice balls in excess of 3 inches in any dimension,
    - Maintains a moisture content, at the time of compaction, that exceeds the Optimum Moisture content, established by the method used to determine the Maximum Unit Weight, by three percentage points or more.
16. Utilities – Underground pipes, sewers, water mains, conduits, ducts, cables, as well as underground services to properties and buildings.
17. Zone of Influence - a one to one (1 horizontal to 1 vertical) slope from the edge of pavement to the trench bottom.

C. Reference Standards
1. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

2. MDOT Density Testing and Inspection Manual
3. OSHA Standard 29 CFR Part 1926 – "Safety and Health Regulations for Construction"
4. Reference Standards that are cited specifically by name shall be the current versions of said manuals existing at the time of the award of the Contract.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Conform to applicable state and local codes for disposal of excavated materials judged unsuitable for backfill.

B. Obtain disposal permit from the Local Enforcing Agency.

C. Unless otherwise specified, provide third-party materials testing services for the testing requirements specified herein.

D. Coordination
1. The Owner is the sole operator of all water system valves and hydrants. Coordinate all utility service interruptions with Owner
2. Contact the Owner to schedule field representation for construction observation.
3. Coordinate with utilities for relocation, adjustment, or support of their facilities

E. Safety
1. Contractor is solely responsible for site safety.
2. Comply with applicable requirements of MIOSHA and OSHA, specifically Standard 29 CFR Part 1926, Subpart P "Excavations"
3. Keep surface over and along trenches and other excavations in a safe and satisfactory condition during the process of the Work.

1.5 SUBMITTALS

A. Classifications and MDOT pit numbers of aggregates for Undercut Backfill, Bedding, Initial Backfill and Final Backfill and supporting material characteristic test results

B. Concrete cradling or other bedding to be used in the event of an unauthorized excavation per Article 3.6.

C. Supplier endorsements that certify materials meet project requirements.

D. Sheeting, Shoring or Trench Box Construction Plan

E. Dewatering Plan for utility trench, if necessary

F. Testing summaries as required in Article 1.6

1.6 QUALITY ASSURANCE

A. Initial compaction tests will be made by a representative of the Owner and paid for by the Owner.
1. If it is necessary to repeat compaction tests because initial compaction methods or construction procedures failed to produce required density, in

place, the Contractor shall be billed for the cost of all repeat testing until material meets specifications

B. Conduct a Pre-Excavation Meeting at the project site at the request of the Owner.

C. Comply with all code, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

D. Trench subgrade will be reviewed for elevation and stability.
   1. Elevation of trench bottom to be within a tolerance of one-half (1/2) inch from plan grade.
   2. Potential for trench undercutting will be reviewed by probing the trench bottom. Penetrations greater than six (6) inches below the specified subgrade elevation will prompt review by the Owner for potential undercuts.

E. Compaction of Undercut Backfill, Bedding, and Initial Backfill will be visually observed to review installation in conformance with the project requirements.

F. Compaction testing will be conducted on each lift of Final Backfill above the Pipe Zone, including the top of the Pipe Zone.
   1. Maximum lift thickness of final backfill is 12 inches unless otherwise detailed.
   2. Compact top of the Pipe Zone and Final Backfill materials to not less than 95% of the maximum unit weight as determined by the method described in the MDOT Density Testing and Inspection Manual appropriate for the backfill material.
   3. Provide testing summaries for each day and type of compaction testing, each summary shall include, at minimum, the following;
      a. Station and depth of where the test was taken from centerline of utility.
      b. The specified material and type of material (if different) being tested and the measured maximum dry density, moisture content, and percent compaction.
      c. Method of compaction testing.
      d. All tests taken.

1.7 EXISTING CONDITIONS

A. The Contractor will be held to have compared the conditions of the site where work is to be performed with the Drawings and Specifications and to have satisfied themselves as to the conditions of the site, existing conditions, and any other conditions affecting the carrying out of the work.
   1. It is expressly understood that the Contractor will obtain first-hand information concerning the available facilities for receiving, transporting, handling and storing construction equipment and materials and concerning other local conditions that may affect the Work.
   2. The Contractor shall draw their own conclusion as to soil and/or rock conditions and groundwater to be encountered, and shall complete the Work under any job or field condition which was present and/or ascertainable prior to bidding.

B. The Contractor shall complete the work under whatever conditions created by their own sequence of construction, construction methods, or other condition created at no additional cost to the Owner.

C. Contact Miss Dig (811) a minimum of 72 hours in advance of any excavation for the location of utilities and cable facilities.

D. Utilities have been located from surveys and available existing records. Not all utilities may be shown on the Drawings. Locate all utilities prior to beginning trench excavation activities.

E. Where utilities require adjustment, relocation, or support to construct the Work, and those utilities are shown on the Drawings, relocation, adjustment or support shall be considered included in the Work and shall be completed at no additional cost to the Owner.

F. Where utilities require adjustment, relocation or support to construct the Work, and those utilities are not shown on the Drawings, notify Owner or Owner's Representative before proceeding.
   1. Relocate or adjust utility as directed.
   2. Utility relocation and/or adjustment will be paid for in accordance with the Contract provisions for changes in Work.

G. If utility is damaged by Contractor, notify utility owner and Owner or Owner's Representative immediately. Repair or replacement of utilities damaged by Contractor, whether utilities are shown on the Drawings or not shown on the Drawings, shall be at the Contractor's expense.

1.8 POTENTIALLY HAZARDOUS SUBSTANCES

A. Use the following indicators to identify materials suspected of being hazardous or contaminated and requiring disposal in a Type I or Type II landfill.
   1. Materials other than general construction debris of a color not consistent with the natural soils observed in the area;
   2. Materials other than general construction debris of a consistency that is not consistent with the natural soils observed in the area;
   3. Man-made containers, vessels, tanks, or barrels;
   4. Electric devices;
   5. Insulation or fibrous material that may contain asbestos;
   6. Material that emits a chemical or petroleum odor.

B. Separately stockpile questionable materials.
   1. Inspected and representative samples should be collected and screened in the field.
   2. Materials should be stored on plastic sheeting at the predesignated, secure location on the parcel or an adjacent parcel and covered with plastic sheeting until disposal is determined.

C. The Contractor will be responsible for identifying and testing of potentially hazardous materials and reporting to the Owner and Engineer.

D. Potentially hazardous materials should be screened in the field by qualified personnel for the presence of volatile organic compounds (VOC) using a photoionization (PI) meter.

1. It is assumed that the presence of VOCs should provide a general indicator of the presence of other potentially hazardous chemicals.
2. Materials to be subjected to further laboratory analysis should be selected based on the results of the field screening and observations made by the person monitoring the excavation.

E. Based on the field screening and laboratory analysis, the Contractor will be advised by the Owner as to the required method of disposal.

PART 2 PRODUCTS

2.1 UNDERCUT BACKFILL AGGREGATES

A. Coarse graded aggregate to meet grading requirements as specified below.

B. Slag and crushed concrete aggregates are prohibited.

Aggregates to be supplied from approved manufacturers of prequalified aggregate sources, as identified in the MDOT Materials Source Guide, latest edition.

UNDERCUT BACKFILL GRADING REQUIREMENTS								
Material	Total Percent Passing (Sieve Size)							
	1 ½"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	Loss by Washing
MDOT 6A	100	95-100	-	30-60	-	0-8	-	≤ 1.0
MDOT 17A	-	100	90-100	50-75	-	0-8	-	≤ 1.0

2.2 UTILITY BEDDING

A. Refer to specific pipe material specification for Bedding material requirements.

2.3 UTILITY INITIAL BACKFILL

A. Refer to specific pipe material specification for Initial Backfill material requirements.

2.4 UTILITY FINAL BACKFILL

A. Final Backfill for utility trenches will be "Sand Backfill Trench" or "Standard Backfill Trench" as defined in Section 1.3.B

B. Granular materials used for Final Backfill in the "Sand Backfill Trench" shall meet the minimum requirements for granular material as specified on the following page:

FINAL BACKFILL SAND BACKFILL TRENCH GRADING REQUIREMENTS								
Material	Total Percent Passing (Sieve Size)							
	3”	2”	1”	1/2”	3/8”	No. 4	No. 100	Loss by Washing
MDOT Class II	100	-	60-100	-	-	50-100	0-30	0-7
MDOT Class IIA	100	-	60-100	-	-	50-100	0-35	0-10
MDOT Class IIIA	-	-	-	-	100	50-100	0-30	0-15

C. Final Backfill material used for the “Standard Backfill Trench” shall comply with;
   1. Grading requirements as specified below, or
   2. Definition of “Suitable Material” as described in Section 1.3.B.

FINAL BACKFILL STANDARD BACKFILL TRENCH GRADING REQUIREMENTS								
Material	Total Percent Passing (Sieve Size)							
	6”	3”	1”	1/2”	3/8”	No. 4	No. 100	Loss by Washing
MDOT Class II	-	100	60-100	-	-	50-100	0-30	0-7
MDOT Class IIA	-	100	60-100	-	-	50-100	0-35	0-10
MDOT Class III	100	100-95	-	-	-	50-100	-	0-15
MDOT Class IIIA	-	-	-	-	100	50-100	0-30	0-15

D. Material not meeting the grading requirements for above may be used for Final Backfill provided the Contractor can supply test results showing conformance with the definition of “Suitable Material” as described in Section 1.3.B.

E. Materials meeting any of the criteria for “Unsuitable Material” as described in Section 1.3.B are prohibited from use as Final Backfill.

2.5 APPURTENANT STRUCTURE BACKFILL

A. Materials shall match condition and grading requirements detailed in “UTILITY FINAL BACKFILL”.

PART 3 EXECUTION

3.1 PREPARATION

A. Plan construction to minimize disturbance.

B. Protect adjacent structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent sites and walkways.

D. Maintain normal flow of drainage water on the jobsite and all present above ground and underground utilities.

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

3.2 DEWATERING

A. Do not allow water to accumulate in the trench.
   1. Remove water that accumulates in the trench which would affect the construction of utilities or their appurtenant structures by pumping, bailing, well-pointing, draining or other approved dewatering method.
   2. Perform all work necessary to keep the trenches entirely clear from water throughout construction of utilities and appurtenant structures.
   3. Construction of structures in water is prohibited.

B. Convey all water removed from trench in a proper manner to a suitable point of discharge that complies with applicable soil erosion and sedimentation control regulations.
   1. Dispose of water from the trench in such a manner to cause no injury to public health, property, work completed or in progress, street surfaces, or where such effluent may cause an interference with the use of the streets.
   2. If water is odorless and stable, discharge of the dewatering systems into an existing storm drain, channel, or street gutter in a manner approved by the Owner is permissible. Filtering of the discharge water is required.
   3. Discharge of water to a sanitary sewer main of sanitary sewer related structure is strictly prohibited.

C. Maintain dewatering systems until dewatering is no longer required.

D. Prevent surface water from ponding on prepared subgrades and from flooding the project site and surrounding areas. Reroute surface water runoff away from or around excavated areas.

E. All shoring, sheeting, well-pointing, gravel bedding and other dewatering devices necessary to successfully complete the dewatering requirements of the project shall not be considered separate items of work but are inclusive to dewatering.

3.3 TRENCHING AND EXCAVATION

A. Excavate utility trench width to at least the minimum width in conformance with the material specification and standard details for the associated pipe material type.
   1. If material specification and standard details are not provided, refer to manufacturer's recommended trench widths.
   2. Provide Owner with planned trench dimensions at Pre-Excavation meeting if different than material specification and standard details.

B. All excavation of trenches is to be by open cut method, to the depth and grade shown on the Drawings and as necessary to accommodate the Work, unless otherwise noted.

C. Excavate to the line and grade shown on the Drawings.
   1. Excavations shall be to depths to provide cover of five and one half (5½) feet over the top of pipe to plan grade, unless otherwise noted on the plans.

D. Begin trench excavation at the downstream end of the utility, when applicable.

E. Excavate in accordance with OSHA Standard 29 CFR Part 1926 – "Safety and Health Regulations for Construction".

F. Do not stockpile materials along one edge of the excavation so as to impose too great a load on the bank of the trench or cause damage to trees, shrubs, fences or other property.

G. Excavate only as much trench as can be entirely completed (install utility, backfill, compact, clean up) within that working day.
   1. Do not open a greater length of trench than can be effectively utilized and maintained under existing conditions and with the forces at hand.
   2. Limit maximum allowable length of open trench to 50 linear feet per work crew.
   3. Remove all construction debris, equipment and excess dirt from the site.

H. Contractor is responsible for proper disposal of excavated materials.
   1. Dispose of excess and unsuitable material in accordance with local, County, State and Federal Regulations.
   2. All excavated material removed offsite becomes the property of the Contractor.

I. Preparation of Trenches for Utility Installation:
   1. Excavate the bottom of the trench to a minimum over depth as indicated in the material specification and standard details for the associated pipe type and laying condition specified to provide for pipe bedding.
   2. Shape the bottom of the trench to support the utility uniformly.
   3. Check the elevation of the excavation depth.
   4. Review the subgrade for stability.
   5. Remove all water from the trench prior to utility placing operation to ensure a dry, firm bed on which to bed the utility.
   6. Where unsuitable soil conditions, or obstructions other than ~~rock~~ *Rock*, require excavation of the trench below the subgrade elevation detailed on the Drawings; undercut, backfill and compact the trench as specified in Section 3.4

J. Excavation for Structures:
   1. Excavate to provide a minimum of 12 inches of horizontal clearance between outer surface of structure and trench wall.
   2. Excavate the bottom of manhole bases and other precast structures and appurtenances to a minimum over depth of 6 inches below the bottom of the structure, or no less than indicated in the applicable standard details.
   3. Shape and grade the excavation so that the subgrade is level over the entire area.
   4. Check the excavation depth. Subgrade is required to be within 1/2-inch of elevation specified in the Drawings.
   5. Review the subgrade for stability.
      a. Probe suitable soils that appear unstable.
      b. Notify Owner if probe penetrations exceed six (6) inches.
   6. Remove all water from the excavation prior to placing the structure to ensure a dry, firm bed on which to install the base of the structure.

7. Where unstable soil conditions, or obstructions other than rock, require excavation below the subgrade elevation detailed on the Drawings; undercut, backfill and compact the excavation as specified in Section 3.4.

K. Once trench or excavation is open, proceed immediately to place specified materials in trench, or to otherwise utilize trench for its intended purpose.
1. Schedule work and order materials so that trenches are not left open for a longer period of time than is reasonably necessary.
2. Any trench or portion of trench, which is opened and remains idle for 24 hours or longer, as determined by the Owner, may be directed to be immediately refilled, without completion of work, at no additional cost to the Owner.
3. Said trench may not be reopened until the Owner is satisfied that work associated with trench will progress to finish.

3.4 TRENCH UNDERCUT AND BACKFILL

A. Notify the owner when any unsuitable soil conditions or obstructions are discovered at the bottom of the trench or appurtenant structure excavation.
1. Undercut the subgrade only upon authorization of the Owner.
2. Delineate and record limits of unsuitable materials.

B. Excavate below the proposed subgrade elevation within the excavation limits until solid, suitable bearing material is uncovered.

C. Fill the undercut excavation with approved aggregate material detailed in Section 2.1 to the proposed subgrade elevation.
1. Maximum 12-inch lifts.
2. Compact each lift to minimize voids.

D. Suspend undercutting activities once a depth of 3 feet is reached to review the conditions with the Owner and, if necessary, consider alternative solutions.

3.5 ROCK EXCAVATION

A. Notify the Owner when Rock within an excavation is encountered and prior to any blasting or removal.
1. Do not perform rock excavation work until rock has been cross-sectioned, classified, and approved for removal by the owner.
2. Owner will measure the rock, after which, the rock shall be excavated to a depth six (6) inches below the grade of the proposed utility and the bottom of the excavation brought back to grade by using the approved Undercut Backfill material.

B. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of rock encountered will be deemed to be an unauthorized excavation.

C. Remove over-blasted rock which has been loosened prior to backfilling.

D. Use overburden, mats, or other means to minimize fly-rock. Any damage caused by fly-rock or excessive vibration due to rock excavation activities will be the responsibility of the Contractor.

E. No rocks or boulders shall be used as backfill in any part of the trench.

F. Where mineral masses have been scattered over adjacent lands as a result of the Contractor's blasting or Rock excavation operations, Contractor shall remove the mineral masses and restore area to its original condition at no cost to the Owner.

3.6 UNAUTHORIZED EXACAVTIONS

A. Whenever the trench excavation is carried beyond the lines and grades established by the Drawings or as approved by the Owner, the Contractor shall, at his own expense, fill all such excavated space with concrete cradling or other approved material and in such a manner as to meet the approval of the Owner.

B. Unauthorized excavation beneath structures shall be filled with plain concrete, or flowable fill as determined by the Owner.

3.7 SHORING, SHEETING AND TRENCH BOX CONSTRUCTION

A. Shoring and Sheeting
   1. Refer to specific sheeting and shoring specifications for minimum requirements braced excavation design and installation.
   2. Sheet and brace excavations as necessary to ensure substantial completion of the work and ensure the safety of the workers and the public and to protect existing structures
   3. Sheeting and shoring placed in the trench's Pipe Zone shall be left in place or cut off not lower than the top of pipe.

B. Trench Boxes
   1. It is the Contractor's responsibility to determine the necessity of using a trench box for excavation.
   2. Ride trench box above the top of pipe to maintain the design trench width up to the top of pipe.
   3. Protect the integrity of the pipe bedding.
   4. Care must be taken to ensure that movement of the trench box does not pull the pipe joints apart.

3.8 UTILITY BEDDING

A. Refer to specific pipe material specification for Bedding installation requirements.

3.9 INITIAL BACKFILL

A. Refer to specific pipe material specification for Initial Backfill installation requirements.

3.10 FINAL BACKFILL

A. Place Final Backfill using mechanical compaction method in layers not to exceed 12 inches.

B. Compact each layer of Final Backfill to not less than 95% of the maximum unit weight of the selected material as specified in Section 1.6.

C. It is the Contractor's responsibility to provide safe and secure access for testing personnel to complete the specified testing requirements.

D. Backfill to the top of the excavated trench and compact all backfill for the utility installed during the same day, prior to completion of the day's work to provide a firm continuous support and covering for the utility.

E. Do not operate heavy equipment or vibratory equipment over any utility until it has been properly backfilled and compacted to minimum required maximum unit weight and has a minimum of 48 inches of cover.

F. Place backfill around structures in a manner that will not cause unequal pressure or damage to any exterior coatings, plastering or parging.

G. Compaction by flooding the excavation is prohibited.

3.11 NON-CONFORMING WORK

A. Re-excavate trenches that have been improperly backfilled and replace and re-compact

B. Should any of the Work be so enclosed or covered up prior to compliance with the quality assurance requirements of these Specifications, such Work shall be uncovered and after quality control testing, refilled and compacted all at no additional cost to the Owner.

C. Remove and replace pipe that shows excessive settlement or has been otherwise damaged by Contractor's operations at no cost to the Owner.

END OF SECTION